

Working Paper

Reducing Pollution of the Rhine River: The Influence of International Cooperation

Thomas Bernauer and Peter Moser

WP-96-7
January 1996



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Preface

This paper was written by Thomas Bernauer and Peter Moser as a commissioned study in the framework of the Regional Material Balance Approaches to Long-Term Environmental Policy Planning project (IND project).¹ The policy part of this project - the Rhine/Black Triangle Policy Comparison - aims at a better understanding of policy options for cleaning up the Black Triangle, particularly with regard to pollution by heavy metals.²

The paper examines the contribution of transboundary political and legal efforts to reducing pollution of the river Rhine by heavy metals. In doing so, it seeks to contribute to the analysis of the performance of transboundary environmental cooperation, and to gain insights that may be relevant to environmental clean-up efforts in the Black-Triangle region.

The first part of the paper reviews international and transnational agreements aimed at reducing Rhine pollution by heavy metals. The second part discusses the evolution of Rhine pollution by heavy metals. The third part analyzes the relationship between the evolution of cooperation and pollution. It does so by examining: (a) processes by which cooperation may affect the behavior of actors polluting the river; (b) actors and institutions that may have influenced such processes; and (c) background variables which need to be controlled when assessing the impact of transboundary efforts on river pollution.

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² See Blazejczak 1995.

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1. Introduction

It is widely believed that the river Rhine is one of the most successful examples of international cooperation in environmental protection and the management of international rivers in particular.³ On the one hand, pollution of the Rhine has decreased dramatically since the beginning of the 1970s. On the other hand, we can observe a growing web of transboundary agreements providing for just that - a cleaner Rhine. This correlation of reduced pollution and growing international cooperation provides good ground for the assumption that there is a connection between the two phenomena. Indeed, analysts often take it for granted that the necessity of international cooperation to resolve transboundary pollution problems implies the effectiveness of cooperation when it occurs - particularly if the stated goals of the actors involved are met, as it is the case with the Rhine. However, the connections between presumed causes (international cooperation) and effects (reduced pollution) are usually not as straightforward as one might think. They may be mediated by many other variables, or presumed correlations can be entirely spurious, meaning that they are caused by other variables and do not reflect a causal relationship between cooperation and pollution reductions.

In this paper we try to disentangle the Rhine story, with the goal of isolating and bringing into perspective the role that various forms of transboundary cooperation have played in reducing pollution of the river. In line with the broader research project, within which this paper is situated, we focus on heavy metals. The aim of the paper is to contribute to the analysis of the performance of transboundary environmental cooperation, and to gain insights that may be relevant to environmental clean-up efforts in the 'Black triangle' region.

The first part of the paper reviews international and transnational agreements aimed at reducing Rhine pollution by heavy metals. The second part discusses the evolution of Rhine pollution by heavy metals. The third part analyzes the relationship between the evolution of cooperation and pollution. It does so by examining: (a) processes by which cooperation may affect the behavior of actors polluting the river; (b) actors and institutions that may have influenced such processes; and (c) background variables which need to be controlled when assessing the impact of transboundary cooperation on river pollution.

2. Transboundary Cooperation

Each of the existing transboundary agreements regulating Rhine pollution may, at least hypothetically, have had an effect on the discharge of heavy metals into the Rhine or its tributaries. Hence they are described here as a starting point. These agreements can be divided into three categories:

- *International agreements aimed exclusively at reducing pollution of the Rhine.* The parties to these agreements include all riparian states of the Rhine, or the Rhine basin, including Switzerland. The European Union is also a party to these agreements.
- *Transnational accords* under private law between firms discharging heavy metals into the Rhine and those suffering damage from this pollution.
- *Environmental regulations by the European Union (EU, formerly the European Community).*⁴ These regulations are applicable to EU member states and thus also to the riparian countries of the Rhine, with the exception of Switzerland

³ See Stigliani et al. 1993:786; Neue Zürcher Zeitung, 17.3.90. For more critical views, see LeMarquand 1977:123, who attributes progress in cleaning up the Rhine more to domestic political pressure than to international cooperation.

⁴ For reasons of simplicity, we use the term European Union throughout the paper.

2.1 International Efforts Focused Exclusively on the Rhine

The International Commission for the Protection of the Rhine against Pollution

Early traces of what today is called international environmental law can be found in some of the older treaties relating to the river Rhine.⁵ However, 1950 is usually considered as the starting point of the modern history of international environmental cooperation among the riparians of the Rhine (Kiss 1985:621). At that time, a coordinating body, the International Commission for the Protection of the Rhine against Pollution (ICPR), was set up by an exchange of notes, following several initiatives by the Netherlands (Goppel 1991:4).⁶ The Netherlands had since the early 1920s expressed its concern over pollution of the Rhine by the upstream countries (Goppel 1991:4, ICPR 1994). The reason for the Dutch interest in a cleaner Rhine is straightforward. The Netherlands draws a large share of its freshwater supply from the Rhine. At the same time, it is located at the mouth of the river and is thus unable to influence directly the quality of water flowing into the country from outside its jurisdiction.

The ICPR was reconstituted in 1963 by a formal treaty among the riparian states: Switzerland, the Federal Republic of Germany, France, the Netherlands and Luxembourg (the latter is connected to the Rhine basin through the river Moselle). The functions of the ICPR were quite narrowly defined. Its tasks are to:

- monitor the nature, the extent, and the sources of pollution;
- propose measures for the protection of the Rhine; and
- prepare agreements among the parties.

The functions of the secretariat of the ICPR (located in Koblenz, Germany) are those of an advisory body that has no decision making power of its own. Decisions by the ICPR must be taken by consensus, which tends to produce agreements at the lowest common denominator. Indeed, the ICPR and its secretariat did not play a very active role during the 1960s and early 1970s and were unable to exert political pressure on the riparian governments to cut their pollution of the river (LeMarquand 1977). The ICPR concentrated merely on the first of its three functions during the first ten years of its existence: gathering and publishing information on the pollution of the Rhine.⁷

The Annual Rhine Environmental Ministers Conference

Some progress was made in 1972, when on the initiative of the Netherlands the first Annual Rhine Environmental Ministers meeting was instituted. Although these meetings were subsequently not held every year as planned, they have been the most important international forum for the discussion and resolution of Rhine water quality issues at a high political level (LeMarquand 1976:112). It seems that this step exerted a reviving influence on the ICPR by giving it clearly defined objectives. Already in the following year, the Rhine Ministers meeting directed the ICPR to negotiate a Convention regulating chemical pollution of the Rhine.

France was among the major advocates of a convention on chemical pollution despite its not being very much affected by this form of pollution. The motives for the French position may have been the low costs that cuts in chemical pollution would entail for French

⁵ See, for instance, the "Convention relative to the carriage of inflammable substances on the Rhine," concluded in 1902.

⁶ A Treaty, concluded in 1885 and regulating salmon fishery along the Rhine, provided for occasional meetings of government representatives. It served as a framework for the meetings in which Rhine pollution was first discussed at the end of the 1940s. These meetings ultimately led to the decision to establish a special commission that would exclusively deal with Rhine pollution (Romy 1990:52).

⁷ The monitoring program of the ICPR was gradually expanded over the years. A continuous measurement program at all Rhine monitoring stations (as compared to only 26 samples before) is in place since 1980 (IKSR, Tätigkeitsbericht 1980).

industry, and the desire to shift the political pressure for environmental protection by France on to other actors. Since the 1930s, France had been accused of being the biggest chloride polluter of the Rhine (Bernauer 1995a). Germany, by contrast, would bear the heaviest burden if chemical pollution were to be cut, because it had the largest industries along the Rhine.

Convention for the Protection of the Rhine against Chemical Pollution

These renewed efforts produced first results in 1976. Two treaties were signed:

- the Convention for the Protection of the Rhine against Pollution by Chlorides; and, more important for this paper,
- the Convention for the Protection of the Rhine against Chemical Pollution, the so called Bonn Convention

The coming into existence of the Bonn Convention was fraught with difficulties (ICPR 1975-76). The signing of the accord was retarded by one year because, due to problems unrelated to the agreement, there was no ministerial conference in 1975 (ICPR 1975-76). The treaty finally entered into force in 1979. This delay resulted from concerns in the German Federal Republic that the costs, which would fall heavily on German industry, would be too high.

The approach used in the Bonn Convention is heavily influenced by the European Community's directive on "Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment" (76/464/EEC) (Romy 1990:54). The influence of the EC was recognized by admitting the latter as a full member to the ICPR and inviting it to join the Bonn Convention.⁸ Like the EC directive, the Bonn Convention is a framework agreement. It outlines the general aims of the environmental protection effort, that of reducing pollution of the Rhine. It defines black and grey (called Annex I and Annex II) lists of substances which are to be controlled through different procedures (see Grjins/Mostert 1992). It directs the ICPR to elaborate proposals for threshold values for particular substances and branches of industry. Only in a second stage would these proposals become binding rules (once they are adopted unanimously by the contracting parties); that is, national emission permits could not exceed the agreed thresholds. The Bonn Convention expanded the geographical scope of cooperation by providing for the application of the agreement to the entire Rhine basin. The 1963 treaty establishing the ICPR was applicable only to the Rhine itself. In other words, the Bonn Convention applies to discharges into the Rhine itself plus discharges into its tributaries.

The Rhine Action Program (RAP)

Since 1987, the Rhine Action Program (RAP) has emerged as the leading international effort to protect the Rhine against pollution. There are two immediate reasons for this development: (a) difficulties with the implementation of the Bonn Convention (see below); and (b) the accident in November 1986 at the Swiss chemical firm Sandoz, which had catastrophic consequences for the ecology of the river and disrupted water-supply systems downstream. At the Rhine Environmental Ministers Conference of October 1987 (the third within a year, since the accident) the Rhine Action Programme prepared by the ICPR was adopted. In contrast to the Bonn Convention, the RAP is not a formal treaty but a gentlemen's agreement. It covers a broader range of Rhine environmental issues and its approach is different, one might say more pragmatic.

The overarching goal, symbolizing the health of the ecosystem as a whole, is the re-introduction of the Salmon in the river and its tributaries by the year 2000. As a result of the Sandoz spill, the prevention and reduction of pollution caused by accidents has gained in

⁸ A representative of the EU Commission usually takes part in the Annual Rhine Ministers Conference.

importance. Another critical area of activity is the reduction of chemical pollution, which is to be attained this time by means different from those of the Bonn Convention, namely:

- Specific water quality targets: taking as a baseline the year 1985, a 50% reduction of the total load of priority substances (among which are heavy metals) over the entire course of the river should be reached by 1995; in 1991 the reduction targets for lead and cadmium were increased to 70% (ICPR 1994).⁹
- To achieve the reduction targets, the ICPR can make recommendations as to the waste-water treatment technology which should be used in specific industries. Such recommendations have been issued for the cellulose industry (1992), communal waste water management (1991), treatment of metallic surfaces (1992, with possible implications for heavy metals), the production of paper and cardboard (1993), and the organic chemistry industry. The member states of the ICPR are under the obligation to ensure the application of "best available technology" on their territory, and to report to the ICPR about their activities (see ICPR reports). Because the ICPR's recommendations are not legally binding, their monitoring and enforcement is based on informal control which operates largely at the domestic level (ICPR 1992:30).
- The RAP encompasses not only the reduction of pollution originating from point sources but also diffuse sources. It remains to be seen, however, whether the RAP will be able to contribute to the reduction of pollution by diffuse sources (Grjins/Mostert 1992:35). The press communiqué of the eleventh Rhine Ministers Conference (December 1994) states that the specified targets for pollution from diffuse sources were not yet met, and that diffuse pollution originating from agriculture remains a serious problem.

To achieve the RAP's goals, the Rhine riparians agreed to a three-stage process:

- The first stage was to consist primarily of fact-finding, particularly the establishment of detailed national registers of important dischargers, and the development of models to estimate the costs and benefits of measures to be taken.
- During the second stage, from 1989 to 1995, the proposals made by the ICPR were to be put into effect.
- In the third stage (1995-2000), the remaining problems were to be ironed out.

The eleventh Rhine ministers conference stated that for mercury, cadmium, lead, copper, and zinc further measures were necessary to achieve the 70% reduction target set in 1991. It also requested that the ICPR elaborate a new international convention for the protection of the Rhine. Entering into force by the year 2000, this agreement would go beyond pollution matters and address a wider range of ecological problems, such as the reconstitution of natural habitats and flood protection measures.

2.2 Transnational Cooperation

A relatively new and innovative transboundary measure aimed at reducing pollution of the Rhine involves non-state actors, such as firms or municipalities. The most widely publicised such case relating to Rhine pollution by heavy metals involves the city of Rotterdam on the one hand and chemical industries in Germany, Switzerland, and France on the other hand.

The City of Rotterdam is under the obligation, imposed by public law, to keep its harbour navigable. It therefore has to remove sediments from the harbour, which lies at the

⁹ For a detailed list of the threshold values, see ICPR Tätigkeitsbericht 1991:140. There is a clause in the program which allows for exceptions from the 50% rule for pollutants which were heavily reduced in the years before 1987 and whose emission is already subject to Best Available Technology.

mouth of the Rhine. These sediments have, over time, become more and more contaminated (particularly by heavy metals) as a result of Rhine pollution. Dutch law as well as international law prohibit the dumping of these sediments into the North Sea. Nor can they be used for land-fills, but have to be disposed of in special repositories on the Dutch coast, so-called sluffers. Such a sluffer was built in the mid-1980s at a cost of around 200 million Dutch Guilders, of which the Municipality of Rotterdam had to contribute about half. This sluffer will be full approximately by the year 2000. If the construction of another, costly, sluffer is to be avoided, heavy metal loads in the Rhine will have to be reduced substantially (70-90%). The Municipality of Rotterdam therefore started a highly publicised project to:

- identify the principal dischargers of heavy metals along the Rhine (for example by sending a vessel on reconnaissance missions upstream); and
- conclude agreements with polluters

To enhance its bargaining position, which as a sub-national actor downstream would otherwise have been weak, Rotterdam threatened lawsuits against upstream polluters. In return for pollution reductions by upstream polluters, Rotterdam offered to drop its liability claims for the costs it incurred as a result of the contaminated harbour sediments. The most important legal premise backing the credibility of the threat is the fact that Rotterdam could file a lawsuit before the courts of any state bordering the Rhine.¹⁰ This means that a Dutch court, which would apply potentially more favourable Dutch environmental law and would presumably be more sympathetic to Dutch victims, could decide in the matter. (For a detailed discussion of the legal issues involved in the Rotterdam cases, see van Dunne 1990, 1992, and Kernkamp 1992.)

After extensive research, the Rotterdam authorities began to negotiate with 2 Swiss, 4 French and 7 German companies.¹¹ These negotiations have so far resulted in several agreements. The most important agreement was concluded with the Association of the German chemical industry (VCI) in mid-1991. 100 out of VCI's 400 members discharge pollutants into the Rhine. Other contracts were concluded with Sandoz, the Duisburger Kupferhütte and Rhône-Poulenc. Yet other negotiations seem to be under way. Characteristically these contracts contain clauses regarding the time-span during which certain immissions are to be reduced, and by what degree this should be done. They also contain provisions regarding the periodic evaluation of the fulfilment of the terms of the contract. In the case of a breach of the contract, the claim for tort by the Municipality of Rotterdam will be revived. (For further information about the legal contents of these contracts, see van Dunné (1992: 124).

2.3 Environmental Regulations of the European Union

Even though the protection of the natural environment has been an explicit task of the European Union only since the Single European Act of 1986¹², the Union moved into this policy area already in 1973. The first Environmental Action Programme (EAP) adopted in that year¹³ and also the subsequent EAPs mention water quality as a concern. These EAPs have served as guidelines for EU policy and have not had a legally binding character. On a somewhat more specific level the EU has issued a number of directives which either define

¹⁰ This possibility originates in a decision by the European Court of Justice in connection with a key-case in transboundary environmental liability: the case of Dutch nursery firms against the Mines de Potasse d'Alsace (MdPA) over MdPA's discharges of chloride into the Rhine (Bernauer 1995a).

¹¹ The companies chosen were those whose discharges of certain pollutants exceeded one percent of their total annual load at Lobith in the reference year 1985 (van Dunné 1992, 122).

¹² See Art 130r,s.

¹³ See the Preamble and Article 2 of the EC-treaty of 1957, which state that one of the aims of the EC is to ameliorate living conditions and to further a harmonious development of the EC's economies.

quality objectives for certain types of water consumption or emission norms for the discharge of certain substances.

Water quality directives

This category of EU legislative activity includes most notably:

- the directive on the quality of surface water for the production of drinking water (75/440/EEC), adopted in 1975;
- the directive on the quality of freshwater capable of supporting fish life (78/659/EEC), adopted in 1978;
- and the drinking water directive (80/778/EEC), adopted in 1980.

These three directives do not prescribe a general minimum quality standard for all surface waters. They even leave it up to the member states to define the waters to which the directives should apply (Grjins/Mostert 1992: 29). Moreover, there has been considerable disagreement about the effectiveness of these directives.¹⁴

Emission directives

Potentially more important to our study are the EU's emission directives, not least because they seem to have influenced the content of some of the treaties concluded among the riparian states of the Rhine (see above). The most important piece of legislation relating to emission standards is

- the 1976 directive "on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment" (76/464/EEC).

This directive established a framework for issuing more specific directives that contain thresholds for concentrations of certain harmful substances in the waste water of specific branches of industry. It distinguishes between substances on a "black" and a "grey" list. Black list substances are considered especially harmful and their discharge must therefore be completely halted in due course. As to the grey list, member states are free in how they wish to address emissions of such substances. According to a 1983 decision of the European Council, heavy metals are among those black list substances that are to be dealt with in priority. Analysts have observed, however, that the implementation of this directive has been unsatisfactory (Grjins/Mostert 1992: 26). Follow-up directives established thresholds for a small number of substances only, most notably:

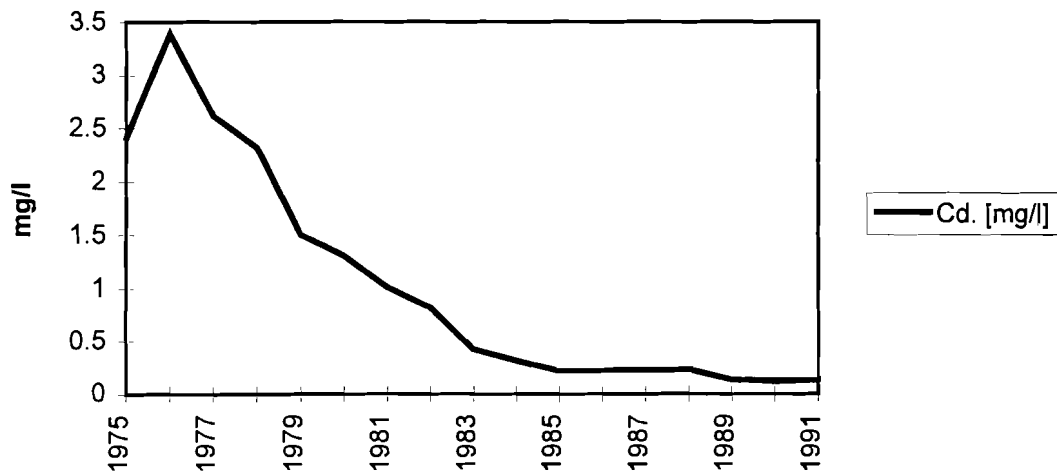
- mercury in waste water of the chlor-alkali electrolysis industry (82/176/EEC) and other branches of industry (84/156/EEC) (adopted in 1982 and 1984 respectively); and
- cadmium (83/513/EEC) (adopted in 1983).

3. The Evolution of Rhine Pollution

After having outlined the web of transnational agreements and activity aimed at curbing pollution of the Rhine, we now turn to the environmental outcome, to which these agreements and activities relate. Until the end of the 1960s pollution of the Rhine increased steadily - with peak loads of heavy metals in the late 1960s and early 1970s (Stigliani et. al. 1993:790). Since then, pollution has declined significantly. The pattern of this decrease is essentially similar for all heavy metals: we can observe a very steep decrease from the peak years until about the mid-1980; since then the decline has slowed down with concentrations stagnating at a relatively low level (IKSR 1994; van Dunné 1992: 117). Figure 1 shows, as an example, the pollution by cadmium.

¹⁴ Krämer (1992:11) argues that the implementation of agreed measures has been extremely difficult, agreed programs were rarely elaborated further, and actual reduction measures were only occasionally carried out.

Average annual Cadmium loads in the Rhine at Bimmen-Lobith 1975-1991



1 entry into force of the Bonn Convention (1979)

2 entry into force of the Cadmium directive (83/513/EEC) (1983)

3 entry into force of the Cadmium threshold values prepared in the framework of the Bonn Convention (1986)

Source: Bundesministerium für Umwelt Naturschutz und Reaktorsicherheit 1995: Abb. 5a.

Most international efforts to reduce pollution of the Rhine have concentrated on point sources. At the same time, pollution by point sources has declined significantly more than pollution by diffuse sources as the annexed chart (source: Stigliani et al. (1993: 790) shows. To conclude from this correlation that international cooperation must have influenced pollution would be premature. This correlation may rather stem from the fact that it is much easier to reduce pollution from relatively few and clearly identifiable point sources than from numberless diffuse sources; consequently, international efforts and efforts at the polluter level have tended to concentrate on point sources.

In looking closer at pollution originating from point sources, it is interesting to note that the iron, steel/coke, and metal refining industries, which in their peak years were major point sources for all three pollutants examined in the chart, had reduced their emissions dramatically by 1988. For instance, aqueous cadmium emissions discharged by the metal refining industries had amounted to almost 40% of the total cadmium load of the Rhine in the peak year. By 1988, they were reduced to zero. Stigliani et. al. (1993), see Figure 2 in Annex, attribute this progress to:

- The installation of waste-water treatment as a result of more stringent national regulation.
- Implementation of good housekeeping practices: by-products of production processes (such as cadmium in Zinc refineries), which used to be dumped into the Rhine, are now considered as valued resources.
- Metal-producing industries recycle their waste and have replaced older, more wasteful technologies by cleaner processes.

Other factors, which may have contributed to pollution reductions, include industrial restructuring processes in the Rhine area, particularly in the context of declining coal and steel production. Whether, and if so how and to what degree, transboundary cooperation has influenced these developments will be examined in the next section.

4. Hypotheses and Methodology

The previous two sections of the paper have examined transboundary efforts to curb pollution of the Rhine (the potential explanatory variables) and the evolution of Rhine pollution (the dependent variables). Now we turn to the issue of whether there is a causal relationship between the two groups of variables. Drawing on a broader range of social science theories¹⁵, we first outline a number of effects that transboundary cooperation may, hypothetically, have on the behavior of polluters along the Rhine. The second part discusses some methodological issues involved in the analysis of the effects of transboundary cooperation. The third part presents the results of our research.

4.1 Hypothetical Effects

In the simplest case, a specific transboundary regulation will either be directly applicable at the domestic level, or will be transformed into national law. To avoid the consequences of breaching the law, polluters will react to new regulations by changing their behavior, for example by installing waste water treatment facilities or using cleaner production technology.¹⁶ In the case of agreements that are not legally binding, such as the RAP, the cause-effect relationship could work in a similar way. The recommendations by the ICPR serve as guidelines for national regulations which influence the behavior of the relevant polluters. In both cases one should expect that Rhine pollution decreases *after* the conclusion of transboundary agreements. If, at the same time, we can make a plausible (counterfactual) argument that polluters would not have reduced their emissions in the absence of transboundary efforts, we can claim that international efforts had an effect on Rhine pollution.

In addition to direct effects, such as those just discussed, transboundary cooperation may have several more indirect effects. The prospect of future regulation may throw its shadow on the present behavior of polluters. If, for instance, the expected conclusion of an international agreement makes stricter regulation probable in the future, a polluter might change its behavior in advance in order to spread her investment in pollution reduction over a longer time span and gain a competitive advantage. The same effect may occur if the shadow stems not from new national and international legislation, but from the threat of costly lawsuits against polluters. In addition, as more and more companies believe that stricter regulations will be adopted, greater competition for a "greener" image may set in. In all these cases, we should expect pollution reductions even before the conclusion of transboundary agreements.

The question of time-lags underlines that the direction of causal relationships is crucial to the analysis because it provides preliminary answers as to whether transboundary cooperation has had an effect on pollution reduction. It will be noted that causal relationships between transboundary and national and actor-specific pollution reduction efforts can also work the other way around: national or actor-specific efforts can determine cooperation at the transboundary level in that states only agree to reduction measures that have already been agreed to or implemented at the domestic level. In this case, no new obligations exceeding domestic standards are created at the transboundary level and, therefore, transboundary efforts have not affected domestic efforts. The same holds for lawsuits. In the Rotterdam case, for example, some analysts have claimed that upstream chemical firms signed on to reduction targets that they knew they were going to implement irrespective of the Rotterdam case. Even

¹⁵ For a theoretical and conceptual analysis of the issues involved in analyzing the effects of international environmental institutions, see Bernauer 1995b.

¹⁶ Social science theories offer various explanations of why individuals or groups behave in compliance with norms or rules. For example, actors may comply because they fear costly punishment (sanctions). They may also comply out of a habit of obedience (see Bernauer 1995b).

in such cases, however, we may find that transboundary efforts can have other types of effects on the behavior of polluters at the domestic level, including the following.

First, transboundary cooperation may lead to changes in domestic power structures. For example, governments or, at a lower level, environmental agencies which run into implementation problems with domestic regulations on water pollution may use transboundary obligations to increase their pressure on polluters and the interests supporting them. This strategy may facilitate the implementation of agreed or planned domestic measures.

Second, the additional information generated by transboundary cooperation can foster pollution reductions in at least three ways. It can render riparian actors more willing to engage in cooperation on pollution reductions because it raises transparency. Incomplete information on the present and future preferences and behavior of the actors in a given group is widely regarded as one of the major impediments to cooperation. This applies in particular to cases where pollution reductions by one actor are contingent on reductions by another actor (see Morrow 1994). Information generated by transboundary efforts can be used by environmental lobby groups, waterworks, or political authorities to exert pressure on national governments, individual firms or other actors (shame these actors into pollution reductions). Finally, information generated through transboundary cooperation can result in new options for reducing pollution at lower cost, which in turn increases the willingness of polluters to comply with more stringent regulations.

4.2 Methodology

The analysis of whether transboundary efforts have contributed to the reduction of heavy metal pollution of the Rhine, and if so, to what extent, does not lend itself to the application of statistical methods. We therefore chose a qualitative approach. This step requires some justification because evaluation research into domestic environmental policies is often carried out with quantitative methods.¹⁷

The potential causal connections between international cooperation on the one hand and pollution reductions on the other hand are much more drawn-out and multifaceted than on a regional or geographically even more restricted (e.g. communal) level, where the direct effect of the entering into force of a new national or communal regulation may be a quite distinct event, triggering a behavioral change on the part of polluters. Even the preliminary and superficial comparison of important events, such as the entering into force of a treaty or a follow-up regulation, and the development of pollution over time (see section 3) shows that immediately obvious connections between any of them are lacking. Thus one of the conditions which would make the application of a statistical method, such as impact analysis with a Box-Tiao time series model, sensible, is not given. There are no significant breaks in the pollution data time-series which could be assigned to specific events and tested as to their non-randomness and which, in turn, would allow us to hypothesize about a causal connection.¹⁸ Even if the pollution data were abundant enough to allow for the application of statistical methods, there would be yet another problem: the variables which influence pollution in such a wide area as the Rhine catchment area are very numerous. Consequently, exogenous variables are extremely difficult to control. This implies that spurious correlations between transboundary cooperation and pollution reductions might not be recognized.

¹⁷ See, for example, Thomas Widmer, *Evaluation von Massnahmen zur Luftreinhaltepolitik in der Schweiz* (Evaluation of clean-air policy in Switzerland) (Chur and Zürich: Verlag Rüegger, 1991).

¹⁸ This may well be the case with a pollution reduction measure at the domestic or even local level: there the behavioral change may stem mainly from the entering into force of a particular law, or, more precisely, from the change in conditions brought about for the relevant actors. In such cases, therefore, statistical methods for analyzing the impact of events on time series data (Box-Tiao) may be more appropriate.

Finally, from a policy perspective, the advantage of a qualitative approach is that it allows us to trace in detail the causal chains that connect transboundary cooperation with polluter behavior. Hence the results are more likely to yield practical knowledge on when which type of effort affects polluters in which manner, or, conversely, when and why transboundary efforts fail.

The following analysis is based on a critical synthesis of the very sparse secondary literature relevant to the area of our study and, more important, interviews with a selected group of experts, including Dr. Schulte-Wülwer-Leidig (Secretariat of the ICPR, Koblenz, Germany), Dr. Michael von Berg (Federal Ministry for the Environment, Bonn, Germany), Prof. J. Wessel (Delft Technical University, Delft, Netherlands), Mr. Mark Uilhoorn (Erasmus University, Rotterdam, Netherlands), Mr. Karel Dieperink (University of Utrecht, Utrecht, Netherlands), Dr. Walter Jülich (IAWR, Amsterdam, Netherlands), and Mr. Edwin Müller (Department for the Environment, Bern, Switzerland). In compliance with a request made by most of our interview partners, we do not attribute particular pieces of information to individuals.

5. The Effects of Transboundary Cooperation

This section presents the results of our analysis in three steps. First, it examines the causal pathways by which transboundary cooperation has affected the perceptions and ultimately the behavior of the actors relevant to the cleanup of the Rhine. Second, it complements the preceding, process-oriented analysis by looking at the actors involved in efforts to curb Rhine pollution. Third, we identify a number of background conditions present in the Rhine case, which have influenced the decline of pollution in general. This last step is necessary if we wish to draw any lessons from the Rhine case that might, for instance, be applicable to the Black-Triangle region.

In our research, we found that transboundary efforts contributed to the cleanup of the Rhine by:

- increasing information about the pollution of the river and the technical and political means to deal with the problem; and by
- strengthening government agencies involved in the implementation of environmental legislation in their national context against the rest of the government structure and the polluting firms.

To a lesser extent, transboundary efforts may also have fostered pollution reductions by:

- being anticipated in their effects by polluters; and
- initiating the implementation of internationally agreed and directly applicable environmental legislation.

5.1 Information

In the Rhine case, a very important, if not the most important effect of transboundary cooperation was that institutionalized exchanges of information among national government agencies involved in implementing environmental standards enhanced their problem-solving capacity by increasing their knowledge. The Rhine *regime*, defined as the totality of the international agreements and organizations, thus acted as a learning facilitator. At present, the governmental authorities responsible for the implementation of environmental legislation in the riparian states form a close-knit community. This community shares a coherent view regarding not only the extent and origins of Rhine pollution, but also about the available technological means to deal with problems as they occur.

This community did not spring into life immediately; its evolution was on the contrary a lengthy process. It began in the mid-1950s, when the first annual pollution data, covering

only a few parameters, were published by the ICPR. These data were collected by national measurement stations. During the 1960s, information exchanges were restricted to annual pollution figures collected at the principal national measurement stations along the Rhine. This approach may have raised the general awareness of Rhine pollution problems. But it does not seem to have significantly influenced the behavior of national water agencies, which at that time were weak. It should be noted that during this early period the ICPR was not dominated, as it is today, by technocrats but largely by diplomats. Contacts intensified after the first 1973 meeting of the Rhine riparians' environmental ministers, which asked the ICPR to negotiate a convention on chemical pollution.

The 1976 chemical convention added an important layer of institutionalized information flows. This development led to the further enhancement and unification of measurement programs.¹⁹ It also institutionalized international discussions about threshold values for particular polluting substances. Therefore, even though the results of this development in terms of legally binding agreements were rather poor, these information exchanges facilitated discussions on sensible threshold values for polluting substances and the technical possibilities of dealing with the problems at hand. In the framework of the 1986 Rhine Action Programme, the riparian states must supply information on the pollution of the Rhine, including data on individual firms and their emissions. They must also indicate for individual substances the reductions which are possible applying the best available technology (BAT). Beforehand, such detailed information was not available to many of the national authorities. The requirement to furnish this information to the ICPR and the other parties thus made it necessary for at least some riparians to allocate more resources to the collection and processing of such information.²⁰

This increase in transboundary information flows has resulted in a homogenization of perceptions of Rhine pollution problems, and, perhaps equally important, common views about the available technical means to solve these problems. The various treaty provisions concerning information gathering and exchange thus had the important effect of binding together national authorities directly involved in Rhine pollution issues. They helped to create a closely connected community of low- to mid-level government officials and scientists. This group has met largely in the working groups of the ICPR to exchange information about new forms of pollution, polluters, sudden increases in pollution due to accidents, measurement methods, pollution abatement technologies, and so on. As a result, it seems that new information and knowledge has spread virtually as quickly across as within national boundaries. Moreover, this development appears to have strengthened national government agencies dealing with Rhine pollution vis-à-vis coalitions representing the interests of polluting actors, for example, industry associations, or industry and transportation ministries.

Information networks, such as the one just discussed, have also developed at the non-governmental level. The water purification plants in the Rhine catchment area are under the obligation to secure certain water quality standards. Not surprisingly, therefore, they have been very much interested in the quality of the Rhine water they use and measure the latter regularly. This information is cleared through a non-governmental organization, the International Association of Waterworks in the Rhine Basin (IAWR).²¹ It serves to identify

¹⁹ Bonn Convention, Art. 8-13.

²⁰ The fact alone that these measurements (and the improvement of measurement programs in general) have existed seems to have affected the behavior of polluters in a favorable manner. As they could no longer assume that the origin of a particular polluting substance would be unknown to the authorities, they had a strong incentive to curb their immissions.

²¹ Due to the larger number of measurement stations, the information produced by this non-governmental network is geographically more fine-grained than the information coming from the official measurement stations; it thus seems to allow a quite exact identification of polluters.

polluters and exert pressure on them as well as national legislators or, as it seems to be increasingly the case, the European Commission in Brussels.

5.2 Strengthening of Environmental Government Agencies

As shown above, there exists plausible evidence that the Rhine regime has strengthened environmental agencies by facilitating the transboundary flow of information. International obligations concerning national measurement programs and requirements (for example in the RAP) seem in some cases to have been instrumental in mobilizing additional resources for the reporting agencies. In addition, the regime seems to have acted as an "agent of internal realignments" (Levy/Young/Osherenko 1991) in other ways as well. Environmental agencies have been able to use international commitments made by their governments as arguments in support of their (often costly) goals vis-à-vis other branches of the bureaucracy in intra-governmental bargaining processes about resources and policy goals and probably also the polluters themselves.

One of the most interesting examples of an environmental agency which used the existence of an international commitment to enhance its own standing domestically is the "Agence de l'eau Rhin-Meuse," situated in Metz. The French water management authorities (agences de l'eau), which are organised by catchment area, are designed to act as financial intermediaries between polluters and consumers of water. They subsidize, but cannot initiate, water improvement projects through fees levied from polluters. In this particular case, the agence de l'eau in Metz seems to have tripled the emission levies in its domain by referring to the commitment which the French Government had entered into in the context of the RAP. Besides improving water quality, the increased levies also made the agence grow. It seems to serve as a model which other French water agencies seem keen to emulate. It is a telling detail that the director of the agence de l'eau Rhin-Meuse is now head of department in the environmental ministry in Paris.

5.3 Anticipation of Regulation by Polluters

So far we have discussed causal chains by which the Rhine regime has influenced pollution by changing the perceptions and means available to national authorities. Besides these more indirect effects, it appears that transboundary efforts have exerted more direct positive effects on the behavior of polluting industries. In particular the establishment of new programs for measuring pollution of the Rhine, the commitment to pollution thresholds in the chemical convention, and the ensuing discussions about them in the 1970s and 1980s have cast a shadow ahead. These developments were interpreted by those actors potentially affected as a sign of further tightening of environmental regulation in the future. Hence these actors reacted by reducing their pollution in advance of anticipated legally binding laws by installing waste treatment plants or transferring especially polluting activities out of the Rhine catchment area. The same logic applies to the mandatory national registers of important polluters and discussions about international BAT standards after the adoption of the RAP. The intense interest with which the big chemical firms located along the Rhine have observed developments in the framework of the ICPR makes this claim at least plausible. It would also account for the fact that heavy metal loads in the Rhine started to decrease before international agreements entered into effect.

It is, however, difficult to isolate the exact role of the Rhine regime in this respect. Even if one concedes that polluters anticipate future legislation (we will discuss this point further below), it may be difficult to determine what these polluters actually reacted to: was it developments in the ICPR, national measures, measures by the EU, and to what extent does each of these potential driving forces account for changes in the behavior of polluters? Because the trend towards stricter environmental regulation seems to be a universal and

largely parallel phenomenon at all levels, it is very difficult to sort out individual effects. An additional problem is that the importance of individual factors may vary over time and across countries. However, the history of environmental protection efforts by the Rhine riparians suggests the following.

In the 1970s, the focus of attention was mainly national. This applies in particular to firms located in countries which initiated comprehensive environmental protection programs during this period as a consequence of expanding domestic green movements, especially in the Netherlands, Germany and Switzerland. This situation has changed somewhat in the 1980s when tangible discussions about pollution thresholds started in the context of the chemical convention, and when the European Community became increasingly involved in environmental protection. In recent years notably the European Commission seems to have gained in importance. One of the indications is the fact that not only international industrial associations but even big national associations, such as the association of German water treatment plants, are represented in Brussels. Their aims are to obtain information about the substance of future EU directives and also to influence the contents of such directives as far as possible.

5.4 Direct Impacts of Transboundary Measures

This section evaluates possible direct effects of the two major international agreements on Rhine pollution, the 1976 chemical convention with its follow-up agreements on specific substances/industries and the 1987 Rhine Action Program. We treat these two agreements separately because, as noted above, they are based on different approaches.

The Chemical Convention

Most experts agree that the implementation of the Bonn Convention has been disappointing, even in a strictly legal sense, let alone the actual effect on pollution loads. The ICPR prepared 9 recommendations (IKSR 1981, Kiss 628),²² some of which deal with heavy metals. But in the end only two of these proposals were adopted by the riparian countries: thresholds for mercury in the waste water of the chlor-alkali electrolysis industry (adopted in 1982) and, for a slightly wider range of industries, thresholds for cadmium concentrations (1986) (Goppel 1991).²³ These measures coincide with the European Community's implementation directives mentioned above, particularly as regards the substances and sources covered by the 1976 directive "on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment" (76/464/EEC). This parallel development is due to the fact that especially Germany made progress in the Rhine catchment area conditional on agreement in the wider context of the EU (see below).

Another sign for the ineffectiveness of the chemical convention is that by the time the follow-up agreements on pollution thresholds for particular industries had entered into force, they were to a large extent already obsolete. They had been anticipated by independently started programs by national regulatory authorities and possibly the polluters themselves. The approach of the chemical convention was obviously not well adapted to the fast-changing circumstances prevalent in Rhine environmental matters. Notably, it established a procedure much too cumbersome and inflexible to keep pace with the decrease of pollution for reasons unrelated to the international effort and the development of new technologies.

Hence there are enough reasons to argue that the chemical convention did not generate any important new obligations, neither for national authorities nor polluters. The legalistic make-up of the convention probably reflects an earlier stage of international environmental

²² According to the ICPR annual reports, the ICPR prepared threshold values for 12 substances, whereas only two were adopted.

²³ For details, see ICPR Tätigkeitsbericht 1985 and following.

cooperation, at least in Western Europe.²⁴ In the 1970s when environmental protection was just beginning to move up on political agendas, the Rhine riparian governments tried to keep the decision-making power on Rhine pollution issues at a political level, so as to keep control even about minute technical matters and avoid any costly overcommitment. The greening of politics, the parallel growth of environmental authorities (in terms of their resources and bureaucratic power) and the ensuing pressure on polluters led to rapid improvements in environmental protection technology and cleaner processes: all of this created a new situation in which the approach of the chemical convention became virtually useless because its results tended to come too late.

In summary, the ineffectiveness of the Bonn Convention largely stems from its design - in particular its cumbersome procedures for negotiating and implementing concrete pollution reduction measures - paired with fast developments in pollution reduction at the national level, which at that time were easily achievable. Whether the riparian governments would have been able in the 1970s and 80s to conclude and implement a more effective approach, and which one, remains an open question. In any event, however, Rhine pollution by heavy metals and other substances decreased throughout the 1980s, but was driven by forces other than the Bonn Convention. International measures in the context of the Bonn Convention were, it seems, always several steps behind the evolution of pollution and never really got a chance to significantly shape pollution reductions. This ineffectiveness of the convention has not escaped the riparian countries. By the end of the 1980s, the ICPR had clearly reduced its efforts to implement the agreement. And in 1992 the implementation of the convention seems to have been quietly dropped altogether (IKSR 1992).²⁵

The Rhine Action Programme

The evaluation of the RAP is somewhat more complicated than that of the chemical convention because in the case of the RAP it becomes more difficult to apply the straightforward top-down model of legislation (international rules are first established and then implemented domestically). Negotiations in ICPR working groups between the representatives of national environmental authorities and negotiations at the national level between polluters and national authorities have proceeded in a parallel and highly interactive fashion. This circumstance stems from the fact that environmental authorities in most riparian states have in recent years emerged as relatively powerful branches of government. It also stems from the less formal/diplomatic and more technical approach to dealing with problems in the framework of the ICPR, which has evolved over time (see above). Finally, the lack of pressure originating from the need for ratification, which would involve higher political levels of government, has also contributed to more flexible and informal forms of cooperation between actors at various levels.

The resulting BAT recommendations therefore have less the character of internationally enacted "laws" to be fed subsequently into a national implementation process, but are rather some kind of consensual statements of intention of all the parties concerned, including the dischargers themselves. The latter are usually few in number for each given industry targeted by a particular BAT recommendation. In the paper and cellulose industry, which was one of the first to be targeted, only about six dischargers were actually involved.

It is clearly the case that the RAP was effective in several respects. First, it intensified the flow of information. Second, by setting reduction targets within strict time-frames and

²⁴ It will be noted that at the global level the combination of framework conventions with follow-up protocols is still very popular (see, for example, the case of climate change).

²⁵ In a last-ditch effort, the ICPR decided in 1990 that the formal ratification of its recommendations was to be replaced by an accelerated procedure, at least for recommendations that were modelled on EC regulations (IKSR Tätigkeitsbericht 1991:31); but this does not seem to have resulted in tangible progress.

elaborating BAT recommendations it created clear points of reference for all the parties. Third, the lack of treaty status accelerated agreement on the RAP in the first place, and made it possible to get quick results in terms of BAT recommendations. The time gained in preparing these soft recommendations probably outweighed the protraction in their implementation due to their not legally binding nature. That, according to the Communiqué of the 11th Rhine Ministers Conference, the goals set, particularly in the heavy metals domain, were not fully reached, has probably much to do with their strictness, and also with the fact, that it becomes increasingly difficult and costly to bring about even small additional pollution reductions (increasing marginal abatement costs).

The Rotterdam Agreements

The agreements between the Rotterdam municipality and various chemical firms along the Rhine have been lauded by some analysts - especially and understandably in the legal community - as a new and potentially more effective approach to reducing pollution of the Rhine than the intergovernmental approach within the framework created by the ICPR. The information we obtained through interviews suggests, however, that the effect of the Rotterdam effort on Rhine pollution may have been rather small.

The reduction targets in these agreements did not exceed in a substantial way the commitments already pledged to national authorities in the framework of the RAP. The argument that the Rotterdam agreements added the extra fear of lawsuits against polluters if agreed goals were not met, and therefore changed the polluters' behavior, should be taken with a grain of salt. One needs to bear in mind that legal battles of this kind are usually extremely costly for both sides while the outcome is by no means clear. Lawsuits in the context of chloride pollution of the Rhine have shown that it is extremely difficult to quantify pollution damages and attribute this damage to the immissions of particular firms. Indeed, only in one single case have lawsuits resulted in a clear court verdict and ultimately compensation payments (see Bernauer 1995a). This problem reduces the effectiveness of the threat of legal action, and therefore also the effect of the threat on the behavior of polluters (if we assume that polluters know what we have just said!). This leaves the possibility, however, that the behavior-altering fear of the polluters can originate not primarily in the prospective damages that might have to be paid to Rotterdam, but rather in the potentially negative effect on the image of industries in the case of a highly publicised lawsuit.

5.5 Actors

Whereas the analysis has so far focused mainly on processes and the various transboundary agreements involved, this section concentrates on actors, including governments and environmental authorities, non-governmental organizations such as industries and waterworks, the municipality of Rotterdam, and finally the European Union. We examine whether, and if so why and how particular actors have been able to influence the behavior of polluters, and therefore also the evolution of Rhine pollution by heavy metals.

Governments and Environmental Authorities

The analysis of causal pathways has shown that the effects of cooperation cannot be explained merely in terms of unitary state actors, that is, governments as entities. If cooperation influences polluter behavior, it does so because lower, more technically oriented layers of government such as water authorities are able to advance their own interests by employing international commitments, such as the Chemical Convention, the RAP, or institutions like the ICPR. The involvement of governments as such is neither a sufficient nor a necessary condition for the effectiveness of the transboundary efforts we examined. The role of governments is rather to create institutions in the first place, and to establish commitments as to the goals to be attained. The Rhine environmental ministers' conferences, especially the

three conferences held after the Sandoz incident, have clearly served this purpose. Whether these commitments can trigger a process which leads to changes in the behavior of polluters is highly dependent upon other circumstances, especially the agility of lower levels of government.

The important, perhaps even decisive stage of the process is entered after international commitments have been established. The problems encountered in implementing the Bonn Convention indicate that the institutionalized inclusion of higher levels of government (mainly in terms of the need for ratification of follow-up agreements) may be counter-productive (at least under conditions in Western Europe; we will come back to this point). Moreover, if governments as such have become active, they have usually done so largely in order to placate public outrage after some spectacular incident such as the Endosulfan accident in the late 1960s or, more recently, the Sandoz incident of 1986 - the latter led to three Rhine ministers conferences within one year.

One of the key results of our analysis is that environmental authorities in the riparian countries have probably been the most important catalysts as regards the domestic impact of transboundary cooperation. For these actors, international agreements have not constituted obligations to be shunned wherever possible, but on the contrary an opportunity to strengthen their own role in various ways. They have managed to enhance their domestic position by increasing their knowledge base through information exchanges in the ICPR, and by using international commitments as an instrument to enhance their domestic bargaining position.

However, the importance of transboundary cooperation in this respect should not be overestimated. Sufficiently independent and resourceful administrative structures at the domestic level, which are capable to use international cooperation to their own advantage, must probably exist in the first place. International cooperation may enhance their position, but cannot create them. The most important variable determining their strength is probably the degree of environmental consciousness among the domestic population. In the end it is this consciousness which creates the political pressure that forces governments to react by enacting environmental laws and establishing the bureaucratic structures to implement and enforce them.

Non-governmental Actors

In this section, we discuss the role of two types of non-governmental actors that have had a particularly important influence on efforts to curb Rhine pollution: industry and waterworks. One of the more striking results of our research is that many of the larger sources of Rhine pollution, and particularly the big chemical companies such as Sandoz and Roche in Basel, or Hoechst, Bayer and BASF in Germany are no longer passive and reluctant targets of environmental regulations. To the contrary, it appears that they have increasingly cut back on their immissions in anticipation of future regulation and have sought to influence regulatory processes well before any legislation has been passed.

A telling sign of this development is the fact that in 1992 the German chemical firm Bayer received the so-called WRK-Rhine-Prize by the IAWR for its exemplary efforts in the field of waste-water treatment (IAWR 1995: 99). This distinction had hitherto been awarded to scientists or civil servants engaged in environmental protection. This development probably implies that the difficulty of implementing regulations on Rhine pollution has, at least for the larger point sources, eased considerably: the atmosphere among the key actors relevant to Rhine pollution seems to be one of reluctant cooperation rather than one of insuperable antagonism.

This (modestly) cooperative attitude of important parts of industry along the Rhine seems to contradict the traditional picture of the company as a single-minded profit maximizer: measures to prevent pollution from reaching the environment are usually costly, so one would expect them to be taken at the last possible moment, just before the cost of

sanctions surmounts the cost of installing, say, a pollution treatment facility. The inconsistency of observed behavior of industry with this model can be explained as follows.

First, the big companies do not operate in a societal vacuum: with the possible exception of France, the population of all Rhine riparian countries has since the beginning of the 1970s grown increasingly conscious of environmental matters. This development has created a public opinion climate in which being ostracised as a polluter can impose very heavy costs on industry, as the chemical firm Sandoz had to learn after the fire in Schweizerhalle in 1986. The reverse side is that a green image can be an important asset for public relations. Considerable investments of chemical and other companies in the projection of a green image through advertisements and other public relations instruments testifies to this point.

These developments are also reflected in organizational changes within firms. Beginning in the 1960s the latter began to establish non-production related departments for pollution abatement in order to cope with increasing environmental regulatory activity at all political levels. These departments have grown in importance over time and have often been staffed by environmental scientists who have the same educational background as their "opponents" in state or international bureaucracies. The fact that these people have been part of the same scientific community and have thus often shared a common outlook and values on Rhine pollution issues has probably facilitated cooperation.

The waterworks along the Rhine, the second type of non-governmental actors to be discussed here, have been organized in the International Association of Waterworks in the Rhine Basin (IAWR). IAWR, whose secretariat is located in Amsterdam, is an umbrella association whose members are associations of waterworks in the Netherlands (RIWA), Germany (AWR, AWBR), Switzerland, and France. It represents 113 waterworks in the Rhine catchment area. The waterworks can be regarded as a particular type of industry, one that operates under quite special conditions which, in turn, create unique incentives. These waterworks have been under pressure from strict legislation defining thresholds for polluting substances in their output. This legislation has been increasingly enacted at the EU level.²⁶ In addition, the waterworks have also been under pressure by their customers, and private households in particular, which are very sensitive to the quality of drinking water: we were told that a request for a glass of plain water in a Cologne Restaurant meets with incredulous stupefaction.

Because the room of manoeuvre for the improvement of technology for drinking-water production is, for technical and cost reasons, rather small and the directors of waterworks are personally responsible for the quality of their output, the waterworks have a very strong incentive to improve the quality of their water *input*. At least in certain locations where their water input stems directly from the Rhine or wells in the immediate vicinity, notably in Germany and the Netherlands, the waterworks are strongly affected by the extent of Rhine pollution, and therefore by immissions upstream. Not surprisingly, therefore, the waterworks have organised themselves internationally early in the 1970s (IAWR 1995: 97) and engaged in lobbying efforts at various political levels. They also sought to identify the sources of particularly harmful substances and put pressure on them to stop their immissions. They have done so through direct negotiations with the firms concerned. For the reasons mentioned above, many of these negotiations have been successful, even if they were not highly publicised.

The Municipality of Rotterdam

The Municipality of Rotterdam is, as we outlined above, in a very similar situation as the waterworks as far as its interests are concerned. It differs, however, in the approach it has

²⁶ See, for example, the EC drinking water directive of 1980.

used to put pressure on the polluters. Instead of the rather low-key approach of the IAWR it has led a highly publicized campaign in a style somewhat resembling that of some environmental NGOs, such as Greenpeace. In addition it has relied quite heavily on legal means of threat and coercion. Whether this approach has been more effective than the approach used by IAWR for example, is difficult to pin down.

The differences in the approach between Rotterdam and IAWR can probably be explained by the fact that the Rotterdam municipality, as a political body responsible to its own population/voters, experienced a greater need than IAWR to engage in more tangible efforts to demonstrate to its constituency that it was active in trying to avert the costly building of another slufter. One should also consider that, at the time the Rotterdam project was initiated, it was by no means clear what we know now, that considerable pollution reductions were lying ahead.

The European Union

The influence of the European Union as an actor involved in the clean-up of the Rhine is difficult to gauge. Moreover, its role seems to have changed during the period in question. In the 1970s, EU environmental policy was hampered by substantial differences among member states about the approach to be used: the immission approach was favoured by Britain, for example; the emission approach was favored by Germany and the other Rhine riparians (Grijns/Mostert 1992: 28). Member states also held different positions as to the standards to be applied. There are indications that the introduction of the EU as an additional contracting party to the ICPR and the chemical pollution convention slowed down the implementation process. The principal reason was that some countries (mainly Germany) made the conclusion of follow-up treaties to the emission oriented chemical convention conditional on the adoption of equivalent directives within the wider framework of the EU. But steps in this direction were blocked by Great Britain until 1983.

The fact that the 1976 EC-directive on "Pollution caused by Certain Dangerous Substances Discharged into the Aquatic Environment" (76/464/EEC) was mirrored by the Bonn convention on chemical pollution therefore seems to have been rather unhelpful. The drinking water directive (80/778/EEC) of 1980, the other major piece of relevant EC legislation, has no counterpiece within the cooperative framework of the Rhine riparians. Its impact is therefore, at least theoretically, easier to assess. It is generally acknowledged that the threshold values set by this directive are very strict (even water treatment plants in highly developed countries such as Germany were at first unable to fulfil them). This led to implementation difficulties.

Unlike regulations, directives address not individuals but member states. As a result, they need to be transformed into national regulations by the member states to become binding upon individuals and corporate actors. It seems that member states implemented them with varying degrees of success.²⁷ Because the drinking water directive regulates water quality at the very end of the pipe, its influence on polluter behavior and pollution of the Rhine is necessarily indirect. The existence of this directive has, however, served as an argument for the waterworks (which are directly concerned) in their lobbying activities vis-à-vis polluters and governments.

This rather ambiguous picture notwithstanding, the fact that a growing number of relevant international interest groups (for example, chemical and pesticide industry associations) and even national interest groups (e.g. the German association of waterworks)

²⁷ The unsatisfactory implementation of EC environmental legislation seems to be a widespread problem, at least if one uses the large number of legal cases against member states as an indicator (Oppermann 1991:750; Vogel 1993: 190; Grijns/Mostert 1992:29).

are present in Brussels seems to indicate that Brussels has become increasingly important as a focus of environmental regulatory activity in the Rhine basin.

5. Background Variables

The analysis of causal pathways and the actors involved in curbing pollution of the Rhine provides us with a relatively comprehensive picture as to the role transboundary efforts have played in bringing about reductions in heavy metal pollution. To complete the analysis, and to be able to draw some more general conclusions that may be applicable to other cases, such as the Black-Triangle, we have to come back to some background variables that were so far referred to only in passing. In line with a distinction used by many social science theories²⁸, we distinguish between *ideas*, an indicator of which is environmental consciousness, and *structures*, for which we will discuss several variables

Environmental Awareness

The rising degree of environmental awareness in the population of all Rhine riparian states during the 1970s and 80s, which is indicated by the growth of green NGOs and political parties, was probably the most important driving force behind the spectacular cleanup of the Rhine in general, and the international component we are interested in here in particular. It would go beyond the scope of this paper to explain this development and its precise effects on efforts to curb pollution of the Rhine. However, this section touches on a few aspects in which rising environmental awareness among constituencies may have spurred pollution reductions.

First, growing environmental awareness forced (vote maximizing, we assume) governments to do something about Rhine pollution; to enact national laws for the protection of the environment. These separate but parallel national efforts to clean the rivers in the Rhine catchment area are certainly the main contributor to pollution reduction in the Rhine as a whole.

Second, to cope with the implementation of this legislation, national environmental authorities had to be created or strengthened. For the reasons discussed above, the existence of entrenched and resourceful environmental agencies is probably an important precondition for making international cooperation fruitful and effective - as well as facilitating the implementation of national law. While international cooperation, as we have argued above, may have strengthened these agencies' back, they already needed to have a strong back in the first place.

Third, public outrage or concern, especially about spectacular incidents of a boundary transcending character such as the Sandoz spill is conditional on pre-existing environmental awareness. Such incidents have thus been important triggers for international agreements and declarations by governments. These declarations and agreements have then served as starting points for the processes analyzed above.

Fourth, environmental awareness among populations has changed the conditions under which polluting firms operate (see above). Polluter behavior tends to be strongly penalized by the public at large, while the projection of a green image is an important asset. Especially the big chemical firms are under close scrutiny by environmental NGO's and the press; larger-scale discharges (be it on a regular basis or due to an accident) rarely go unmonitored and uncommented.

²⁸ See, for example, Gill, Stephen/Law, David (1988), *The Global Political Economy: Perspectives, Problems and Policies*, London: Harvester, Wheatsheaf.

Similarity of Structural Conditions

The second group of background variables, which needs to be controlled, pertains to structural conditions. All Rhine riparian countries are Western European democracies at a high level of socio-economic development. The industries causing chemical pollution are more or less evenly distributed among these countries, and their environmental standards at the outset of transboundary pollution reduction efforts were about the same. This circumstance has facilitated cooperation and made the latter - perhaps paradoxically - less urgent, because neither the costs nor the benefits of pollution abatement measures would accumulate asymmetrically across the riparian countries. There is, in other words, no clear-cut distinction between those who suffer from pollution and those who cause it: all riparian countries are to a certain extent both victims and polluters.²⁹

If, for instance, Germany takes measures to improve the water quality of the Rhine or its catchment area (covering a substantial part of the country), this is seen by its environmentally conscious population as being to its own advantage, as well as having the side-effect of benefiting the Netherlands downstream. While no water is taken directly from the Rhine for drinking water purposes in Germany, water from adjacent wells is used, whose quality depends critically on Rhine water quality.³⁰ The same is true for Switzerland, where many of the lakes in the Rhine catchment area are used for drinking water production.

An additional problem, which prevents states from turning an international river into a gutter with the goal of minimizing the country's costs of pollution reductions is the following: a country would have to treat dischargers on its territory differently. Those at or near the point where the river crosses the border (e.g. Basel in Switzerland) would be allowed to discharge without limit while those in more sensitive regions inland would have to pay for treatment facilities. In a state where information flows freely, and where the principle of equality before the law is generally accepted, such a solution would meet strong opposition from those who are by their geographical location under the obligation to reduce their emissions and to bear the costs.

Another structural condition which facilitated the cleanup of the Rhine were the high growth rates prevalent particularly in the chemical industry along the Rhine during the 1970 and 80s. High profits certainly made the installation of often costly waste water treatment facilities and other pollution reduction measures easier.

Taken together, these background variables created a favorable environment for cleaning up the Rhine: one could imagine this clean-up happening even without transboundary cooperation, although it would probably have happened somewhat slower given the effects that transboundary cooperation had on pollution reduction efforts (see section 5).

6. Conclusion

Pollution of the river Rhine by heavy metals has declined substantially since the 1970s. At the same time, we can observe an extensive web of transboundary political and legal activity designed to reduce such pollution. In this paper we have made an attempt at analyzing whether, and if so how these two developments are causally related. In other words, did the observed transboundary efforts contribute to curbing pollution of the Rhine, and if so to what extent and how?

²⁹ The example of the chloride pollution by the mines de potasse d'Alsace shows that this may indeed be an important factor; in that case the costs of reducing pollution accumulated mainly in France, while the Netherlands benefited from it. The tortuous history of the international efforts to solve this particular problem indicates that similarity in this respect matters (Bernauer 1995a).

³⁰ See Bundesministerium für Umwelt Naturschutz und Reaktorsicherheit 1995: 7.

The analysis in this paper does not produce a simple answer. Causal chains leading from transboundary efforts to the behavior of polluters and ultimately to river pollution itself are long and multifaceted. As a result, statistical analysis, often used for the analysis of impacts of domestic policy measures, is of little use. The transboundary efforts whose impact we examined qualitatively include international negotiations and agreements aimed exclusively at reducing pollution of the Rhine, negotiations and agreements between non-state or para-state actors, and legislative activity by the European Community/Union.

Our analysis shows that transboundary efforts have influenced polluter behavior in four different ways. First, these efforts have intensified the exchange of information at various levels (inter-governmental, transnational, EC/EU). This exchange ultimately created a tightly knit community of people with a consensual knowledge on the causes of pollution and methods to deal with the problem. Second, transboundary efforts were used by domestic environmental agencies to strengthen their position with regard to other government agencies and the polluting actors. Third, the extensive transboundary political and legal activity with regard to Rhine pollution led polluters to reduce their emissions in anticipation of future regulation (domestic and transboundary). Fourth, the legally binding output of transboundary efforts contributed to changing the behavior of polluters. Our analysis suggests that the first and second type of effect were probably more pronounced than the other two.

In drawing any general conclusions from this analysis, we have to keep in mind two groups of background conditions: first, environmental awareness in all riparian countries of the Rhine has been relatively high, at least since the 1980s; second, all Rhine riparian countries are at a high level of socio-economic development. We think, however, that the following lessons might well be useful to efforts to clean up other international rivers:

- One should not expect that the traditional approach to international environmental politics - international treaties and protocols, translation of these agreements into domestic law, implementation of these laws - will necessarily work better than "softer" approaches, such as action programs or transnational policy efforts. This applies in particular to relatively homogeneous and environmentally advanced countries in which a stable legal and administrative framework already exists.
- Liability rules may contribute towards pollution reductions, but they are no panacea. Because of difficulties involved in identifying sources of pollution, estimating damages, and attributing particular portions of the damage to individual polluters are enormous, the effect of threats of legal action on polluters often tends to be small. A different case may be pollution originating from accidents (such as the Sandoz accident), where the source of pollution is easily identified, and damages are usually quite straightforward. Furthermore, public pressure on the firm to reach a face-saving settlement is usually higher in these cases.
- International and transnational negotiations can contribute to learning processes in which decision-makers develop common perceptions and approaches to dealing with river pollution problems.
- International or transnational commitments can strengthen domestic government agencies favorably disposed towards pollution reductions. They cannot create such agencies, but can enhance their position vis-à-vis government agencies or sources of pollution less favorably disposed towards cleaning up the river.
- A further lesson to be learned from the Rhine case is that background conditions which are largely outside of the scope of international cooperation are highly important, and even crucial as they shape the contents and the forms of international cooperation and its effectiveness much more than the reverse.

7. References

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ANNEX:

Source: Stigliani et al. 1993, 790.

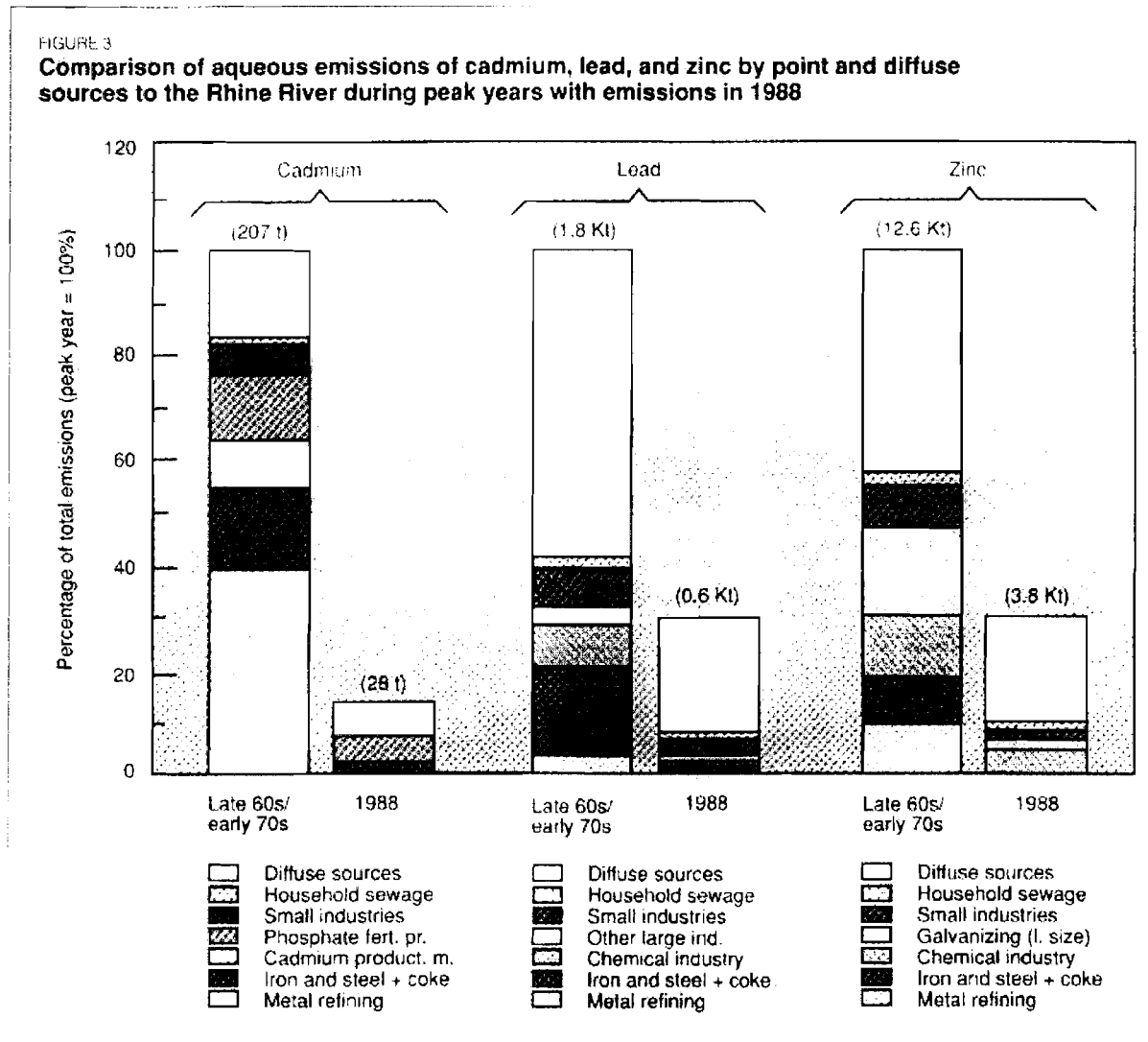


FIGURE 2