



Forschungsstelle Für Umweltpolitik
Environmental Policy Research Centre
Freie Universität Berlin
Fachbereich Politik- und Sozialwissenschaften
Otto-Suhr-Institut für Politikwissenschaft

FFU-report 04-2006

**Environmental Policy
Research Centre**

Water regime formation in Europe

**A research framework with lessons
from the Rhine and Elbe river basins**

STEFAN LINDEMANN

ffu

Paper prepared for the
German-Israeli-Palestinian research project
“From conflict to collective action Institutional change and
management options to govern transboundary watercourses”

ISSN 1612-3026
FFU-rep 04-2006

Stefan Lindemann
Environmental Policy Research Centre
Freie Universitaet Berlin
Ihnestr. 22, D – 14195 Berlin
stelin@zedat.fu-berlin.de



**FORSCHUNGSSTELLE FÜR UMWELTPOLITIK
FREIE UNIVERSITÄT BERLIN**

Fachbereich Politik- und Sozialwissenschaften
Otto-Suhr-Institut für Politikwissenschaft

Ihnestr. 22
14195 Berlin

telefon +49-30-838 566 87
fax +49-30-838 566 85
email ffu@zedat.fu-berlin.de
internet <http://web.fu-berlin.de/ffu/>

Table of contents

1	International river basin management in Europe	1
2	Determinants of water regime formation	5
2.1	Theoretical approaches to explaining water regime formation	5
2.1.1	Power-based hypotheses	5
2.1.2	Interest-based hypotheses	8
2.1.3	Knowledge-based hypotheses	11
2.1.4	Context-based hypotheses	15
2.2	Methodological considerations	15
3	Empirical case studies	16
3.1	The Rhine Water Regime	16
3.1.1	Power-based hypotheses	17
3.1.2	Interest-based hypotheses	18
3.1.3	Knowledge-based hypotheses	22
3.1.4	Context-based hypotheses	24
3.1.5	Summary	26
3.2	The Elbe Water Regime	27
3.2.1	Power-based hypotheses	30
3.2.2	Interest-based hypotheses	31
3.2.3	Knowledge-based hypotheses	32
3.2.4	Context-based hypotheses	33
3.2.5	Summary	34
4	Conclusions	34
5	Bibliography	37

List of abbreviations

APE	Action Programme Elbe
ARGE	Arbeitsgemeinschaft zur Reinhaltung der Elbe
DM	Deutsche Mark
EEC	European Economic Community
EU	European Union
FAO	Food and Agriculture Organization
GDR	German Democratic Republic
GWP	Global Water Partnership
HDI	Human Development Index
IAWR	International Association of Waterworks in the Rhine Basin
ICPE	International Commission for the Protection of the Elbe
ICPR	International Commission for the Protection of the Rhine
IWRM	Integrated Water Resources Management
MdPA	Mines de Potasse d'Alsace
OECD	Organisation for Economic Cooperation and Development
PD	Prisoner's Dilemma
RAP	Rhine Action Programme
RIZA	Institute for Inland Water Management and Waste Water Treatment
TFDD	Transboundary Freshwater Dispute Database
UK	United Kingdom
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WFD	Water Framework Directive
WWC	World Water Council

1 International river basin management in Europe¹

Almost all of the world's largest rivers cross national borders. According to recent estimates, there are 263 international river basins² that account for almost one-half of the earth's land surface, generate about 60% of global freshwater flow and are home to approximately 40% of the world's population. Geographically, Europe has the largest number of international basins (69), followed by Africa (59), Asia (57), North America (40) and South America (38) (Giordano/ Wolf 2002: 1).

The use of international river basins leads to numerous problems and conflicts among riparian states, including disputes over water quantity, pollution, dam schemes, flood protection or navigational issues. While global-scale efforts have only to a limited extent served to encourage greater collaboration among basin states³, it is at the basin-scale where greatest developments in cooperative water management are found. The FAO has documented more than 3600 international water treaties dating from AD 805 to 1984 (FAO 1978). If one excludes the numerous treaties on navigational issues, there are still more than 400 different treaties on international rivers as documented in the Transboundary Freshwater Dispute Database (Giordano/ Wolf 2002: 6).⁴ While most of these cooperative efforts are functional in scope (which means that they are confined to specific problems in the river basin), recent years have seen the increasing propagation of the idea of Integrated Water Resources Management (IWRM) at the river basin level. IWRM is defined as a "process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (GWP 2000: 24). This integrated management approach has been widely endorsed and promoted by international organisations, NGOs and scientists (Teclaff 1996: 384) but suffers from a so far very limited practical application (Hartje 2002: 23).

¹ I thank Ines Dombrowsky for her extensive and helpful comments.

² River basins or catchment areas are defined by their common mouth, which is either the point where the river flows into the sea or an inland delta.

³ The *UN Convention on the Law of the Non-Navigational Uses of International Watercourses*, which took 27 (!) years to develop, establishes a series of principles for international water cooperation but has neither entered into force nor does it provide clear guidance in resolving transboundary water conflicts (Beach et al. 2000: 9). Among many problems, it institutionalizes the inherent upstream/downstream conflict by calling for both "reasonable and equitable use" and an "obligation not to cause appreciable harm". These two principles are in implicit conflict in the setting of an international waterway: up-stream riparians have advocated that the emphasis between the two principles be on "reasonable and equitable use," since this gives the needs of the present the same weight as those of the past. In contrast, down-stream riparians have pushed for emphasis on "no significant harm," which effectively protects the pre-existing uses generally found in the lower reaches of most major streams (Wolf 1998: 1).

⁴ The Transboundary Freshwater Dispute Database (TFDD) was developed by Aaron Wolf and his colleagues at the Oregon State University. It includes, among others, a digital map of the 263 international river basins, a searchable compilation of more than 400 water-related treaties along with the full text of each, and a comprehensive news file of all reported cases of international water-related disputes and dispute resolution between 1948 and 1999 (Wolf et al. 2003: 32).

Europe features a particularly long and rich history of international water cooperation. Between 1945 and 2000, a total of 118 international water treaties have been concluded in 45 of the 69 international river basins on the European continent (*see figure 1*). While this figure provides an impressive account of international water cooperation in Europe, it should be noted that the treaties exhibit an unequal geographical distribution: The Danube and Rhine river basins alone feature 32 and 29 international water treaties and therefore account for more than half of the 118 water treaties (UNEP 2002: 77ff.).

Fig. 1: International river basins and water treaties in Europe



Source: UNEP 2002: 77

The spread of international water treaties in Europe shows a continuous and almost steady growth since 1945 (*see figure 2*). Taking a closer look, we can distinguish three phases. The *first phase between 1945 and 1960* features the rapid spread of 47 international water treaties that are almost exclusively of bilateral nature and typically concerned with technical problems such as border issues, common infrastructure projects or water-economy questions.⁵ During the *second*

⁵ Representative examples of international water cooperation during this first phase include the *Agreement between Poland and the USSR concerning the regime on the Soviet-Polish state frontier* (1948), the *State*

phase between 1961 and 1986, the number of international water treaties grows – at a slightly reduced pace – from 47 to 84. While the majority of the new treaties are still concerned with bilateral infrastructure projects or border issues, the early 1960s mark the beginning rise of international water agreements with environmental focus: Here, we can cite the conclusion of a number of bilateral and multi-lateral treaties to combat transboundary pollution, the *Agreement on the international commission for the protection of the Rhine against pollution* (1963) and the *Rhine Chemical and Chloride Conventions* (1976) being the most prominent examples. This evolution is reinforced during the *third phase between 1987 and 2000*. While the latter witnesses the birth of numerous bilateral agreements on transboundary waters, namely between countries of the former Soviet bloc⁶, it is the agreement on the *Rhine Action Programme* (RAP) in 1987 that is of particular interest: The RAP marks the beginning of efforts to realise a more integrated river basin management approach – a development that is taken up in the context of the subsequent conclusion of a number of international agreements to combat transboundary pollution from the early 1990s (e.g. in the Elbe, Danube, Scheldt and Odera river basins).⁷

Phase 1 as well as most of phase 2 reveal a picture of merely technical and largely piecemeal water cooperation at the bilateral level. Since we are more interested in exploring the viability of IWRM in a river basin context, this type of cooperation is of limited interest. The spread of international water agreements to combat transboundary pollution since the early 1960s, on the other hand, is a more interesting phenomenon that merits closer attention. Against this background, we seek to answer the following research questions:

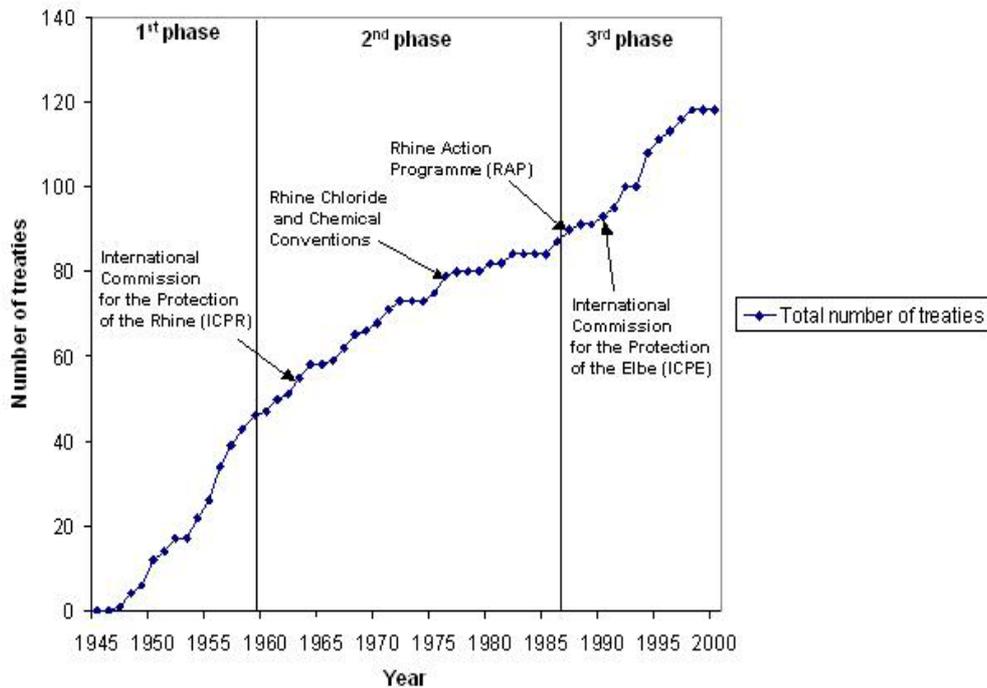
- How can we explain the formation of international agreements against transboundary pollution in Europe since the early 1960s?
- Is the subsequent spread of international agreements against transboundary pollution pure coincidence with independent reactions to similar problems in European river basins? Or can we observe a process of policy learning with the transfer of institutional knowledge from one setting to the other?

treaty between Germany and Luxembourg concerning the construction of a hydroelectric power-plant on the Sauer at Rosport/Ralingen (1950), the *Convention between Germany and France on the management of the upper course of the Rhine between Basel and Strasbourg* (1956) or the *Agreement concerning water-economy questions between Yugoslavia and Bulgaria* (1958) (UNEP 2002: 77ff.).

⁶ E.g. the *Agreement between Russia and Ukraine concerning the joint use and protection of transboundary waters* (1992), the *Agreement between Croatia and Hungary on water management relations* (1994) or the *Agreement between Romania and Ukraine in the field of transboundary water management* (1997) (UNEP 2002: 77ff.).

⁷ The *Convention on the International Commission for the Protection of the Elbe* (1990), the *Convention on cooperation for the protection and sustainable use of the River Danube* (1994); the *Agreement on the protection of the Scheldt* (1994) and the *Agreement on protection of the Odera river from pollution* (1996) (UNEP 2002: 77ff.).

Fig. 2: *The spread of international water treaties in Europe (1945–2000)*



Source: Own compilation based on UNEP (2002: 77-132)

In order to find answers to these questions, we develop a research framework that makes use of realist, institutionalist, cognitivist and contextual approaches to the study of international cooperation (*chapter 2*). While this combination of power-, interest-, knowledge- and context-based arguments is a popular approach in the field of international relations (e.g. Young and Osherenko 1993), we here attempt to complement more “traditional” knowledge-based hypotheses with research on policy diffusion in order to shed light on processes of international policy learning. The hypotheses derived from the different theoretical approaches are then tested in two short empirical case studies on international water cooperation in the Rhine and Elbe river basins (*chapter 3*). The conclusion summarizes the empirical findings from the case studies and outlines possible pathways for further research (*chapter 4*).

It is important to note that we deliberately limit the scope of this paper to “voluntary” water cooperation in Europe before the introduction of the EU Water Framework Directive (WFD) in 2000. The WFD has made international river basin management compulsory for the now 25 member states of the European Union – a situation that has fundamentally changed the prospects for international cooperation along European waterways: As the creation of international river basin organisations is a formal requirement of the WFD, policy development in the field of international river basin management is now introduced from above (e.g. Moss 2003) and therefore needs to be analysed under very different premises.

2 Determinants of water regime formation

2.1 Theoretical approaches to explaining water regime formation

In order to explain the genesis of international water cooperation, we make use of international regime theory. International regimes are understood as “sets of implicit or explicit principles, norms, rules and decision-making procedures around which actor’s expectations converge in a given area of international relations” (Krasner 1983: 2).⁸ *International water regimes* may therefore be defined as

*norm- and rule based cooperation for the political resolution of problems and conflicts in the field of international river basin management.*⁹

To explain water regime formation in Europe, we develop a research framework that combines (1) power-based, (2) interest-based, (3) knowledge-based, and (4) context-based approaches to the study of international cooperation. While this paper draws heavily on typologies that are similar (Haggard and Simmons 1987; Hasenclever et al. 1997) or almost identical (Young and Osherenko 1993), we seek to place our own emphases by systematically applying the different theoretical approaches to the field of international river basin management. Also, we attempt to complement more “traditional” knowledge-based hypotheses with research on policy diffusion in order to explore processes of international policy learning and policy transfer.

2.1.1 Power-based hypotheses

Realist or neo-realist scholars have long considered the distribution of power in the international system as the key to explaining the formation of international institutions. Their basic assumption is that international regimes are structured by and reflect the interests of the dominant members of the international system. The classical and most widely discussed example of a power-based theory of international regimes is the *theory of hegemonic stability* which links the existence of international institutions to a unipolar configuration of power in the issue-area in question. Accordingly, the presence of a hegemon - a single state possessing a preponderance of material resources - is a necessary condition for the formation of international regimes, while regimes tend to decline when power be-

⁸ “Principles are beliefs of fact, causation, and rectitude. Norms are standards of behaviour defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice” (Krasner 1983: 2).

⁹ Alternatively, Haftendorn (2000: 65) suggests that “[a] water regime exists when the affected states observe a set of rules designed to reduce the conflict potential, caused by the use, pollution or division of a given water resource; or the reduction of the standing costs; and the observance over time of these rules”. We consider this definition as rather narrow and prefer the conceptually more open understanding as cited above.

comes more equally distributed among their members. The underlying assumption is that international regimes are public goods for the states in the issue-area (Hasenclever et al. 1997: 90).

Following the well-known critique by Duncan Snidal (1985: 285-90), two schools of thought have developed to explain how a hegemon uses its preponderant material resources to create the regimes it prefers. The *benign hegemon*, closely associated with the work of Charles P. Kindleberger (1981), exercises “positive leadership” and provides the collective good (here, the international regime) all by itself, while the other states are freed from the responsibility to contribute to the maintenance of the regime. Even though it may seem that “the great tend to be exploited by the small” as the smaller actors receive rents due to the hegemon’s action, the hegemon is not acting altruistically. Advantages is benefits (received from the good) minus costs (from the provision of the good), and, by assumption, the hegemon’s benefits are greater than those of the free-riders (Hasenclever et al. 1997: 90). The *coercive hegemon*, best represented in the work of Robert Gilpin (1981), uses its superior power to impose the institutional arrangements it prefers on a group, de facto “taxing” the other members for the collective good provided under his leadership. Even though the distribution of burdens is usually not proportional to actors’ gains, the smaller states tolerate the international regime imposed by the coercive hegemon because they have no other choice.

While realists tend to dismiss the significance of international institutions in general, their account of the prospects for international cooperation in the field of river basin management is even gloomier. Adopting a realist perspective, John Waterbury (1997: 280) summarizes the cooperation problems on international rivers as follows:

“International relations theory, as well as a good deal of economic theory, would warn us of the difficulties of achieving cooperative solutions to multi-player games in which the actors are sovereign and the pay-offs to cooperation asymmetrical. Asymmetrical rewards always characterize the potential outcomes of cooperation in international river basins (...) those with the least to gain will retain veto power over cooperative solutions” (Waterbury 1997: 280).

Rejecting the „[u]topian vision of comprehensive basin-wide agreements that establish a mutually beneficial cooperative regime“, Waterbury underlines the prevalence of a passive or active unilateralism in international river basins (Waterbury 1997: 279). Against the background of the “upstream-downstream structure” of international rivers with asymmetrical pay-offs to cooperation¹⁰, he

¹⁰ For a more detailed discussion of the “upstream-downstream structure” of international rivers and its implications for international water cooperation see section 2.1.2 of this paper.

considers it „unrealistic, if not impossible, to elaborate equivalent [i.e. basin-wide, SL] plans for the allocation of the resource among competing demands” (Waterbury 1997: 280).

In the eyes of (neo-)realist scholars, the only way to achieve the formation of a water regime under such circumstances is the presence of a hegemon. When we speak of hegemonic stability in the field of international river basin management, we first need to highlight an important anomaly: While the theory of hegemonic stability departs from the assumption that international regimes are public goods for the states in the issue-area, the provision of international river basin management is by no means always a public good.¹¹ Instead, the field of international river basin management is dominated by upstream-downstream games with unidirectional externalities (see below). Nonetheless, we consider it possible to apply the theory of hegemonic stability to problems along international rivers.

Analysing the drivers of cooperation in four Southern African international river basins, Andrew Turton (2003: 302) finds that “the water regimes all originated as a result of national security threats to the hegemonic riparian. This means that the water regimes are in fact a form of security regime with the preference structure having been defined by South Africa as the hegemonic state”. Miriam Lowi (1993) has made a similar, albeit more sophisticated argument. Employing a variant of the theory of hegemonic stability, she departs from the assumption that “if the dominant power in the basin will benefit from regional cooperation in water utilization, it will take the lead in creating and maintaining a regime, and will enforce compliance with its rules” (Lowi 1993: 10). Taking the Jordan, Nile, Euphrates and Indus rivers as empirical case studies, Lowi concludes that the formation of international water regimes requires the presence of a hegemon in the downstream position since the latter has both an interest to secure its water supply and the power resources to compensate for its geographically disadvantageous situation (e.g. Egypt in the case of the Nile). A hegemon in the upstream position, on the other hand, does not show any interest in the conclusion of cooperative arrangements since this would restrict its future scope of action for unlimited and discriminatory water utilization (e.g. Turkey in case of the Euphrates) (Lowi 1993: 203). A recent quantitative study by Bertram Spector (2000) gives further credit to the theory of hegemonic stability. Spector finds that inequalities between riparian countries – e.g. in the ratio of water use for industrial purposes, access to clean drinking water, Human Development Index (HDI) or economic strength – show a positive correlation with international water cooperation (Spector 2000: 31). He therefore concludes that “in the inequality among riparians, the seeds for cooperation may be found” (Spector 2003: 233). Possible explanations for

¹¹ I owe this point to Ines Dombrowsky.

this observation include that hegemon have the necessary resources to both impose cooperative arrangements and/or to make benevolent concessions (Spector 2000: 232).¹²

The above-cited arguments lead to the following power-based hypothesis:

H1: The presence of a hegemon – benign or coercive – is a necessary condition for water regime formation along international rivers. Due to the upstream-downstream structure of international rivers, it can be expected that only hegemon in the downstream position show an interest to take a lead in the creation and maintenance of a water regime.

2.1.2 Interest-based hypotheses

Interest-based arguments claim that international regimes arise when self-interested parties approach a problem in *contractarian terms* and seek to coordinate their behaviour to reap joint gains. The basic assumption is that a regime forms when the participants of the bargaining process reach agreement on the terms of a mutually acceptable constitutional contract (Young and Osherenko 1993: 11).

The most important contribution has been provided by Robert Keohane (1984) who develops a functionalist theory of international regimes based on the analysis of *constellations of interests*. Drawing on the game-theoretical model of the Prisoner's Dilemma (PD) – which, in Keohane's (1984: 68) view, captures the essence of a wide range of situations in world politics – he is able to demonstrate that two countries can *have a common interest* in achieving cooperation in a given issue-area, which, at the same time, they are *unlikely to realise*. The instrument that states employ to help them realize these common interests is the creation of international regimes. The most general proposition of Keohane's theory is therefore that regimes facilitate international cooperation – essentially through the reduction of transaction costs in form of uncertainty – which would otherwise be difficult or impossible to achieve.¹³ Keohane's initial argument has subsequently been extended and further developed by a number of authors adopting a so-called "situation-structural approach" (e.g. Stein 1983; Snidal 1985b; Zürn 1992). Departing on Keohane's game-theoretic assumptions, situation-structuralists argue that the PD, both in game theory and international relations, represents only one type of collective action problems among several and move on to develop typologies of "situation structures" that help to explain the varying likelihood of regime formation across issue-areas. Among the most sophisticated ar-

¹² This argument resembles the distinction between coercive and benign hegemon as outlined above.

¹³ In game theoretic terms, regimes do not (or not necessarily) operate by altering the pay-off structure (or constellation of interests) but by making a different strategy – international cooperation – more rational for the actors involved (Hasenclever et al. 1997: 32).

guments is the contribution by Zürn (1992) who distinguishes between four situation structures: (1) assurance situations, (2) coordination situations, (3) collaboration situations, and (4) suasion (Rambo) situations, where the probability of regime formation is highest in assurance and lowest in suasion situations. The central assumption of situation-structuralist contributions is that the creation of an international regime is more likely the less demanding the cooperation problem (Hasenclever et al. 1997: 44ff.).

But interest-based contributions do not limit themselves to reflections on pay-off structures and their implications for international cooperation. Moving beyond the purely functional logic of the 1980s, the interest based school of thought in regime analysis has come to realise that situation structures do not simply determine the prospects of regime formation – a „turn to process in regime analysis“ (Schram Stokke 1997: 58). Zürn (1992), for example, argues that his regime formation hypothesis as outlined above needs to be refined by taking into account a set of secondary variables comprising (1) the expected frequency of interactions through time, (2) the density of transactions, (3) the type of foreign policy practised by the actors, (4) the distribution of issue-specific resources, (5) the presence or absence of salient solutions, (6) the number of actors in the issue-area, and (7) the state of the overall relationship of the actors. This attempt to pay increased attention to the concrete bargaining processes that regularly precede the creation of regimes has been taken up and “radicalised” in the works of Oran Young (1989; Young and Osherenko 1993). Challenging standard rationalist (or utilitarian) models which take as their point of departure “either an Edgeworth box diagram with its depiction of a well-defined contract curve (...) or a game-theoretic formulation with its identification of a well-defined negotiation set” (Young 1989: 357), Young develops his own model of “institutional bargaining” where parties engage in integrative (rather than distributional) bargaining under a “veil of uncertainty” regarding their own future positions and interests. Under these circumstances, factors contributing to success in institutional bargaining include (1) exogenous shock or crisis, (2) the availability of equitable solutions, (3) the availability of salient solutions, (4) the availability of clear-cut and effective compliance mechanisms, and especially (5) individual leadership (Young and Osherenko 1993: 232ff.).

The interest-based line of reasoning has in several instances been applied to cooperation on international rivers. Following the intuitive assumption that problems of international river basin management are not equally easy to resolve, scholars tend to distinguish between upstream-downstream conditions and situations characterized by more collective problems (Durth 1996; Marty 2001). *Collective (action) problems* similar to the model of the Prisoner’s dilemma (PD) are the exception rather than the norm along international rivers and exist mainly where rivers form the border between two countries. Typical examples of

collective problems include transboundary floods and the realization of common river development projects. These problems are collective in nature since they impose (more or less equal) costs on all affected riparian countries – direct costs in the case of transboundary floods, opportunity costs in the case of under-utilised river development potentials. Game theory and collective action theory (e.g. Ostrom 1990) have shown that the infamous “tragedy of the commons” (Hardin, 1968) logic may also prevail in cases of symmetrically distributed externalities. Nevertheless, there is reason to believe that collective problems are comparatively easy to resolve since they exhibit a more symmetric distribution of cooperation incentives than problems related to upstream-downstream situations.

Upstream-downstream conditions characterise the great majority of problems along international rivers and are usually least conducive to international cooperation. In economic theory, problems of this nature are referred to as externality problems (Bernauer 2002: 6). Externality problems can be both negative and positive. Negative externalities are the most common problem along international rivers and arise when the upstream country imposes costs on the downstream country without compensating it for the inflicted harm (e.g. in the case of water abstraction or pollution upstream). Positive externalities, on the other hand, are less frequent and exist when one riparian country produces a public good without receiving full compensation for its efforts (e.g. the provision for flood control upstream).

What are the implications for the formation of international water regimes? Departing on game-theoretic assumptions, Helga Haftendorn (2000) identifies “rambo situations” as the main obstacle to cooperation on international rivers. The biggest challenge is therefore to transform these non-cooperative situations into a situation where cooperation is to the benefit of all actors involved. This can be achieved by (1) the improvement of information exchange and the promotion of confidence; (2) embedding the conflict in a positive interactive complex; (3) the creation of package solutions by constructing linkage strategies; and (4) the use of arbitration, mediation and intervention (Haftendorn 2000: 68). Adopting a similar perspective, Rainer Durth (1996) considers a high level of regional integration as the key ingredient to international water cooperation: The more integrated the setting, he argues, the easier the conclusion of package solutions, the higher the confidence between riparian states and the more congruent the notions of equity and justice. All these factors facilitate both the reduction of transaction costs and the balancing of incentives and therefore help to transform upstream-downstream conditions.

The most sophisticated interest-based argument in the field of international river basin management has been provided by Frank Marty (2001: 35f.) who distinguishes between *problem* and *process* factors to explain the formation of interna-

tional water regimes. Problem factors comprise (1) collective problems and (2) problems related to transboundary externalities - the latter are particularly difficult to resolve (see above). Process factors, on the other hand, include (1) mechanisms to change incentive structures and (2) instruments to reduce the perceived transaction costs of regime formation (Marty 2001: 38ff.). *Mechanisms to change incentive structures* facilitate the resolution of problems related to transboundary externalities. Balancing incentive structures involves the provision of new or additional incentives: A party which has an incentive to externalise cost, for example, must be given the expectation that it would not be rewarding for her to continue that behaviour. The provision of new incentives usually happens in form of direct or indirect costs. While direct cost incentives comprise the benefits a party expects to gain from a proposed arrangement in the specific issue area (e.g. side-payments), indirect cost incentives refer to all forms of issue linkages, that is the promise of costs or benefits in an issue-area other than the one at stake (e.g. sanctions). Secondly, the formation of water regimes generally requires the development of *instruments to reduce the perceived transaction costs of regime formation* (Marty 2001: 42ff.). Here, we can distinguish between *information costs* and *negotiation costs*. Information costs are related to uncertainty about (a) the nature of the respective problem; and (2) the behaviour of the other parties and/ or third actors. Negotiation costs, on the other hand, derive from communication problems, fragmented decision-making procedures or a high number of involved actors. Political tools to minimise both information and negotiation costs are manifold, e.g. confidence-building meetings at the technical level; the exchange or common generation of data or the implication of independent experts.

The above-cited arguments lead to the following interest-based hypothesis:

H2: The given constellation of interests influences the prospects of water regime formation: While collective problems facilitate the formation of water regimes, the latter are more difficult to achieve in the case of transboundary externalities. Nonetheless, the underlying pay-off structure does not simply determine the chances of water regime formation: The bargaining process can be advanced through the development of political tools that (1) balance asymmetric interests through direct or indirect cost incentives; and (2) minimise the underlying information and negotiation costs.

2.1.3 Knowledge-based hypotheses

Knowledge-based approaches to the study of international cooperation stress the importance of *ideas as explanatory variables*. Unsatisfied with rationalist (realist or institutionalist) theories of international politics, cognitivists generally hold

that knowledge and values do not only affect power and shape interests but also play a more independent role in the formation of international regimes.¹⁴

Knowledge theorists analyse processes of regime formation in terms of *learning*, illustrating how new knowledge can influence the demand for international cooperation: New understandings of their social and political environment may prompt decisionmakers either to alter their strategies to achieve unchanged goals or redefine the content of the national interest, which involves selecting new goals and searching for appropriate strategies (Hasenclever et al. 1997: 145). Central to processes of learning is the concept of *scientific convergence* since it can be assumed that cooperation is relatively easy to achieve once a common or widely shared understanding of the problem arises (Cooper 1989).¹⁵ The argument concerning scientific convergence has been supplemented by introducing a particular mechanism through which new ideas gain acceptance among decisionmakers and lead to regime formation: *Epistemic communities* – defined as “network[s] of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area” (Haas 1992: 3) – are considered as important channels through which new ideas circulate from societies to governments as well as from country to country (Haas 1992: 27). By developing a common set of interpretations and therefore establishing a relatively independent source of scientific evidence, the epistemic community reduces uncertainty and influences the options considered in the formation of international regimes.

In contrast to power- and interest-based hypotheses, knowledge-based approaches to the study of international regimes have so far hardly been applied to the field of international river basin management. Only few scholars have recognized the link between the availability of relevant (hydrological) data and water regime formation (e.g. LeMarquand 1977, Vlachos et al. 1986, van der Zaag and Savenije 2000) but make no reference to the above-cited theoretical arguments. In the light of these shortcomings, we envisage a more systematic application of knowledge-based hypotheses, assuming a relationship between the existence of an epistemic community (that develops a shared understanding of the problem at

¹⁴ Following Hasenclever et al. (1997), we have to distinguish between “weak” and “strong” cognitivists. While both approaches share a dissatisfaction with rationalist theories that, from a cognitivist point of view, treat states’ identities and interests as exogenously given, they differ as how radical a critique of rationalism they consider necessary. Still comfortable with a conceptualisation of states as rational utility maximizers, weak cognitivists consider the two mainstream approaches as incomplete only and inquire into the (cognitive) origins of rational actors’ understandings of the world. Strong cognitivists, on the other hand, challenge the rationalist mode of analysis in international relations theory more fundamentally: They replace the *homo oeconomicus* by the *homo sociologicus* as the microanalytical foundation of social theorizing and inquire into the origins of social actors’ self-understandings in the world (Hasenclever et al. 1997: 136-137). Adopting a rationalist perspective, we here limit our analysis to hypotheses advanced by “weak” cognitivists.

¹⁵ Or, in the words of Ernst Haas (1990: 23), learning is “the process by which consensual knowledge is used to specify causal relationships in new ways so that the result affects the content of public policy”.

hand) and the formation of an international water regime. In the field of international river basin management, an epistemic community will typically include national bureaucrats, experts or scientists with recognized expertise and competence in problems affecting the respective river basin. These professionals will usually come together within the organisational framework of a river basin commission, e.g. in its technical committees or working groups. Epistemic communities as part of river basin commissions need to be conceptually distinguished from river basin commissions as decision-making structures between signatory governments: Forming a scientific-technical complex, epistemic communities can be expected to enhance the knowledge base of a water regime and thereby contribute to the development of a common vision between decisionmakers.

But knowledge-based approaches have even more to say. If we want to move towards a more thorough exploration of cognitivist hypotheses, there is good reason to link the arguments concerning epistemic communities to the broader literature on *policy diffusion*.¹⁶ While the epistemic community argument considers scientific convergence as a driving force behind institutional development, the research on policy diffusion focuses on processes of learning and imitation where information about institutional practices in one setting affect institutional development in another.¹⁷ The latter argument seems to hold considerable potential to better understand the impact of knowledge on water regime formation: Given the large number of international river basin institutions, there is reason to expect a high degree of imitation or learning where information about innovative practices in one international river basin affects policy choices in another (e.g. twinning activities).

Adopting Everett Rogers' definition, diffusion refers to "the process by which an innovation is communicated through certain channels over time among the members of the social system" (Rogers 1995: 5). In terms of political science, it can generally be described as a process of decentral imitation or learning where information about innovative practices in one setting affects policy choices in another. Contrary to other modes of governance, diffusion occurs in the absence of formal or contractual obligation (Jørgens 2003: 6ff.). The motivations of actors to engage in processes of imitation and learning vary tremendously and range from economic competition (Vogel 1997) to rational "lesson drawing" (Rose 1993), "mi-

¹⁶ The research on policy diffusion has so far focused on the spread of *national* policy innovations. As we consider this line of reasoning to be of great heuristic value, we make the attempt to apply the underlying concepts to the diffusion of *international* policy innovations to manage transboundary river basins.

¹⁷ Even though the two arguments adopt different perspectives, they tend of course to overlap: Epistemic communities are often a main driving force behind processes of policy diffusion (see below), while policy-learning and lesson-drawing are important steps towards scientific convergence within epistemic communities.

metic isomorphism” (Di Maggio and Powell 1991) and the search for legitimacy in the context of “norm cascades” (Finnemore and Sikkink 1998).¹⁸

Independent of the underlying motivations, the diffusion of a policy innovation requires the existence of *transnational channels of communication* that provide the basic infrastructure for knowledge about new policy instruments, programmes or institutions to travel from one setting to another (Jørgens 2003: 9). These transnational channels of communication can be *horizontal*, e.g. international issue-*arenas* where state and non-state actors meet regularly to exchange information and coordinate policies. Examples include epistemic communities as discussed above (Haas 1992), transnational advocacy networks (Keck and Sikkink 1998) or international organisations such as the UN, the OECD or the EU. Other transnational channels of communication are *vertical* in nature: Here, international organizations and intergovernmental networks become *actors* in their own right, describing and examining policy innovations or best practices, and making this information available in a wide range of publications, in internal policy papers, and at international conferences. The explicit aim of these institutionalised benchmarking activities is to foster the international diffusion of best practises in a given issue area and to harmonize the choice of strategies at a high level (Jørgens 2003: 10). In the field of international river basin management, we can exemplarily cite the World Water Council (WWC), the Global Water Partnership (GWP) or the UNESCO as prominent agents of policy diffusion.

The above-cited arguments lead to the following knowledge-based hypotheses:

H.3.1: The existence of an epistemic community that develops a shared understanding of the problem at hand (scientific convergence) and therefore contributes to the reduction of uncertainty enhances water regime formation.

H.3.2: Processes of policy diffusion, e.g. instances of imitation or learning where information about innovative practices in one international river basin affect policy choices in another, promote water regime formation. Diffusion takes place either through (1) “horizontal” transnational channels of communication, e.g. international issue-arenas where state and non-state actors meet regularly to exchange information and coordinate policies, or (2) “vertical” transnational channels of communication, where actors such as international organizations and intergovernmental networks actively promote the spread of best practises in international river basin management.

¹⁸ For a comprehensive literature review including a detailed discussion of these concepts see Tews (2002).

2.1.4 Context-based hypotheses

Power-, interest- and knowledge-based arguments all represent distinct theoretical approaches to the study of international cooperation. Despite the richness and complementarities of these approaches, we cannot and should not exclude that international regimes form only when events and conditions seemingly unrelated to the issue under consideration provide a *window of opportunity* or are in some other way conducive to regime formation (Young / Osherenko 1993: 20). In this context, we need to consider any larger national and international event that plays a critical role in determining if and when international cooperation occurs.

Contextual factors have hardly been systematically considered when accounting for the formation of international regimes. This is little surprising since they remain largely arbitrary and are therefore difficult to integrate into any given research framework. With respect to water regime formation, Lindemann (2005) has recently found that situative events played a crucial role in the creation of four selected water regimes in the Southern African region.

To account for the role of contextual factors, we derive the following hypothesis:

H4: National and international events that are seemingly unrelated to the issue under consideration play an important role in determining if and when an international water regime is established.

2.2 Methodological considerations

In order to test our research hypotheses as outlined above, we will conduct two qualitative case studies that follow an approach of “structured and focused comparison” (George and McKeown 1985) defining and standardizing the data requirements for each case study according to the theoretically deduced hypotheses. Afterwards, we engage in process tracing, that is we focus “on whether the intervening variables between a hypothesized cause and an observed effect move as predicted by the theories under investigation” (Bennett 2004: 22). With respect to the selection of cases, we adopt a pragmatic approach and chose to study the formation of international water regimes in the Rhine and Elbe river basins. The Rhine water regime is *the* pioneer effort in the field of international river basin management and serves as a reference point across Europe and the world. The Elbe case, on the other hand, is interesting in the sense that it is a pioneer effort after the end of the Cold War that brings together countries from Western and Eastern Europe and builds heavily on experiences from the Rhine river basin. We do not deny that this pragmatic case selection approach involves a high risk of selection bias – a problem that is largely due to the limited scope of this paper.

Future research will therefore have to subject our findings to more comprehensive and systematic investigations.¹⁹

Given the limited scope of this paper, both case studies are kept relatively short and do not claim to give a complete account of the genesis of the water regime under discussion. Rather we intent to test the general relevance of the theoretical approaches under consideration. The findings of the case studies are exclusively based on the examination of secondary sources. Due to time and resource constraints, the generation of missing data (e.g. through expert interviews) was unfortunately not possible.

3 Empirical case studies

3.1 The Rhine Water Regime

On its 1300 km long way from the Swiss Alps to the North Sea, the river Rhine crosses some of the most populated and industrialised areas of Switzerland, Germany, France and the Netherlands, while its basin also covers parts of Luxembourg, Liechtenstein, Italy, Austria and Belgium. The Rhine is the most important inland waterway in Western Europe. It produces drinking water for around 20 million people and receives the wastewater of 50 million people, large chemical industries and potash and coal mines (Bernauer 1996: 201). By the mid-1970, levels of water pollution had developed to a point that the “artery of Western Europe” (Dieperink 2002: 67) had been turned into the “sewer of Europe” (LeMarquand 1977). The Rhine presents a classical case of negative externalities linked to upstream-downstream conditions: The Netherlands as the downstream riparian state - that draws around 65% of its freshwater supply from the Rhine - is the main victim of transboundary water pollution, most notably chloride and chemical pollution. As a consequence, the issue of water quality has been subject to protracted negotiations between the Netherlands and the most important upstream riparian states Germany, France, Switzerland and Luxembourg (Dieperink 2002: 67).

The international regime concerning the clean up of the Rhine presents a paradigmatic case of a “progressive regime” (Dieperink 2002: 69ff.). While first international exchanges over water quality go back to the late 19th century, more specific concerns arose in the 1930s when growing levels of pollution motivated

¹⁹ This could be done through a case selection approach that ensures variation in the explanatory variables, while allowing for the possibility of at least some variation on the dependent variable (King et al. 1994: 140ff.). Here, we would first need to make sure that the selected cases exhibit sufficient differences as regards to the respective relevance of power-, interest-, knowledge and context-based influencing factors. On the other hand, there would need to be at least one case where regime formation (the dependent variable) has yet not been achieved.

Dutch drinking water companies to seek contacts with upstream riparian states – contacts that gave way to informal intergovernmental consultations in the early 1950s. Those consultations were formalised with the Bern Convention of 1963 that established the *International Commission for the Protection of the Rhine* (ICPR). In 1976, negotiations within the ICPR resulted in the conclusion of two international conventions: While the *Convention on the Protection of the Rhine against Chemical Pollution* expressed agreement concerning the regulation of waste discharges, the *Convention on the Protection of the Rhine against Chloride Pollution* specified norms for the loads and the concentration of chlorides, and how the discharges from Alsatian potassium mines could be gradually reduced. The next major event in the progressive development of the Rhine regime was the agreement on the *Rhine Action Programme* (RAP) in 1987. The programme – a recognised example of a less legalistic and more flexible international problem solving approach – seeks to promote the restoration of the Rhine’s ecosystems and adopts the return of the salmon by the end of the century as its overarching symbol. Further elaborated in the *Salmon 2000* Ecological Master Plan in 1992, the RAP includes agreement on far-reaching reductions of the discharges of chemicals as well as measures designed to improve the hydrology, morphology and safety of the Rhine river basin. The conclusion of a new *Convention on the Rhine* in 1998 marks, for the time being, the final step in the development of the international Rhine regime.²⁰ The new Convention replaces the Bern Convention as well as the Rhine Chemicals Convention and provides the RAP with a formal status. The initial goal to decrease the impact of waste discharges as specified in the Chemicals Convention has been supplemented by new goals to address flood control and bank restoration, to increase the diversity of species, to improve the natural flow in the basin and to reconstruct biotopes.

Altogether, co-operation between the Rhine riparian states has led to the progressive development of a comprehensive water regime that represents one of the few, if not the only example(s) of a water regime moving towards the implementation of the increasingly popular concept of “integrated river basin management”. In order to understand the main driving forces behind this unique “success story” of water regime formation, we will subsequently test the hypotheses underlying the power-, interest-, knowledge- and context based approaches.

3.1.1 Power-based hypotheses

Following the theoretical predictions of (neo-)realist scholars, one should expect that the development of the comprehensive Rhine regime could be explained by the presence of a (downstream) hegemon that has taken the lead in the creation

²⁰ As indicated above, the recent developments under the EU Water Framework directive (WFD) are beyond the scope of this paper.

and maintenance of international water cooperation. Empirically, this is clearly not the case. While it is generally difficult to identify a hegemon in the Rhine river basin - Germany or France being possible, but unconvincing candidates, the downstream country the Netherlands is certainly not the “single state possessing a preponderance of material resources”. The Netherlands has indeed been an important driving force behind the Rhine regime but their pro-active role has not been based on material power. This is why we turn to interest-based hypotheses to explore more convincing explanations.

3.1.2 Interest-based hypotheses

Interest-based hypotheses predict that negative externalities in form of transboundary pollution tend to impede the formation of international water regimes. This prediction is generally confirmed by empirical evidence from the Rhine river basin: Overall, the negotiations since the early 1950s have been difficult, cumbersome and slow. Nevertheless, the protracted negotiations have led to the progressive elaboration of a comprehensive water regime – a fact that confirms the theoretical assumption that the underlying pay-off structure does not simply determine the chances of water regime formation. Instead, and in accordance with interest-based hypotheses, the negotiation process has – at least in the case of the *Chloride Convention* - been advanced through the development of political tools that balance asymmetric interests through cost incentives and minimise the transaction costs of regime formation. The Dutch government has been the driving force behind these processes by adopting a strategy that combines financial incentives and the threat of legal sanctions with political persuasion through the mobilisation of knowledge. To illustrate this strategy, we will take a brief look at the driving forces behind the different elements of the Rhine water regime.

The *International Commission for the Protection of the Rhine* (ICPR) was established in 1950 on a temporary basis based on an exchange of notes between the Netherlands, France, Germany, Luxembourg and Switzerland. When it became obvious that the ad-hoc structure of the Commission was inadequate to tackle the problem of transboundary water pollution, the ICPR was given formal status through the 1963 Berne Convention. The latter is exclusively institutional, as the main polluters, France and Germany, did not want to make any material commitments outside of the agreement to cooperate in the Commission. The task of the ICPR is to (a) carry out all necessary research to determine the nature, importance, and origin of the pollution of the Rhine; (b) propose to the signatory governments appropriate measures to protect the Rhine against pollution; and (c) prepare the basis for possible future arrangements concerning the protection of the Rhine. Signatory states are represented by four delegates at most, the voting rule is unanimity. The Commission headquarter – a permanent secretariat – is located in Koblenz, Germany. Altogether, the ICPR is no more than an advisory

body for the signatory governments, with no independent power to take binding decisions (Holtrup 1999: 90f.). The Netherlands has been the driving force behind the creation of the ICPR – a situation that is closely linked to the country's vulnerable downstream position. Dutch efforts to institutionalise a permanent forum of international water cooperation go back to the pre- World War II period and had to overcome the persistent resistance of the upstream countries. After protracted negotiations in the post-war period, the Netherlands succeeded by adopting a strategy of “issue-linkages”: The issue of Rhine water pollution was explicitly linked to questions related to World War II – a move that finally helped to overcome German opposition and paved the way for the creation of the ICPR (albeit in a less supranational form than the Dutch had initially intended) (Durth 1996: 172).

In the case of the *Chloride Convention* (1976), the Netherlands had to persuade upstream polluters to reduce their chloride emissions. Unlike the Netherlands, the upstream riparian countries Switzerland, France and Germany do not suffer from their own or other countries' chloride emissions along the Rhine – it is therefore not surprising that these countries have been reluctant to engage in costly emission reductions from which they do not receive any immediate benefit. After protracted bargaining in the early 1970s, the adopted solution to the chloride problem involved financial transfers from all four riparian governments to the polluter and to the pollutee, not just transfers from the Netherlands to France or Germany (Bernauer 1996: 204ff.). The agreed reductions have been organised into two projects and focus on the French “Mines de Potasse d'Alsace” (MdPA) as the largest source of chloride pollution with approximately 40% of the total chloride load.²¹ The first project (negotiated between 1972 and 1986) foresees that MdPA curb its chloride emissions by 15 kg/s, while the costs of 132 million French francs (FF) are shared to a formula that was agreed to in 1972: Germany and France pay 30% each, the Netherlands 34%, and Switzerland 6%. This cost sharing formula reflects the relative contributions to the pollution problem and the intensity of their demand for chloride reductions. The second project (negotiated between 1987 and 1991) consists of two components: (1) Modulated reductions, with MdPA reducing its emissions by up to 56kg/s whenever the chloride concentration of the Rhine exceeds 200 mg/l at the Dutch-German border; and (2) an internationally financed project in the Netherlands designed to reduce the chloride pollution of the Ijsselmeer. The costs of the two projects amount to FF 400 million and FF 100 million respectively and are shared according to the 1972 cost-sharing formula (Bernauer 1996: 204).

²¹ Reductions in France are cheaper than reductions in Switzerland and Germany. Between half and two-thirds of the salt waste of MdPA occurs in solid form before it is dissolved and discharged into the Rhine. The salt waste at other sources occurs mostly in dissolved form. For technical reasons, solid salt waste can be retained at lower cost than dissolved salt waste (Bernauer 1995: 372).

While the Netherlands were willing to assume a substantial share of the costs of chloride reductions, the downstream country managed not to have to pay the entire costs by playing the upstream countries against each other. This success can be attributed to German and Swiss motivations to avoid potential demands for Chloride reductions on their own territory by paying for reductions in France (Bernauer 1996: 210). Furthermore, the Dutch skilfully complemented financial incentives with other forms of political mobilisation. For example, when the French government refused to submit the Chloride Convention to parliament for ratification in December 1979, the Netherlands temporarily decided to resort to open confrontation by calling its ambassador back to the Netherlands for consultations (Dieperink 2002: 72). At the same time, the government joined forces with Dutch interest groups in order to establish a credible threat of legal sanctions.²² When the European Court of Justice accorded victims of pollution the right to claim compensation from polluters in any country of the community (1976), Dutch farmers and waterworks initiated - with the financial backing of the Dutch government (!) - a series of law suits against the French potassium mines in the late 1970s and early 1980s (Dieperink 2002: 74f.). The exact effect of these law-suits on the development of the Chloride case is difficult to determine. On the one hand, Bernauer (1996: 221) is right to point out that uncertainties over the extent of damage made clear verdicts virtually impossible: Only in one case was a small amount of compensation paid to Dutch farmers in an out-of court-settlement. Nonetheless, there may still be reason to assume that potential and ongoing law suits served to exercise political pressure for cooperation on the major upstream states and thereby facilitated the Chloride compromise as outlined above.

The cases of the *Chemical Convention* and the *Rhine Action Programme* (RAP) are different in the sense that the initial constellation of interests between the riparian countries is less asymmetric and therefore more conducive to international cooperation. As the industries causing chemical pollution are more or less evenly distributed among the main riparian countries and the environmental standards are almost the same, neither the costs nor the benefits of pollution reduction measures are asymmetrically distributed across the riparian countries. In the words of Bernauer and Moser (1996: 411), there is thus “no clear-cut distinction between those who suffer from pollution and those who cause it: All riparian

²² The role of Dutch interest groups in furthering the Rhine water regime has been extensively dealt with in the literature (e.g. Durth 1996: 186ff.; Dieperink 2002: 74ff.). The theoretical approaches considered in this paper rely on a more or less pronounced “black box state” – hence the emphasis on the alliance between the Dutch government and the interest groups. Alternatively, one could adopt a liberal perspective on international cooperation (e.g. Moravcsik 1992, Schreurs and Economy 1997) that “opens” the black box and analyses the behaviour of states as a result of the interaction between domestic actors or pressure groups.

countries are to a certain extent both victims and polluters”.²³ While Switzerland and Germany, for example, are the source of upstream chemical pollution, some of their drinking water production depends indirectly on Rhine water quality. Measures to combat chemical pollution are therefore perceived as rather advantageous, while having the side effect of benefiting the Netherlands downstream (Bernauer and Moser 1996: 412). Despite less pronounced upstream-downstream conditions, negotiations on curbing chemical pollution were still subject of conflict among the riparian states. While Germany generally had an interest in good Rhine water quality (see above), it was nevertheless reluctant to agree on far-reaching and binding solutions – a position that was linked to the fact that it would bear the heaviest financial burden because it had the largest industrial base along the Rhine.²⁴ This is one of the reasons why the *Chemical Convention* of 1976 is no more than a relatively broad framework agreement that defines black and grey lists of substances and directs the ICPR to elaborate proposals for threshold values for particular substances that become binding rules only in a second stage (Bernauer and Moser 1996: 392). When it became obvious in the mid 1980s that the implementation of the *Chemical Convention* was proceeding at a disappointing pace, the Netherlands - despite eased upstream-downstream conditions still the main victim of accumulated chemical pollution - once again sought partners with view to creating a credible threat of legal sanctions. This is why the Dutch government joined the City of Rotterdam’s threat to sue upstream companies that had been identified to be responsible for the heavily polluted silt that settled in the Rotterdam port: In the context of the RAP negotiations, the Dutch Minister Smit-Kroes threatened to hold the upstream countries responsible for the removal of the toxic silt, that is, to inflict the cost of the construction of a special storage depot on them. While this combined threat led to several contracts with upstream users that pledged to drastically alter their dumping practices, it also provided an important incentive for the German government to agree on the Dutch proposals for the RAP with ambitious ecological goals (Dieperink 2002: 75).

Beyond incentive structures, interest-based arguments draw our attention to the existence of transaction costs as major impediments to regime formation. A first major obstacle are high information costs in the Rhine river basin that stem from uncertainty about the nature of the problem at hand and hence incomplete in-

²³ Against this background, it does not come at a complete surprise that France was among the major advocates of the Chemical Convention. This position can be explained by both the relatively low costs that cuts in chemical pollution would entail for French industry and the desire to shift the political pressure for pollution abatement to other countries (Bernauer and Moser 1996: 392).

²⁴ German fears that the costs of curbing chemical pollution would be too high explain the delayed ratification of the Chemical Convention that did not enter into force until 1979 (Bernauer and Moser 1996: 392).

formation about the costs and benefits of international cooperation.²⁵ This problem is particularly pronounced in the case of chemical pollution that is more complex and scientifically less understood than chloride pollution. Taking the chloride case as an example, information costs involved determining the level of reductions that would satisfy farmers and waterworks, and determining possible levels of reductions, methods and costs of MdPA (Bernauer 1996: 223). In order to lower information costs in form of uncertainty, the Netherlands adopted a strategy that we may label “knowledge politics” (as opposed to “power politics”), that is to continuously present new knowledge to the other riparian states. With view to convincing France that damage was inflicted by the increased dumping of salt, for example, the Dutch government declared itself prepared in the late 1960s to make a financial contribution to French research concerning facilities for the storage of the waste salts and to the measures to be taken in the Alsace (Dieperink 2002: 71-72). Another instructive example is the work of the Dutch *Institute for Inland Water Management and Waste Water Treatment* (RIZA) that proved very successful in developing new measuring and monitoring techniques that were first introduced in the Netherlands and then subsequently disseminated to other riparian states. This increased both the frequency of sampling and the quality of monitoring and thereby significantly reduced the complexity in demonstrating the existing levels of pollution. While it is of course difficult to determine the exact impact of these activities, it seems plausible to assume that “[b]y expanding the knowledge base underlying the Rhine water regime, the Dutch government has successfully increased its power of persuasion” (Dieperink 2002: 73-74).

Altogether, we have seen that interest-based arguments can provide important insights into the progressive elaboration of the Rhine water regime. Nonetheless they cannot fully explain the extent of international cooperation: We still need to better understand why the Rhine upstream countries have been so “unusually” cooperative, in particular in the case of the comprehensive RAP? This is why we now turn to explore knowledge-based hypotheses.

3.1.3 Knowledge-based hypotheses

In accordance with hypotheses derived from weak cognitivism, the case of the Rhine water regime illustrates the importance of epistemic communities that develop a shared understanding of the problem at hand (scientific convergence), contribute to the reduction of uncertainty and thereby facilitate the process of (progressive) water regime formation. The most influential epistemic community in the Rhine river basin has been the ICPR itself. Of course, one may object that

²⁵ Uncertainty in the Rhine river basin derives from a multiple sources. Mingst (1981: 162ff.) identifies four main sources of uncertainty: (1) The relative importance of each pollutant; (2) differences in the degree of pollution which different societies are willing to accept; (3) divergent interpretations of the dynamics of pollution; and (4) the incertitude related to pollution abatement.

the ICPR is the organisational structure of the Rhine water regime rather than a “traditional” epistemic community as conceptualised by knowledge-based approaches in International Relations theory (see section 2.1.3). But if one focuses on the ICPR’s role in enhancing the knowledge about Rhine water pollution (as opposed to its role of a negotiation forum for signatory governments), the ICPR clearly displays the attributes of an epistemic community:

“The ICPR was able to assume the role as the pivot of the international knowledge community because it managed to fill the gaps in the knowledge base. It promoted insight into the nature, development and origin of the pollution by harmonising measuring and analysis methods, the development of a network of measuring stations and of a signalling and alert system. The insight was greatly boosted by the collection and exchange of information on area-specific details. Within the ICPR there was a lively exchange of the knowledge needed for the correct interpretation of the sampling results. This promoted the growth of unanimity on the exact effects of the concentration of certain substances for the various functions of the water system. Agreement grew on such issues as the need to deal with specific problems. Moreover, the ICPR activities yielded greater insight in the technical and financial options to diminish the pollution. The principle that the *best available technology* should be used to reduce the pollution could thus be given concrete form in certain sectors” (Dieperink 2002: 77; original emphasis).

While Dieperink’s argument is generally very instructive, it requires further qualifications. It should be noted that the ICPR’s role as a “learning facilitator” did not spring into life immediately; its evolution was on the contrary a lengthy process. During the 1950s and the 1960s, information exchanges were largely restricted to annual ICPR publications on pollution data that were collected at the principal national measurement stations along the Rhine. During this early period, the ICPR was not dominated, as it is today, by technocrats and scientists but by diplomats. The exchange of information intensified from the early 1970s when meetings at the ministerial level asked the ICPR to prepare the conventions on chemical and chloride pollution – a situation that gave rise to discussions on sensible threshold values for polluting substances and possibilities of technical solutions. This increase in transboundary information flows has resulted in a homogenisation of perceptions of Rhine pollution problems and common views about the available technical solutions. As a consequence, national authorities involved in Rhine pollution issues have been bound together into “a closely connected community of low to mid-level government officials and scientists (Bernauer and Moser 1996: 400). This community forms a “scientific-technical complex” (Holtrup 1999: 95) that consists of numerous ICPR working groups that exchange in-

formation about new forms of pollution, polluters, measurement methods or pollution or pollution abatement technologies.

Even though it is difficult to “measure” the exact impact of these activities, it is safe to assume that the ICPR has continuously improved the knowledge base of the water regime and thereby fostered agreement between the riparian states. This became especially apparent in the case of the RAP where the ICPR increased its “discretionary power” and skilfully set the agenda for this far-reaching cleanup agreement (Durth 1996: 184f.). Furthermore, we should mention that the activities of the ICPR have been complemented by other, albeit smaller epistemic communities. The most prominent example would be the *International Association of Waterworks in the Rhine Basin* (IAWR) – an association of 110 water companies that has successfully influenced public and political opinion in the riparian states. Here, we can cite the impact of two IAWR Rhine Memoranda: While the first memorandum of 1973 provided technical guidance for the elaboration of the Chemical Convention, the second memorandum, published in 1986, set the agenda for the inclusion of drinking water issues as a priority concern of the RAP (Durth 1996: 192f.).

Processes of international policy diffusion, finally, are largely limited to policy export: Rather than to import innovative practises from other river basins, the Rhine water regime is a pioneer effort in the field of international river basin management that has itself served as a model for other international river basins across Europe or even the world (see below). Nevertheless, certain elements of the Rhine water regime have been facilitated by processes of policy learning or lesson-drawing. The Chemical Convention, for instance, was strongly inspired by the draft *European Convention for the Protection of International Watercourses Against Pollution* (which had never been adopted by the member states of the Council of Europe), the *1974 Paris Convention for the Prevention of Marine Pollution from Land-Based Sources*, and especially the *EEC Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment of the Community* (Kiss 1985: 625).²⁶ The latter document draws the attention to the impact of contextual factors, more specifically the role of European integration.

3.1.4 Context-based hypotheses

While a combination of interest- and knowledge-based hypotheses offers important insights into the progressive formation of the Rhine water regime, we should not overlook the possibility that events and conditions seemingly unrelated to the

²⁶ The preamble of the *Chemical Convention* makes an explicit reference to the EEC Directive (Kiss 1985: 625).

issue under consideration provide a *window of opportunity* or are in some other way conducive to water regime formation. And indeed, in the case of the Rhine, context-based explanations have a high explanatory value.

First, we have to consider the role of the European integration process that has had an ambiguous impact on the formation of the Rhine water regime. On the one hand, the process of European integration has been largely beneficial: We should not forget that the member countries of the Rhine water regime have always been at the very core of the European integration process (with the exception of Switzerland) and are therefore bound together by a complex and dense web of interlinkages. In this context, it is illusionary to think of countries as purely rationalist power or utility maximizers (as done by power or interest-based arguments). Instead, EU member states act as members of an economic and political community (with common values) – their interaction has therefore to be understood in the complex web of economic, political and ideational competition.²⁷ At the institutional level, the process of European integration has been accompanied by the creation of an area of common European law – a situation that has allowed the Dutch government and its interest groups to establish the threat of legal sanctions against upstream polluters (see above). On the downside, we should note that the process of European integration has not always been conducive to water regime formation. Since 1976, the European Commission has been a formal member of the ICPR to enable the coordination of research and promote the specification of norms. In the case of the *Chemical Convention*, however, Germany was only willing to formalise the norms after a consensus on similar norms had been reached among the EU Member states. This consensus proved difficult and cumbersome to achieve since the UK opted for the formalisation of water quality standards by which a maximum allowable concentration of substance in surface waters was specified, whereas other European countries preferred uniform emission standards (Dieperink 2002: 76). The introduction of the EU as an additional contracting party to the ICPR has therefore slowed down the implementation process (Bernauer and Moser 1996: 409).

Furthermore, we cannot understand the development of the comprehensive Rhine water regime without taking into account the impact of several disastrous events that provided important “windows of opportunities” to further international cooperation along the Rhine. A first “policy window” opened in the late 1960s when the threat of high concentrations of mercury and cadmium, combined with the massive fish death caused by the 1969 endosulfan spill, led to high levels of public commotion across the river basin. The latter was skilfully instrumentalised by the Dutch government to further its agenda during the negotia-

²⁷ This point would merit further investigation, e.g. by exploring hypotheses derived from strong cognitivism.

tions that ultimately led to the conclusion of the Chemicals Convention (Dieperink 2002: 72-73).

But the most important disastrous event in the history of the Rhine river basin was without a doubt the Sandoz fire of 1986 – the “Tschernobyl of the Rhine” (Durth 1996: 177) that became a cornerstone on the way to the elaboration of the RAP. On the 1st of November 1986, an accident at the Swiss chemical firm Sandoz near Basel led to a widely publicised spill of toxic substances into the Rhine. As a consequence of extinguishing activities, about 10.000 to 15.000 cubic meters of heavily contaminated water not only turned the Rhine water red, but had a devastating effect on the river’s fauna (e.g. 150.000 dead eels) and led to the interruption of drinking water supply and irrigation systems downstream. The Sandoz accident was followed by several other chemical spills along the Rhine in November 1986 - improvements in the water quality that had been achieved since the late 1970s seemed to disappear completely. The disastrous events were accompanied by high levels of public mobilisation and protest (not least because the population along the Rhine was directly affected by interruptions of drinking water supply) – a situation that put enormous pressure on the governments of all riparian states (for details cf. Durth 1996: 177; Holtrup 1999: 131ff.). Most importantly, the Sandoz accident helped to break up the traditional upstream-downstream constellation along the Rhine (Holtrup 1999: 134): Confronted with thousands of dead fish floating down the Rhine, France and Germany for the first time found themselves in a downstream position. This change in perspective led to a situation where all riparian states started to perceive the Rhine river basin as a common ecosystem that had to be protected through transboundary cooperation – the Rhine had become an international public good (Durth 1996: 180). The Dutch government was able to use this new situation to carry the negotiations further: During two subsequent ministerial conferences in late 1986, the highly involved Dutch Minister of Transport and Public Works Smit-Kroes assembled the other riparian states and converted dormant ideas on the improvement of the Rhine’s ecosystem into the RAP. The return of the salmon became the “political symbol” of the RAP that helped to reduce the enormous complexities associated with the Rhine water regime into a tangible common goal shared by all riparian states (Durth 1996: 181f.).

3.1.5 Summary

The case of the Rhine water regime illustrates that there is no “one-answer-fits-all” in trying to understand the formation of international water regimes. With the exception of power-based hypotheses, all theoretical approaches considered in our research framework provide important insights into the progressive formation of the water regime. Interest-based arguments are a good starting point to explain the agreement on the *Chemical* and *Chloride Conventions* of 1976. More

specifically, the case of the Chloride Convention demonstrates how asymmetric interests due to upstream-downstream conditions can be balanced through financial transfers between riparian states. Furthermore, we have seen that knowledge is both an obstacle and a solution to water regime formation. While a lack of knowledge leads to high transaction costs and thereby hinders international cooperation, the improvement of a regime's knowledge base can be an important driving force behind cooperative solutions. In this context, we need to point to the role of the ICPR that has acted as an epistemic community by continuously improving the knowledge base of the Rhine water regime and thereby fostering agreement between the riparian states. Nonetheless, we cannot understand the progressive development of the Rhine water regime without taking account of contextual influencing factors: The exemplary RAP with its far-reaching ecosystem approach is the immediate outcome of the disastrous Sandoz spill of 1986 that helped to overcome upstream-downstream conditions and turned the management of the Rhine river basin into an international public good.

While our research framework generally helps to systematise the complex genesis of international water cooperation along the Rhine, future research may consider further exploring liberal approaches to international cooperation (see footnote 22). The analysis has shown that the pathways to cooperation cannot always be explained merely in terms of unitary state actors. If we open the "black box state" and analyse the behaviour of states as a result of the interaction between domestic actors or pressure groups, this may lead to further insights. In doing so, we should not limit our analysis to the role of Dutch interest groups that have been sufficiently studied. Instead, we should pay more systematic attention to the rising degree of environmental awareness in the Rhine riparian states in the 1970s and 1980s that has given rise to "green" domestic coalitions and thereby enhanced the riparian states' willingness to engage in international cooperation.

3.2 The Elbe Water Regime

Once the symbol of the division of both Germany and the whole European continent, the river Elbe is now considered a bridge between Eastern and Western Europe. The Elbe is one of the longest rivers in central Europe (Durth 1996: 204f.). On its 1143 km long way from the Czech Riesengebirge to the North Sea, the river crosses the Czech Republic and then continues northwestwardly, diagonally spanning a large portion of eastern and northern Germany. The 148.268 km² large Elbe river basin is home to approximately 25 million people and includes the territory of four countries: The river itself and 99% of its basin is confined to the Czech Republic (34%) and Germany (65%) but the basin also covers tiny parts of Austria and Poland. A substantial amount of the territory of the former German Democratic Republic (GDR) was within the Elbe river basin, and most of the German stretch of the Elbe had been located in the GDR.

Throughout the 1980s, the Elbe was considered to be one of the most heavily polluted rivers on the European continent, equalling the highest load of pollution reached in the Rhine during the 1970s (Holtrup 1999: 178ff.). High levels of water pollution were mainly due to diffuse (agricultural) emissions and industrial and communal point sources, in particular from the large industrial hubs around Prague, Dresden, Magdeburg and Hamburg. At the beginning of the 1990s, 90% of the pollutants were emitted on the territory of the former GDR and Czechoslovakia where industrial and domestic wastewater remained largely untreated. While Czechoslovakian sources contributed only 8% of total pollution, the GDR had officially declared the Elbe its sewer and was therefore responsible for more than 80% of the Elbe pollution. The Elbe presents another case of negative externalities linked to upstream-downstream conditions: Before the fall of the Berlin wall, West Germany suffered from heavy upstream pollution in both Czechoslovakia and the GDR; since 1990 the reunified Germany still receives the wastewater from the Czech Republic.

In contrast to the Rhine river case, the development of the Elbe water regime is a relatively recent phenomenon. Between 1949 and 1989, there was almost no cooperation between the then three main riparian states (Durth 1996: 208ff.). West Germany repeatedly tried to convince the upstream riparian states to curb water pollution, but both the GDR and Czechoslovakia persistently refused to engage in substantial international cooperation, including the exchange of data on water pollution. Both West and East Germany had concluded bilateral agreements on transboundary waters with Czechoslovakia in 1974, but these agreements did not lead to any material results on issues related to the Elbe River. With view to cooperation between the two German states, the GDR government argued that West Germany would have to pay for the reduction of water pollution upstream – a classical position of an upstream riparian state that was rejected by West Germany on grounds of the “polluter-pays-principle”. When West Germany declared itself prepared to discuss the issue of financial compensation towards the end of the 1980s, the GDR linked the issue to the question of the German-German border and thereby prevented the opening of negotiations that would have imposed substantial environmental costs. The only agreement on cooperation along the Elbe before 1989 was reached between the three West German Länder Hamburg, Schleswig-Holstein and Niedersachsen that established the *Arbeitsgemeinschaft zur Reinhaltung der Elbe* (ARGE Elbe) in 1977 to collect data on downstream pollution between the German-German border and the North Sea.

The prospects for international cooperation between the Elbe riparian states improved dramatically with the nearing end of the Cold war (Durth 1996: 213ff.). While negotiations on the international protection of the Elbe had begun in early 1989 already, it was on the 8th of October 1990 – only five days after the German reunification – that Germany, the Czech Republic and the European Economic

Community (EEC) reached agreement on the creation of the *International Commission for the Protection of the Elbe* (ICPE). The goals of the ICPE include (a) to enable the use of the Elbe water, in particular the supply of drinking water from bank-filtered waters and the agricultural use of the waters and sediments; (b) to achieve as natural an ecosystem as possible with a healthy diversity of species; and (c) to reduce substantially the pollution of the North Sea from the Elbe area (Durth 1996: 216f.). While the institutional design of the ICPE is almost identical with that of the ICPR (see above), its formal mandate is more comprehensive. The 13 tasks of the ICPE (as opposed to the three tasks of the ICPR) include, among others, to assess the existing levels of water pollution and to propose specific action programmes for the reduction of point and diffuse sources of pollution, including timetables and cost assessments.²⁸ Even though the ICPE remains an advisory body of the signatory governments with no independent power to take binding decisions, its scope of action is considerable. Accordingly, the creation of the ICPE has been followed by the conclusion of two distinct action programmes during the 1990s (Holtrup 1999: 212ff.). In 1991, the riparian states agreed on a *First action programme* to be implemented between 1992 and 1995 that aims to address the most immediate problems by reducing the heaviest pollution sources, in particular communal and industrial point sources. The programme establishes a priority catalogue that focuses on the finalisation of wastewater treatment plants under construction and defines criteria to identify those communal and industrial “hot spots” where pollution reduction measures (e.g. the construction of new wastewater treatment plants) will have the highest short-term impact. In a second step, the Elbe riparian states adopted a long-term *Action Programme Elbe* (APE) in December 1995 that covers the period between 1996 and 2010. While the APE aims to further decrease pollution from communal and industrial point sources,

²⁸ Altogether, the ICPE is given the task to “(a) prepare surveys showing major point sources of discharges of harmful materials (discharge charts), estimate water pollution from diffuse sources and extrapolate both of these, (b) propose limit values for the discharge of effluent, (c) propose specific quality objectives taking account of the requirements with regard to the use of the waters, the particular conditions for the protection of the North Sea and the natural aquatic communities, (d) propose and coordinate the implementation of joint programmes of measurements and investigations to demonstrate the quality of the waters, sediments and effluent and to describe the aquatic and coastal communities, and shall record and evaluate the findings, (e) compile standardized methods for the classification of water quality in the Elbe, (f) propose specific action for the reduction of discharges of harmful materials from the point sources of both local authorities and industry and from diffuse sources and further measures including timetables and a cost assessment, (g) propose protective measures to prevent water pollution resulting from accidents, (h) propose a uniform warning and alert system for the drainage area, to be updated according to experience, (i) describe the hydrological situation in the Elbe area and record the main influencing factors (Elbe monograph), (j) provide documentary evidence regarding the ecological importance of the various biotope elements of the waters and proposals regarding the improvement of conditions for aquatic and coastal communities, (k) discuss planned and, upon request by a delegation, existing types of utilization of the waters which may have serious international repercussions, including hydraulic structures and regulation of the waters, (l) promote cooperation in particular on scientific research projects and regarding the exchange of information especially on the state of technology, (m) prepare the basis for any regulation between the contracting parties regarding the protection of the Elbe and its drainage area” (ICPE Treaty 1990: Article 2).

it also places emphasis on the reduction of diffuse emissions (e.g. from agriculture) as well as on the ecological recovery of the Elbe and its alluvial plains. Specific goals include, among others, (a) the supply of drinking water from bank filtration and the possibility of fish consumption by the year 2000; and (b) the use of sediments for agriculture and increased biodiversity by the year 2010.

Within the short period of five years, the Elbe riparian states have established an ambitious water regime that has significantly contributed to the progressive clean up of the Elbe throughout the 1990s (c.f. Durth 1996: 220f; Holtrup 1999: 219ff.). In order to understand the driving forces behind the formation of the Elbe water regime, we will once again test the hypotheses underlying the power-, interest-, knowledge- and context based approaches.

3.2.1 Power-based hypotheses

While power-based hypotheses had no explanatory power in the case of the Rhine water regime, the case of the Elbe water regime seems to be different. Among the two main riparian countries of the river basin, the reunified Germany not only enjoys an incontestable hegemonic status but has also a clear incentive to make use of its “preponderance of material resources” to compensate for its geographically disadvantageous downstream position. At first sight, one is therefore easily tempted to argue that the Germany was able to impose the creation of the Elbe water regime on the Czech Republic, after West Germany had been unable to do so during the Cold War period.

However, such claim requires important qualifications. This is not to deny that Germany has indeed been the driving force behind the formation of the Elbe water regime. The country certainly has the necessary resources to both impose cooperative arrangements and/or to make benevolent concessions. Nonetheless, Germany does not fully match neither the image of a coercive hegemon nor that of a benign hegemon. A coercive hegemon would have used its superior power to impose the institutional arrangements it prefers on the other riparian states - a strategy that does not fit Germany's behaviour during the Elbe negotiations. According to Holtrup (1999: 187), the German government was determined to avoid the behaviour of a dominant cooperation partner and therefore adopted a very careful diplomatic approach during the negotiations on the creation of the ICPE. In order to ease the Czech fears of being dominated by the reunified Germany, the German delegation invited the European Economic Community (EEC) to become a member of the ICPE – a step that created a more balanced context for subsequent negotiations. One may conclude that Germany acted as a benign rather than as a coercive hegemon. In this case, Germany would be expected to exercise positive leadership by providing the water regime all by itself. But as we shall see below, this is clearly not the case: Both countries pay for the reduction of water pollution on their own territory (for details see the following section 3.2.2).

In sum, the available empirical evidence makes it difficult to conclude on power-based hypotheses. In the light of German hegemony in the Elbe river basin, there may be reason to assume that the Czech government had little choice but to engage in international water cooperation. Nevertheless, as we have seen, this argument is not entirely convincing. In order to better explain the cooperative behaviour of the Czech government, we now turn to explore interest-based hypotheses.

3.2.2 Interest-based hypotheses

Interest-based arguments would predict that the Czech Republic has been financially compensated for its cooperative behaviour. However, the available empirical evidence from the Elbe river basin does not confirm such prediction.

As already mentioned above, the issue of financial compensation for the reduction of upstream pollution was repeatedly subject to disagreement between the two German states throughout the 1980s. When West Germany finally agreed in early 1989 to support pollution abatement measures in the GDR with 1 billion DM, the fall of the Berlin wall and the prospect of reunification soon made this deal obsolete (Durth 1996: 210). The ICPE and the two Elbe action programmes of the 1990s, on the other hand, do not involve financial transfers from Germany to the Czech Republic. In the case of the ICPE, each country covers the costs for its representatives, while all other costs are divided according to the following formula: Germany pays 65.0%, the Czech Republic 32.5% and the EEC 2.5% (ICPE Treaty 1990: Article 14). This formula reflects the two riparian states's share of the Elbe river basin and can therefore hardly be interpreted as involving financial compensation. In the case of the two Elbe action programmes, both countries pay for the pollution abatement measures on their own territory. The German government has financed several smaller environmental projects for the construction of wastewater treatment plants in the Czech part of the Elbe river basin (Holtrup 1999: 220). But these financial transfers do not even come close to offsetting the substantial costs of the two Elbe action programmes. In the case of the *First Action Programme* (1991), the Czech government committed itself to invest 11.7 billion Czech korunas (ca. 650 million DM) into the construction of communal and industrial wastewater treatment plants, while Germany's financial burden amounted to 19 billion DM. Estimated costs for the *Action Programme Elbe* (APE) between 1996 and 2010 amount to another 10 billion DM on the German and 8 billion korunas on the Czech side – but Czech costs may as well be more than twice as high as initially estimated (Holtrup 1999: 215ff.).

Altogether, the upstream riparian state Czech Republic has engaged in costly international water cooperation without receiving adequate financial compensation from Germany. Of course, one may argue that the Czech costs are relatively small compared to those incurred by Germany. But ever since the costs on the Czech side are far from negligible in the context of a country in transition, we still need

to explore other hypotheses to explain the surprisingly cooperative behaviour of the upstream state.

3.2.3 Knowledge-based hypotheses

As in the Rhine river case, the Elbe water regime illustrates that international river commissions can successfully assume the role of epistemic communities: The ICPE has helped to develop a shared understanding of the problem at hand, contributed to the reduction of uncertainty and thereby facilitated the process of water regime formation.

The “scientific-technical complex” of the ICPE started to organise shortly after the conclusion of the Elbe treaty (Holtrup 1999: 201ff.). In the 1990s, the ICPE included a total of eight working groups that documented the hydrological and ecological condition of the Elbe, proposed specific action programmes to tackle the existing problems and coordinated the scientific-technical implementation of the programmes. The working groups are dominated by external experts and scientists as well as by representatives of the German Länder that participate through the ARGE Elbe (see above).²⁹ As already mentioned, the ICPE has a considerable scope of action compared to that of the ICPR. Beyond its far-reaching competences in documenting pollution and proposing pollution reduction measures (see above), the ICPE coordinates – through its permanent secretariat in Magdeburg - a number of transboundary scientific research projects that pay particular attention to the state of technology in the Elbe river basin (Holtrup 1999: 199). Again, the available empirical evidence makes it difficult to assess the exact impact of these activities. Nonetheless, it seems safe to assume that the ICPE has significantly enhanced the knowledge base of the Elbe water regime and thereby facilitated the rapid process of regime formation. In 1991, for instance, the work of the ICPE was the driving force behind the establishment of an international water monitoring system that allowed for a comprehensive inventory of the Elbe ecosystem and thereby provided the basis for the priority measures underlying the *First Action Programme* (Holtrup 1999: 212).

Beyond the work of the ICPE, we can hardly overemphasise the importance of (horizontal) policy diffusion. The German idea to establish an international commission for the protection of the Elbe was based on the positive experiences with international water cooperation in the Rhine river basin: At the signing of the Elbe treaty in 1990, Klaus Töpfer, the former German minister for the environment, declared the intention to transfer the successful “Rhine model” to the

²⁹ The ARGE Elbe has become an important actor within the ICPE since it disposes of long-standing experience and capacity with respect to the management of the Elbe (for details see Holtrup 1999: 203ff.).

Elbe river basin (Holtrup 1999: 173).³⁰ This intention was mirrored by the composition of the German delegation during the ICPE negotiations: Dr. Ruchay, the German head of delegation, had been heavily involved in the work of the ICPR and was now able to bring his experience into the creation of the ICPE (Holtrup 1999: 187). The existence of the “Rhine model” has clearly facilitated the process of water regime formation in the Elbe river basin and given rise to multiple learning processes. While the ICPE was institutionally modelled after the ICPR, the Elbe riparian states deliberately tried to avoid the mistakes that had been made during the early years of the Rhine cooperation by providing the ICPE with a more comprehensive mandate (Holtrup 1999: 190). Also, the two action programmes of the Elbe water regime clearly adopt the flexible ecosystem approach underlying the *Rhine Action Programme* (RAP) (Durth 1996: 218). Interestingly, certain provisions of the Elbe water regime - e.g. its integrated river basin management approach - go even beyond those of the Rhine water regime - a situation that has given rise to reciprocal diffusion processes (Holtrup 1999: 189f.).³¹ Altogether, the rapid creation of the Elbe water regime cannot be understood without taking into account the described process of policy imitation and learning that reflects the experience of 40 years of cooperation in the Rhine river basin. The availability of information about institutional practises in the Rhine river basin has affected institutional development in the Elbe river basin - a classical case of policy diffusion.

While knowledge-based arguments provide important insights into the rapid formation of the Elbe water regime, they cannot fully explain why the Czech government chose to engage in a cooperative process in the first place. This is why we now turn to explore context-based hypotheses.

3.2.4 Context-based hypotheses

In the case of the Rhine water regime, context-based explanations had a very high explanatory value. The same holds true for the Elbe water regime. It is obvious that the end of the Cold War and the fall of the Berlin wall have provided a unique window of opportunity for the development of international cooperation along the Elbe. Without the economic, political and cultural revolution of 1989, the Elbe water regime would have been difficult, if not impossible to achieve.

But the end of the Cold War alone does not explain the cooperative behaviour of the Czech government. Of course, the changes of 1989 may have led to a political

³⁰ Already in 1988, Germany had invited the delegations of the GDR and Czechoslovakia to participate in a boat trip on the Rhine - an invitation that was clearly motivated by the German intention to advertise the model of the ICPR (Holtrup 1999: 186).

³¹ The new Rhine Convention (1998), for instance, is inspired by the integrated river basin management approach of the Elbe water regime (Holtrup 1999: 190).

climate that was generally conducive to environmental cooperation. But the key driving force behind the cooperative attitude displayed by the Czech government was the country's motivation to be among the first East European countries to join the European Union (Holtrup 1999: 194). This required decisive environmental action with view to harmonising the country's environmental standards with those of the European *aquis communautaire*.

3.2.5 Summary

Since the end of the Cold war, the Elbe riparian states have established an ambitious water regime that has - within a relatively short period of time - made an important contribution to the recent clean up of the river. The reunified Germany as the main victim of upstream water pollution has been the driving force behind the water regime. While one may suspect that the Elbe water regime reflects Germany's hegemonic status in the river basin, it seems equally, if not more plausible to explain the cooperative behaviour of the Czech government with the country's motivation to become a full member of the European Union. Water regime formation has therefore been facilitated by the prospect of European integration, rather than by asymmetric power relations.

The surprisingly rapid development of the Elbe water regime can best be explained with knowledge-based arguments. Here, we first need to mention the activities of the ICPE that has performed the functions of an epistemic community: By enhancing the knowledge base of the water regime, it has paved the way for the conclusion of the two Elbe action programmes in the first half of the 1990s. Secondly, the rapid formation of the Elbe water regime is largely due to international policy diffusion: Germany was able to draw on 40 years of positive experiences with the "Rhine river model" that was successfully transferred and further developed in the context of the Elbe river basin.

4 Conclusions

Since the early 1960s, the European continent has witnessed the (subsequent) spread of multilateral agreements to combat transboundary pollution. In order to explain the formation of these international water regimes, we have developed a research framework that considers power-, interest-, knowledge- and context-based approaches to the study of international cooperation. This research framework was then tested at the example of international water cooperation in the Rhine and Elbe river basins.

The empirical findings suggest that there is no "one-answer-fits-all" in trying to understand the formation of international water regimes. Cooperation along international rivers is a complex, lengthy and often contradictory process - an observation that confirms the need to combine competing theoretical approaches to

fully comprehend its driving forces. The conclusions derived from the Rhine and Elbe case studies can be summarised as follows:

- *Power-based hypotheses* have least explanatory power. The Rhine case clearly shows that the formation of a comprehensive water regime can be achieved in the absence of a hegemon: The Netherlands as the non-hegemonic downstream country has been the driving force behind the Rhine water regime by adopting a political strategy that skilfully combines financial compensation, the threat of legal sanctions and the mobilisation of knowledge. The case of the Elbe water regime is only different at first sight: Even though one may argue that the Elbe water regime reflects Germany's hegemonic status in the river basin, it seems equally, if not more plausible to explain the cooperative behaviour of the Czech government with the country's motivation to join the European Union. While the presence of a hegemon is therefore by no means a necessary condition for water regime formation, the Elbe case may still show that a downstream hegemon may facilitate the cooperation process.
- *Interest-based arguments* provide more insight into the formation of the two water regimes. In accordance with theoretical predictions, upstream-downstream conditions along international rivers tend to make efforts for international cooperation difficult, cumbersome and slow. Nonetheless, the Rhine river case illustrates that the extent to which upstream-downstream conditions really impede international cooperation may vary depending on the distribution of costs: While the costs of chloride pollution are asymmetrically distributed at the expense of the Netherlands, the costs of chemical pollution exhibit a more symmetric distribution among the riparian states – a situation that is more conducive to international cooperation. Interest-based arguments suggest that asymmetric interests due to upstream-downstream conditions tend to be balanced through the provision of cost incentives between riparian states. However, this hypothesis is only partially confirmed: With the notable exception of the Rhine *Chloride Convention*, the various action programmes along the Rhine and Elbe were reached without making use of direct cost incentives, that is side-payments. This may be due to high transaction costs in form of uncertainty about the problem at hand or the prominence of the “polluter-pays-principle” in the European context. Also, the instrument of indirect cost incentives, that is “issue-linkages” is remarkably absent in both cases (with the exception of the ICPR).
- *Knowledge-based arguments* prove to be of high relevance. First of all, the empirical evidence confirms the hypothesized importance of epistemic communities: The “scientific-technical complex” of both ICPR and ICPE has fulfilled the function of an epistemic community by developing a shared understanding of the problem at hand (scientific convergence), contributing to the

reduction of uncertainty and thereby enhancing the knowledge base of the water regime. In both cases, this has paved the way for (progressive) water regime formation. Secondly, we find considerable evidence for processes of international policy learning: The model of the Rhine water regime was successfully transferred and further developed in the context of the Elbe river basin. Information about institutional practises in the Rhine river basin has clearly affected institutional development in the Elbe river basin – a classical case of policy diffusion.

- Ironically, context-based arguments have the highest explanatory power. The development of the Rhine water regime, in particular that of the innovative *Rhine Action Programme* (RAP), cannot be understood without the disastrous Sandoz spill of 1986 that has helped to overcome upstream-downstream conditions and turned the management of the Rhine river basin into an international public good (problem). Similarly, the economic, political and cultural revolution of 1989 has provided a unique window of opportunity for the development of the Elbe water regime. Finally, both case studies reveal the relevance of the European integration process: While the Rhine river regime has been facilitated by the fact that it assembles the pioneer countries of European integration, it is the prospect of accession to the European Union that has motivated the cooperative behaviour of the Czech government in the Elbe river case.

In sum, the European continent has witnessed important developments in the “voluntary” management of its transboundary rivers since the early 1960s. The manifold cooperation processes are a still poorly understood and continue to raise many questions to which this paper could only provide preliminary answers. While the Rhine and Elbe cases generally shed light on the driving forces behind water regime formation, future research will have to subject our preliminary findings to more comprehensive and systematic investigations. While there are certainly multiple pathways for future research, we suspect that it may be of particular interest to further explore hypotheses related to international policy diffusion: Has the model of the Rhine water regime also affected institutional development in settings as different as the Scheldt, Danube, Odera and Volga river basins? What has been the relationship with the *UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes* (1992) that legally obliges the signatory governments to enter into bilateral and multilateral agreements on transboundary waters? And can we observe instances of policy diffusion from Europe to other parts of the world?

5 Bibliography

- Beach, Heather L.; Hammer, Jesse; Hewitt, J. Joseph; Kaufman, Edy; Kurki, Anja; Oppenheimer, Joe A.; Wolf, Aaron T., 2000: *Transboundary freshwater dispute resolution: Theory, practice and annotated references* (Tokyo - New York - Paris: United Nations University Press).
- Bennett, Andrew, 2004: "Case study methods: Design, use, and comparative advantages", in: Sprinz, Detlef F.; Wolinsky-Nahmias, Yael (eds.): *Models, numbers, and cases, Methods for studying International Relations* (Ann Arbor: University of Michigan Press): 19-55.
- Bernauer, Thomas, 1995: "The International Financing of Environmental Protection: Lessons from Efforts to Protect the Rhine against Chloride Pollution", in: *Environmental Politics*, Vol. 4, No. 3: 369-390.
- Bernauer, Thomas, 1996: "Protecting the Rhine river against chloride Pollution", in: Keohane, Robert O.; Levy, Marc A. (eds.): *Institutions for Environmental Aid: Pitfalls and Promise* (Cambridge Mass.: MIT Press): 201-233.
- Bernauer, Thomas, 2002: "Explaining success and failure in international river management", in: *Aquatic Science*, No. 64: 1-19.
- Bernauer, Thomas; Moser, Peter, 1996: "Reducing pollution of the river Rhine: The influence of international cooperation", in: *Journal of Environment and Development*, Vol. 5, No. 4: 391-417.
- Cooper, Richard N., 1989: "International cooperation in public health as a prologue to macroeconomic cooperation", in: Cooper, Richard M.; Eichengreen, Barry; Henning, Randall C.; Holtham, Gerald; Putnam, Robert D. (eds.): *Can Nations Agree?: Issues in International Economic* (Washington D.C.: Brookings Institution): 178-254.
- Dieperink, Carel, 2002: "The Clean-up of the Rhine as a Successful International Effort", in: Al Baz, Ismail; Hartje, Volkmar; Scheumann, Waltina (eds.): *Co-operation on transboundary rivers* (Baden-Baden: Nomos).
- DiMaggio, Paul; Powell, Walter W., 1991: "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields", in: DiMaggio, Paul; Powell, Walter W. (eds.): *The New Institutionalism in Organizational Analysis* (Chicago: University of Chicago Press): 63 - 82.
- Durth, Rainer, 1996: *Grenzüberschreitende Umweltprobleme und regionale Integration: Zur Politischen Ökonomie von Oberlauf-Unterlauf-Problemen an internationalen Flüssen*, Dissertation (Baden-Baden: Nomos).
- Finnemore, Martha; Sikkink, Kathryn, 1998: "International Norm Dynamics and Political Change", in: *International Organization*, Vol. 52, No. 4: 887-917.
- Food and Agriculture Organisation (FAO), 1978: *Systematic index of international water resources treaties: Declarations, acts and cases by basin* (FAO: Rome).
- George, Alexander L.; McKeown, Timothy J., 1985: "Case studies and theories of organizational decision making", in: *Advances in Information Processing in Organizations*, Vol. 2: 21-58.
- Gilpin, Robert, 1981: *War and change in world politics* (Cambridge: Cambridge University Press).
- Giordano, Meredith A.; Wolf Aaron T., 2002: "The World's Freshwater Agreements: Historical Developments and Future Opportunities", in: United Nations Environment Programme (UNEP): *Atlas of International Freshwater Agreements* (UNEP: Nairobi): 1-8, at: <<http://www.transboundarywaters.orst.edu/publications/atlas>>, 17 Sep. 2005.

- Global Water Partnership (GWP), 2000: Integrated Water Resources Management, Global Water Partnership Technical Advisory Committee, Background Paper No 4, at: <<http://www.gwpforum.org/gwp/library/TACNO4.PDF>>, 23 December 2005.
- Haas, Ernst B., 1990: *When knowledge is power: Three models of chance in international organizations* (Berkeley: University of California Press).
- Haas, Peter M., 1992: "Introduction: Epistemic communities and International Policy Coordination", in: *International Organization*, Vol. 46, No. 1: 1-35.
- Haftendorn, Helga, 2000: "Water and international conflict", in: *Third World Quarterly*, Vol. 21, No. 1: 51-68.
- Haggard, Stephan; Simmons, Beth A., 1987: "Theories of international regimes", in: *International Organization*, Vol. 41, No. 3: 491-517.
- Hardin, Garrett, 1968: "The tragedy of the commons", in: *Science*, No. 162: 1243-1248.
- Hartje, Volkmar, 2002: "International dimensions of integrated water management", in: Al Baz, Ismail; Hartje, Volkmar; Scheumann, Waltina (Eds.): *Co-operation on transboundary rivers* (Baden-Baden: Nomos): 7-34.
- Hasenclever, Andreas; Mayer, Peter; Rittberger, Volker, 1997: *Theories of international regimes* (Cambridge: Cambridge University Press).
- Holtrup, Petra, 1999: *Der Schutz grenzüberschreitender Flüsse in Europa – zur Effektivität internationaler Umweltregime*, Dissertation (Universität Bonn).
- ICPE Treaty, 1990: *Convention between the Federal Republic of Germany and the Czech and Slovak Federal Republic and the European Economic Community on the International Commission for the Protection of the Elbe*, at <<http://ocid.nacse.org/qml/research/tfdd/toTFDDdocs/183ENG.htm>>, 21 December 2005.
- Jürgens, Helge, 2003: *Governance by diffusion – implementing global norms through cross-national imitation and learning*, FFU-report 07-2003, (Berlin: Forschungsstelle für Umweltpolitik/ FU Berlin), at <<http://www.fu-berlin.de/ffu/>>, 17 September 2005.
- Keck, Margaret E.; Sikkink, Kathryn, 1998: "Transnational advocacy networks in international and regional politics", in: *International Social Science Journal*, No. 159: 89-101.
- Keohane, Robert O., 1984: *After hegemony: Cooperation and discord in the world political economy* (Princeton: Princeton University Press).
- Kindleberger, Charles P., 1981: "Dominance and Leadership in the International Economy - Exploitation, Public-Goods, and Free Rides", in: *International Studies Quarterly*, Vol. 25, No. 2: 242-254.
- King, Gary; Keohane, Robert O.; Verba, Sidney, 1994: *Designing social inquiry: Scientific inference in qualitative research* (Princeton: Princeton University Press).
- Kiss, Alexandre, 1985: "The Protection of the Rhine Against Pollution", in: *Natural Resources Journal*, Vol. 25: 613-637.
- Krasner, Stephen D., 1983: *International regimes* (Ithaca: Cornell University Press).
- LeMarquand, David G., 1977: *International river basins – The politics of cooperation* (Vancouver: Westwater Research Centre).
- Lindemann, Stefan, 2005: „Erfolgsbedingungen von internationalem Flussmanagement: Der Fall des Südlichen Afrikas“, in: Kipping, Martin; Lindemann, Stefan: *Konflikte und Kooperation um Wasser - Wasserpolitik am Senegalfluss und internationales Flussmanagement im Südlichen Afrika* (Münster: Lit-Verlag): 108-234.
- Lowi, Miriam R., 1993: *Water and power – The politics of a scarce resource in the Jordan River basin* (Cambridge: Cambridge University Press).

- Marty, Frank, 2001: *Managing international rivers – Problems, politics and institutions* (Bern: Peter Lang).
- Mingst, Karen A., 1981: “The Functionalist and Regime Perspectives: The Case of Rhine River Cooperation”, in: *Journal of Common Market Studies*, Vol. 20, No. 2: 161-173.
- Moss, Timothy, 2003: “Solving Problems of 'Fit' at the Expense of Problems of 'Interplay': The Spatial Reorganisation of Water Management following the EU Water Framework Directive”, in: Breit, Heiko; Engels, Anita; Moss, Timothy (eds.): *How Institutions Change: Perspectives on Social Learning in Global and Local Environmental Contexts* (Opladen: Leske + Budrich): 85-121.
- Moravcsik, Andrew 1992: *Liberalism and International Relations Theory*, Working Paper Series 92-6, The Center for International Affairs (Cambridge: Harvard University).
- Ostrom, Elinor, 1990: *Governing the commons: The evolution of institutions for collective action* (Cambridge: Cambridge University Press).
- Rogers, Everett M., 1995: *Diffusion of Innovations* (Free Press: New York).
- Rose, Richard, 1991: “What is lesson-drawing?”, in: *Journal of Public Policy*, Vol. 11, No. 1: 3-30.
- Schram Stoke, Olav, 1997: “Regimes as governance systems”, in: Young, Oran R. (Ed.): *Global governance: Drawing insights from the environmental experience* (Cambridge Mass.: MIT Press): 27-63.
- Schreurs, Miranda A.; Economy, Elizabeth C., 1997: *The Internationalization of Environmental Protection* (Cambridge: Cambridge University Press).
- Snidal, Duncan, 1985: “The Limits of Hegemonic Stability Theory”, in: *International Organization*, Vol. 39, No. 4: 579-614.
- Spector, Bertram I., 2000: “Motivating water diplomacy: Finding situational incentives to negotiate”, in: *International Negotiation*, Vol. 5., No. 2: 223-236.
- Stein, Arthur, 1983: “Coordination and Collaboration: Regimes in an Anarchic World”, in: Krasner, Stephen D. (ed.): *International regimes* (Ithaca: Cornell University Press).
- Teclaff, Ludwik A., 1996: “The evolution of the River Basin Concept in National and International Law”, in: *Natural Resources Journal*, Vol. 36, No. 2: 359-392.
- Tews, Kerstin, 2002: *Der Diffusionsansatz für die Vergleichende Policy-Analyse. Wurzeln und Potenziale eines Konzepts. Eine Literaturstudie*, FFU-report 02-2002, (Berlin: Forschungsstelle für Umweltpolitik/FU Berlin), at <<http://www.fu-berlin.de/ffu/>>, 17 September 2005.
- Turton, Anthony R., 2003: *The political aspects of institutional developments in the water sector: South Africa and its international river basins*, Diss. (Pretoria: University of Pretoria:), at: <http://www.transboundarywaters.orst.edu/publications/related_research/Turton/index.html>, 07 June 2004.
- United Nations Environment Programme (UNEP), 2002: *Atlas of International Freshwater Agreements* (UNEP: Nairobi), at: <<http://www.transboundarywaters.orst.edu/publications/atlas>>, 17 September 2005.
- van der Zaag, Pieter; Savenije, Hubert G., 2000: “Towards improved management of shared river basins: lessons from the Maseru Conference”, in: *Water Policy*, Vol. 2., No. 1: 47-63.
- Vlachos, Evan; Webb, Anne C.; Murphy, Irene L., 1986: *The management of international river basins* (Luxembourg: International Institute for Applied Systems Analysis).
- Vogel, David, 1997: “Trading up and governing across: Transnational Governance and Environmental Protection”, in: *Journal of European Public Policy*, Vol. 4, No. 4: 556-571.

- Waterbury, John, 1997: "Between unilateralism and comprehensive accords: Modest steps toward cooperation in international river basins", in: *Water Resources Development*, Vol. 13, No. 3: 279-289.
- Wolf, Aaron T., 1998: "Conflict and cooperation along international waterways", in: *Water Policy*, Vol. 1, No. 2: 251-265, at: <http://www.transboundarywaters.orst.edu/publications/conflict_coop/>, 14 September 2005.
- Wolf, Aaron T.; Yoffe, Shira B.; Giordano, Mark, 2003: "International waters: Identifying basins at risk", in: *Water Policy*, Vol. 5, No. 1: 29-60.
- Young, Oran R., 1989: "The politics of regime formation", in: *International Organization*, Vol. 43, No. 3: 349-376.
- Young, Oran R.; Osherenko, Gail, 1993: *Polar Politics: Creating International Environmental Regimes* (Ithaca: Cornell University Press).
- Zürn, Michael, 1992: *Interessen und Institutionen in der internationalen Politik: Grundlegung und Anwendung des situationsstrukturellen Ansatzes* (Opladen: Leske + Budrich).