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RESEARCH ARTICLE

# The remarkable restoration of the Rhine: plural rationalities in regional water politics

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## ABSTRACT

The restoration of the Rhine basin is widely viewed as an exemplary case of international water protection. The river's clean-up has been characterized by a number of puzzling developments. These include chemical companies reducing their toxic effluents by more than legally required, and riparian governments quarrelling internationally over environmental measures that each of them were undertaking domestically. It is argued that the plural rationality (or cultural) theory pioneered by Dame Mary Douglas offers an empirically valid explanation of these remarkable processes.

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## Introduction

During the last 50 years, the Rhine watershed has been transformed from the “open sewer of Europe” (as the river was commonly known in the early 1970s) to “the cleanest river in Europe” (as *Le Monde* proclaimed on 17 October 1996). During this time, the release of chemical pollutants and heavy metals by corporations and municipalities into the watershed has been greatly reduced (Villamayor-Tomas, Fleischman, Perez Ibarra, Thiel, & van Laerhoven, 2014), the dumping of salt into the river has been largely discontinued (Dieperink, 2011), flood protection systems have been improved (International Commission for the Protection of the Rhine [ICPR], 2012), a comprehensive warning system against accidental spills has been put in place (Frijters & Leentvaar, 2003), the runoff of nitrogen and other harmful substances from agricultural sources has been somewhat diminished (Farmer & Braun, 2002), monitoring of the Rhine's water quality has been improved (ICPR, 2007), passageways for migratory fish have been built (Bölscher, van Slobbe, van Vliet, & Werners, 2013), and ecosystems have partly been restored (Schmitt et al., 2012). As a result, oxygen levels in the waters of the Rhine have rebounded to healthy levels, while many species of fish (including salmon) and other animals have begun to return to the river (Molls & Nemitz, 2006). Today, the governance of the Rhine is routinely held up as an example for other watersheds around the globe (Chase, 2011; da Silveira & Richard, 2013; Myint, 2005).

None of these successes has been a foregone conclusion. In the Rhine basin, massive interests and values clash, and diverse countries are involved (Uehlinger, Wantzen, Leuven, & Arndt, 2009). The Rhine begins in the Swiss and Austrian Alps, where a

number of small brooks flow together in the Bodensee. From this lake, the waters of the Rhine start their 1250 km trip through Switzerland, France, Germany and the Netherlands, where the river drains into the North Sea. Other countries included in the Rhine catchment area are Belgium, Luxembourg, Liechtenstein, Austria and Italy, which are connected to the river by tributaries. In 1992, the Rhine–Main–Danube Canal was completed, linking the North Sea with the Black Sea. For centuries, transport of bulk goods over the Rhine has been of paramount importance to the economies of Western Europe. About 50% of all inland navigation within the European Community currently takes place on the Rhine, with about 311 million tonnes of goods and 700 ships crossing the border between the Netherlands and Germany each day. The watershed hosts some of the largest chemical companies in the world, including Hoechst, Bayer, BASF, Novartis and Shell Chemicals. Today, the river receives the wastewater of about 58 million people and a multitude of chemical and other companies, as well as agricultural sources. The basin is also dotted with more than 2000 hydroelectric, and 10 nuclear, power plants. In addition, it is used as a source of drinking water for over 25 million people.

As the governance of the Rhine watershed has often been touted as a model for other transboundary water basins, it is vital that valid theoretical conclusions and policy implications are derived from the case. This is a conceptual challenge, as the Rhine's restoration has involved processes that appear surprising from the viewpoint of standard theories of international environmental cooperation. Below, I first describe how the remarkable restoration of the Rhine has come about. Thereafter, I assert that to explain the puzzles that characterize the river's clean-up, it is necessary to look beyond the standard, interest-based frameworks that abound in environmental studies. Specifically, I argue that the plural rationality theory pioneered by anthropologist Dame Mary Douglas offers a convincing explanation of the remarkable restoration of the Rhine. This approach posits that resilient environmental governance depends on the creative interplay between adherents of a limited set of alternative ways of defining and resolving the issues at hand. If decision makers facilitate, and make use of, the interplay between these opposing viewpoints, then widely acceptable and sustainable solutions to environmental issues can emerge. In contrast, if decision makers insist on addressing the issues in a more monolithic manner, then policy failure will ensue. After setting out Douglas's approach, I show that these hypotheses explain the paradoxical restoration of the Rhine. Finally, on the basis of plural rationality theory, I conclude by suggesting that policy makers in the Rhine catchment area appear to have drawn the wrong lessons from the river's restoration, putting at risk the continued improvement of the water basin.

## **The restoration of the Rhine**

International cooperation on the protection of the Rhine started in 1946, when the Dutch government raised the issue with the governments of the other riparian states. Four years later, Switzerland, France, Germany, Luxembourg and the Netherlands formed the International Commission for the Protection of the Rhine against Pollution (ICPR), which acquired official status in 1963. Ever since, it has been tasked to: (1) report on the state of the Rhine's environment; (2) propose and coordinate

policy solutions to the river's ecological problems; (3) organize regular international consultations; and (4) monitor and implement any intergovernmental agreements that have been reached. The European Economic Community (now the European Union) joined the commission in 1976. The efforts to restore the Rhine basin, coordinated by the ICPR, can be usefully separated into three distinct phases.

### ***1963–1986: intergovernmental strife and effective domestic policies***

The efforts to stop the environmental degradation of the Rhine between 1963 and 1986 were paradoxical. The attempts to do so with the help of international agreements were ineffective at best, and counterproductive at worst (Kiss, 1985). Yet, simultaneously, the domestic efforts to clean up the Rhine were quite effective in each riparian country.

In 1976, after years of tense negotiations, both the Convention on the Protection of the Rhine against Chlorides and the Convention on the Protection of the Rhine against Chemical Pollution were signed. The first of these was not ratified until 1983, and never implemented to any significant degree (Bernauer, 1995). This non-compliance even resulted in the recall of the Dutch ambassador from France in 1979. The Chemicals Convention was equally unsuccessful. It called for the establishment of 'black' and 'grey' lists of toxic substances. The black list was to contain the most dangerous chemicals, whose reduction needed priority. Grey-listed substances were considered somewhat less toxic, but still in need of regulation. Between 1976 and 1986, only three chemical substances found their way onto the ICPR black list. The insignificance of this number becomes apparent when one realizes that the European Commission had drawn up a list of some 1500 chemical substances suspected of being toxic.

Meanwhile, the same ministries that were fighting in the international arena were setting up elaborate water protection programmes at home. Between 1970 and 1987 the levels of many toxic substances in the Rhine were reduced by 60–80% (Beurskens, Winkels, de Wolf, & Dekker, 1994). Part of this achievement has to be attributed to the domestic water protection policies developed in the Rhine countries. In each of these countries, a command-and-control system for water protection was set up. Point-source dischargers (municipalities and large firms) were required to obtain permits for their discharges of wastewater into rivers and lakes. This made it necessary for them to build sewage treatment plants from the late 1960s onwards. In addition, riparian governments levied a water pollution tax on companies and cities. Nevertheless, these domestic protection policies cannot receive the sole credit for the clean-up of the Rhine. Remarkably, the large chemical firms along the river often took measures that went beyond the required legal standards (Bernauer & Moser, 1996). Non-governmental organizations (NGOs) also played their part by organizing large-scale protests, suing salt mines, and, in 1983, holding a much-publicized International Water Tribunal (Myint, 2005).

The restoration of the Rhine watershed from 1963 until 1986 was therefore characterized by a paradox: within each riparian country, national and local governments, as well as large corporations, had begun to significantly reduce their release of toxic effluents into the basin, while at the intergovernmental level discord about how to reduce the pollution of the Rhine abounded. Several processes were involved in the making of this puzzle. First, until the end of the 1980s, the domestic water protection

programmes in all Rhine countries took the form of command-and-control systems. These approaches worked reasonably well *within* the Rhine countries. Yet these approaches all differed from each other – for instance, some relied on effluent limits, others on water quality standards. As each national delegation to the ICPR tried to impose its own method of organizing water pollution control on the other delegations, it proved difficult for them to agree on a single command-and-control approach at the international level. A second factor that hampered the intergovernmental deliberations until 1987 was the insistence on following the formal procedures of international public law. This was a slow process with many veto points, as it required unanimous agreement among the governments of the riparian countries, and ratification by their parliaments. Moreover, the governments appeared weary of committing themselves to agreements that are legally binding under international public law (Wieriks & Schulte-Wülwer-Leidig, 1997).

### **1987–1999: implementation of effective international programmes**

The international cooperation on the protection of the Rhine drastically changed in November 1986. From then on, the international policies have led, rather than lagged behind, domestic efforts. This was the month in which the Sandoz accident took place (Giger, 2009). During the dousing of a fire in a warehouse of Sandoz AG in Basel, Switzerland, about 15,000 m<sup>3</sup> of water, mixed with highly dangerous chemicals, flowed into the Rhine, forming a 70 km red trail that moved slowly downstream from Switzerland, through France, Germany, and the Netherlands. Hundreds of thousands of dead fish and waterfowl washed up along the banks of the river. All the processing plants of the drinking water companies using Rhine water shut down.

The Sandoz incident was widely perceived as an indictment of the reigning international approach to the protection of the Rhine, and shook up the intergovernmental negotiations on this issue (Plum & Schulte-Wülwer-Leidig, 2014). Environmental groups staged novel demonstrations, the media zoomed in, and ministers became more involved. A sense of alarm swept over the delegations to the ICPR. The Dutch minister of transport, Neelie Kroes, cleverly exploited this to strengthen international cooperation on the protection of the Rhine. Minister Kroes took a step that is unusual in international relations: to broker international agreement on the clean-up of the Rhine she relied on private initiative. She hired a team of consultants from McKinsey Amsterdam to outline a comprehensive international agreement on the restoration of the Rhine basin, and to build up intergovernmental support for this plan. The final report of the McKinsey team likewise contained several innovative proposals. First, it recommended keeping intergovernmental agreements concerning the Rhine non-binding. Second, it gave responsibility for the implementation of any international agreements to the lowest possible government levels: the Swiss *cantons*, the French *agences de l'eau*, the German *Länder* and the Dutch *waterschappen*. Last, it kept intergovernmental regulation to a minimum. The report outlined a small number of environmental goals to be achieved: (1) the governments should strive to eliminate a restricted list of the most toxic chemicals from the Rhine watershed; and (2) the governments should ensure the return of salmon and other indigenous species to the

Rhine. How these goals were to be reached was left up to the riparian countries themselves.

The McKinsey report was endorsed at the 1987 Ministerial Rhine Conference and adopted as the Rhine Action Programme (RAP). This programme was hugely successful. It aimed to reduce the discharge of a number of highly toxic chemicals into the river by 50% in 1995 (as compared to 1985). Moreover, its goal to allow the salmon to return introduced an ecosystem approach, as it required the redevelopment of upstream spawning grounds that had disappeared because of industrial, agricultural or city development, or had become unattainable because of dams and weirs in the waterway. The anti-pollution measures, as well as the ecosystem approach, envisioned by the RAP went beyond existing national legislation and initiated new domestic protection laws and policies. The RAP was also costly. The German Association of Chemical Firms (VCI) has estimated that its members along the Rhine alone spent DM 6.6 billion on sewage treatment during 1987–1991. The costs incurred by municipalities are generally thought to be higher.<sup>1</sup> In addition, a total cost of DM 110 million was foreseen for the construction of fish ladders and fish sluices (ICPR, 1991).

Nevertheless, the RAP was quickly implemented. Originally, all of the goals of the RAP were meant to be achieved by the year 2000. By the end of 1994, most had already been reached. Discharges of a large number of the most toxic substances had been reduced by 70–90%, instead of the targeted 50% (ICPR, 2003). Salmon and other species had returned to the river, for the first time in 40 years (Cazemier, 1994). A sophisticated warning system had been put in place to react better to accidental spills (Malle, 1994). The RAP was indeed one of the most successful international programmes for the restoration of a major water basin in the Northern Hemisphere (Dieperink, 2000; Huisman, de Jong, & Wieriks, 2000). A large part of its success can be attributed to its unique approach to international coordination: (1) non-binding; (2) limited to goal-setting, instead of aiming at agreement on both goals and means of environmental protection; (3) leaving implementation up to the lowest possible government level. This pragmatic approach to international governance allowed the government officials involved to reduce their preoccupations with legal formalities, sovereignty, relative gains, and defence of their own regulatory approach, and allowed the officials to focus on how to clean up the Rhine.

The massive floods of the Rhine and Meuse in late 1993 and early 1995 served to strengthen the ecosystem approach that the RAP had brought about (van Stokkom, Smits, & Leuven, 2005). In January 1995, in the Netherlands, Germany and Belgium, around 250,000 citizens had to be evacuated. The total economic damage of the 1995 events has been estimated at around €1 billion. The immediate cause of the floods was a combination of adverse weather events in both basins. The underlying reason, however, was the centuries-old human encroachment upon the rivers for the purposes of urban expansion, better navigation, greater electricity supply and increase of farmland. As a result of this encroachment, riverbeds had become eroded, rainwater runoff had become more rapid (resulting in higher water discharge peaks) and natural floodplains had disappeared. In response, the Action Plan on Floods for the Rhine was adopted by the riparian countries in 1998. This plan calls for floodplain expansion, habitat restoration, the lowering of groynes, moving dykes further inland, dredging the riverbed where sedimentation occurs, increasing citizens' awareness of the risk of flooding, and the

installation of a public warning system. Thus, the Action Plan builds upon, and expands, the ecosystem approach initiated by the RAP. The plan leaves it up to national and local authorities to decide upon specific measures, and calls for public participation in the making of these decisions. It was swiftly implemented by the governments in the catchment area in a coordinated, but decentralized, manner – to the tune of €10 billion (ICPR, 2012).

Habitat restoration had been a long-standing priority of the environmental NGOs in the Rhine watershed. The support that the environmental groups in the watershed showed for the RAP and the Action Plan on Floods helped Dutch Minister of Transport, Public Works and Water Management Annemarie Jorritsma overcome initial resistance from the French, German and Swiss delegations to include NGOs more in the governance of the Rhine watershed. From 1997 onwards, NGOs have not only had observer status at the Ministerial Rhine Conferences, but have also been involved in the deliberation on restoration activities.

Between 1987 and 1999, the international policies to clean up the Rhine were therefore highly effective, and led (rather than trailed) domestic restoration efforts. The only exception was the agricultural sector: runoff from diffuse sources (especially nitrogen) did decrease during those years, but not by much (de Vries, Boers, Heinis, Bruning, & Sweerts, 1998).

### ***2000–present: the EU Water Framework Directive***

Despite the many steps taken to restore the Rhine catchment area, a number of environmental problems remain or have recently emerged. Apart from continued pollution from diffuse sources, these include: contaminated sediments as a result of past effluents (Uehlinger et al., 2009); the possible effects of climate change (van Slobbe, Werners, Riquelme-Solar, Bölscher, & van Vliet, 2014); invasion of non-native species (Leuven et al., 2009); and the inability to achieve fully self-sustaining populations of salmon and other species due to hard-to-reverse human changes to the watershed (bij de Vaate, Breukel, & van der Velde, 2006). Since 2000, several initiatives for overcoming these obstacles have been launched. The most important of these is the EU's Water Framework Directive (WFD), which came into force in December 2000 (Mostert, 2009). The WFD has rapidly become the focal point of the protection of the Rhine. The initial objective of the directive was to achieve, by 2015, good ecological quality for all EU waters with the help of river basin management. Under the directive, all 27 EU member states are obliged to identify their river basins and set up river basin districts. For each district, a six-yearly River Basin Management Plan has to be written. The directive also specifies which biological, physical and chemical parameters should be measured, how deviations from reference conditions should be enumerated, how monitoring programmes should be designed, in what manner results should be presented, and which timetables for the completion of different tasks should be followed. Furthermore, member states have to organize three consultation rounds in each basin. Last, the directive asks member states in each river basin to calculate, and agree on, the environmental and resource costs of using water, and then incorporate these costs into the pricing of water services (Gawel, 2014).



The WFD represents a major divergence from the RAP. Unlike the RAP, the WFD legally commits the governments of the Netherlands, Germany, Luxembourg and France. With its binding targets, the WFD resembles a supersized version of the formal and ineffective approach that characterized the international cooperation on the clean-up of the Rhine before 1987 more than the informal, successful international regime that came into being after the Sandoz incident. The directive has come in for criticisms from politicians, water managers and scientists (Hering et al., 2010). This may not be surprising given that, in 2015, “No Member State reported having completed all measures [of the WFD] and only one Member State (AT) reports that the status of water bodies is improving” (European Commission, 2015, p. 81). Discussion of these criticisms is reserved for the concluding section of the article.

### **An uncommon explanation**

It is difficult enough to describe the ecological recovery of the Rhine in detail, but harder still to explain it. This is because the Rhine’s environmental restoration has involved a number of surprising developments. First, before the Sandoz spill in late 1986, domestic and local measures by governments, municipalities and firms in all riparian countries had greatly reduced discharges of chemicals into the river, while at the same time the governments of these countries were quarrelling over such reductions in international fora. Second, during the same period, the large chemical companies in the watershed reduced the toxicity of their effluents by more than they were obliged to do under national (and international) water policies. Last, in the course of just a few months in late 1986 and early 1987, the international decision making regarding the clean-up of the Rhine turned from acrimonious and ineffective to harmonious and cutting-edge.

It is clear that interest-based theories of environmental cooperation (e.g. Sprinz & Vaahutoranta, 1994) do not offer much leverage in the case of the Rhine. Such approaches aim to explain the actions of stakeholders in terms of their (financial or other) self-interests. But in the Rhine basin, upstream users helped downstream users, companies went beyond legal standards, and the effectiveness of international cooperation changed nearly overnight. None of these processes can be explained by interest-based approaches without overstretching their central concepts. Even Elinor Ostrom’s (2010) common-pool resources theory offers relatively limited purchase. This framework sets out 20 characteristics of resource systems that are presumed to increase the chances of sustainable resource use. Yet according to Villamayor-Tomas et al. (2014), nearly one-third of these characteristics have not been present in the Rhine catchment area. In addition, Villamayor-Tomas et al. conclude that various factors not mentioned in common-pool resources theory have been instrumental in bringing about the Rhine’s restoration. To fully explain the remarkable clean-up of the Rhine, and extract policy lessons for other cases, I therefore believe that it is helpful to look for other approaches. Below, I argue that the plural rationality theory initiated by Douglas offers a more convincing explanation.

### **Plural rationality theory**

After anthropologist Dame Mary Douglas’s (1978, 1982) pioneering research, plural rationality (or cultural) theory<sup>2</sup> was developed into a full-fledged social and political



theory (Rayner, 1992; Thompson, 2008; Thompson, Ellis, & Wildavsky, 1990). The theory distinguishes between four primary ways of organizing, perceiving and justifying social relations (called ‘ways of life’ or ‘rationalities’): *egalitarianism*, *hierarchy*, *individualism* and *fatalism*. The theory postulates that these four ways of life emerge in contradistinction to each other in every conceivable domain of social life. Most such domains (say the way a school operates, or how an international regime functions) will consist of some dynamic combination of these pure forms. Because many social domains can be distinguished within and between societies (and because many societies can be distinguished around the world), the theory allows one to perceive a wide and ever-changing cultural and social variety – while still enabling the formulation of general propositions about social and political life. These propositions include possible ways in which people perceive and attempt to stave off a threat such as the degradation of a transboundary watershed. In order to explain this, I have to set out plural rationality theory in some detail.

Each of the theory’s four ways of life consists of a pattern of social relations as well as a supporting cast of perceptions, values and interests. The typology is derived from two dimensions of sociality that Douglas called ‘grid’ and ‘group’. Grid measures the extent to which ranking and stratification constrain the behaviour of individuals. Group, by contrast, measures the extent to which an overriding commitment to a social unit constrains the thought and action of individuals. Assigning two values (high and low) to each of the two dimensions gives the four ways of organizing social relations. Egalitarianism is associated with a low grid score (little stratification) and a high group score (strong group boundaries and solidarity). The combination of a high score on the grid dimension (lots of stratification) with a high score on the group dimension (much solidarity) gives hierarchy. The third way of life, individualism, is associated with low scores on both the grid and group scales. Last, fatalism is characterized by a high grid score and a low group score.

According to plural rationality theory, each of these four ways of organizing tends to induce, and be supported by, a particular way of perceiving nature, human nature, time, space, risk, technology, justice and governance. Since it was first formulated, this classification has helped illuminate the paradoxical and sometimes contradictory ways people approach a welter of contemporary public issues (Hartmann, 2011; Levin-Keitel, 2014; Swedlow, 2014; Verweij, 2011). Moreover, plural rationality theory posits that social domains and policy discourses are forever in flux due to the never-ending waxing and waning, splitting and merging of its four ways of life. Adherents to a particular way of life constantly compare its truth claims (regarding nature, human nature, risk, technology, etc.) with perceived reality. When this distance becomes too large, they will start to adjust their views (and social relations).

The theory’s classification can be usefully applied to the protection of international watersheds, such as the Rhine.<sup>3</sup> In the hierarchical perspective, preservation of transboundary water basins requires the provision of public goods that are under-produced by the market or the anarchical international system. In order to remedy this, watersheds need to be brought under the formal control of a single authority that is responsible for regulating, in a coherent and integrated manner, all aspects of the ecosystem involved. This authority, preferably enshrined in domestic and international law, should keep the activities of stakeholders (such as companies, ships, municipalities, farmers

and fishers) within precise targets. The limits themselves should be determined by experts, if possible with the help of such techniques as objective risk analysis, long-term planning, assessment of best available technology, and computer-based future scenarios. They should be imposed through legally binding standards, as well as prices that are appropriately adjusted to incorporate externalities with the help of taxes, fees and/or subsidies. Public participation can be allowed, but will mostly serve as input into the decision makers' calculations, and to inform citizens of what needs to be done. In the Rhine watershed, the ICPR, European Commission, and national governmental delegations, as well as many scientists, have frequently adhered to such a hierarchical perspective. These views were somewhat submerged during the implementation of the RAP, but resurfaced when that programme had run its course in 2000.

The egalitarian take on how to restore transboundary watersheds is to consider these as highly vulnerable common-pool resources that are imminently threatened by greedy corporations, aloof bureaucrats, abstruse technocrats and rampant consumerism. Rather than top-down regulation or market solutions, what is needed is a moral revival, resulting in a significant reduction of human interference with watersheds. Ecocentrism and animal rights are called for, not egocentrism and speciesism. This desired state of affairs can be brought about by adhering to a very strict interpretation of the precautionary principle (according to which companies have to prove that a particular chemical is harmless, in any doses or combinations, before mass-producing it) and by letting waterways meander freely again. Decisions regarding the catchment area should ideally be made on the basis of consensus among all citizens affected by them. If this cannot be done, then citizens and citizens' groups should nevertheless be involved in the basin's governance as much as possible. In the Rhine watershed, many (though not all) environmental groups have espoused such ideals. These groups have included Greenpeace, Reinwater, Stichting Natuur en Milieu, Bundesverband Bürgerinitiativen Umweltschutz, Naturschutzbund Deutschland, Alsace Nature and Schweizerischer Bund für Naturschutz.

The individualistic perspective on how to protect international watersheds emphasizes the need to retain the opportunity to freely produce, and consume, private goods. In this view, water basins are highly resilient, and the extent of their degradation is frequently exaggerated. The use of chemicals should not be regulated unless abundant evidence of their toxicity has come to light. Even then, the costs of their regulation should be carefully weighed against the benefits of their use. Moreover, voluntary covenants between companies and governments are preferable to rigid, top-down imposition of environmental rules. The latter would risk preventing the technological improvements that could usher in a brighter environmental and economic future. Governments should therefore restrict themselves to declarations of intent, and leave the achievement of these goals to the polluters themselves. In the Rhine basin, the large chemical companies have often endorsed such views.

The fatalistic stance on watershed restoration is that it cannot be done, or at least not planned for. This is because all actors (be they companies, states or farmers) are too preoccupied with improving their own, short-term fortunes to care much about the environment or each other. In this view, upstream actors will not take into consideration the interests and wishes of downstream users unless they are coerced by superior force to do so. Upstream actors merely exploit the club goods that they can eke out of

the watershed. In any case, the ecosystems involved are too complicated and unpredictable to allow rational analysis and planning. So why bother? Quite a few farmers in the Rhine catchment area appear to have adhered to such a view, at least more than other actors.

Hence, plural rationality theory's fourfold classification captures many of the protagonists involved in the governance of the Rhine watershed rather well. Of course, not all stakeholders involved have adhered to a single rationality. One hybrid actor has been the influential representative of the 120 water supply companies in the basin, called the Internationale Arbeitsgemeinschaft der Wasserwerke in Rheineinzugsgebiet (IAWR). These companies have had to make sure that their drinking water, taken from the Rhine, complies with very strict national and European quality standards. They therefore have had a strong financial incentive to induce other companies to reduce their pollution of the river. Moreover, the water supply companies have long assembled detailed information on the effluents of companies and cities. Until 2006, they maintained the only fine-grained measurement system of water quality in the entire Rhine basin. Backed up by this knowledge, the IAWR has used a series of sticks (in the form of lawsuits, lobbying for stricter laws, and threats to name and shame) and carrots (in the shape of a yearly award for good environmental practice) to motivate the chemical industry and municipalities to reduce their pollution of the Rhine. In their quest, the drinking water companies have combined rationalities. On the one hand, they have shared with the more egalitarian NGOs a limited tolerance for chemicals in the watershed. On the other hand, being companies themselves, they have not employed a radical anti-capitalist, anti-industry rhetoric.

Plural rationality theory has also important normative and policy implications. These flow from the theory's premise that each of its four ways of life is not only different from (and in competition with) but also dependent on all the others. That is to say, each way of life can survive only with the help of the other ways of life. From this premise, the following hypothesis can be derived: *Attempts to resolve pressing social and environmental problems that flexibly combine all ways of defining and resolving the issues at hand tend to be more successful than attempts that rely on fewer ways of life.* The latter will not only fail according to the goals, norms and values prioritized in the excluded ways of life, but they will also fail on their own terms – because each way of organizing and perceiving is complementary to, and co-dependent on, the other three. These efforts have often been labelled “clumsy solutions” (Verweij & Thompson, 2006), although the terms “polyrational” (Davy, 2012) and “robust” (Offermans & Valkering, 2016) have been used as well.

The constructive interplay among opposing ways of life that plural rationality theory advocates helps explain the various phases of the Rhine's restoration. As noted above, before the adoption of the RAP in 1987, two puzzling processes occurred: (1) chemical corporations reduced their toxic effluents beyond what they were legally required to do in the 1970s and 1980s; and (2) while companies and municipalities in all riparian countries were treating their wastewater, intergovernmental negotiations over precisely this topic broke down in acrimony. Plural rationality theory offers the following explanation for these puzzles.

The national and local authorities in the Rhine catchment area tended to follow a hierarchical perspective on water protection. That is, from the 1960s onwards, they

implemented domestic water protection policies and laws, often in the form of pollution fees and command-and-control systems rooted in ‘best available technology’. This compelled large chemical companies, as well as municipalities, to start building wastewater treatment plants. As a result, the chemical pollution of the Rhine began to decline from the early 1970s onwards. However, the chemical multinationals reduced the toxicity of their effluents to a larger degree than was legally mandated. In part, this had to do with the strong pressure exerted, especially on the chemical industry, by egalitarian organizations such as Greenpeace, as well as by the IAWR. Still, it could be argued that, in the face of this pressure, chemical companies along the Rhine could have limited themselves to what was legally required. Hence, something else must also have been going on. The chemical firms have been the more individualistic actors in the Rhine basin. For instance, they have tended to view the Rhine as a more resilient ecosystem than other actors have (Disco, 2007). Before the 1970s, “Public waterways were largely seen as a ‘free good’ by [German] industry. Industrial pollution was also seen as essentially ‘harmless’, and the great rivers like the Rhine were ascribed great natural cleaning powers” (Rüdiger & Kraemer, 1994, p. 59).

Nevertheless, due to several accidents, it became unfeasible to maintain belief in the “great natural cleaning powers” of the Rhine. In June 1969, Hoechst accidentally dumped large amounts of the insecticide Endosulfan into the Main (a major tributary), killing large numbers of fish (Greve & Wit, 1971). And during several days in June 1971, more than 100 km of the Rhine was left without oxygen, killing off all fish in that part of the watershed. Even the chemical corporations had to admit that the Rhine was in need of saving in the early 1970s. When faced with this incontrovertible evidence, the chemical corporations reacted in an individualistic fashion: where others saw an environmental problem, they saw a market opportunity. Instead of relying on ‘the best available technology’, several companies invented new, more efficient wastewater treatment technology (such as Hoechst’s Biohoch Reaktor and Bayer’s ‘tower technology’). They not only installed the novel technologies at their own plants, but also proceeded to sell these to companies and municipalities around the world. Thus, the chemical companies on the Rhine were able to branch out into providing ecosystem services, including wastewater treatment. For example, in 2014, Bayer Technology Services had around 2300 employees and an output of €480 million, while Infraserb Hoechst had some 2700 employees and an output of €1.1 billion.<sup>4</sup> In this manner, between 1970 and 1986, the Rhine chemical corporations reduced their effluents by more than the hierarchical government agencies would have thought technically possible, or the egalitarian NGOs would have believed morally feasible – while building up lucrative subsidiaries. This is clearly a “clumsy solution” that resulted from the often fractious, but ultimately virtuous, interactions among egalitarian environmental groups, hierarchical governmental agencies, individualistic corporations and the culturally hybrid IAWR.

Plural rationality theory also offers an explanation for why, during the same period, international cooperation on the Rhine came to naught – and for why this later changed. Before the Sandoz incident, only hierarchical principles informed intergovernmental cooperation. Non-state actors, and their different perspectives, were barred from the international halls of power. By themselves, national governments attempted to construct a legally binding, transboundary control-and-command system out of the divergent domestic control-and-command systems already in place. Moreover, they

attempted to reach such an agreement in a highly formalistic and time-consuming manner. This typically hierarchical approach to the international governance of the Rhine watershed only led to deadlock.

In contrast, the shock of the Sandoz spill facilitated the infusion of other principles and practices into the Rhine cooperation. The approach that Minister Kroes and the McKinsey team got accepted included a number of individualistic elements: the informal and non-binding character of the RAP; its small set of targets; and the decision to leave the responsibility for reaching these aims to the lowest possible government levels. Indeed, Kroes's initial decision to let consultants outline an international agreement on the restoration of the Rhine basin, and to build up the necessary intergovernmental support for this plan, can itself be seen as individualistic, as it replaces governmental duties with private enterprise. With the subsequent decisions to restore the natural habitat of the Rhine, and to consult much more frequently with NGOs, egalitarian principles also became part of the international governance of the watershed. Only with this much clumsier arrangement in place did the international cooperation on the protection of the Rhine start to function well.

## Conclusion: a foreboding

In this article, I have argued that the plural rationality (or cultural) theory pioneered by Dame Mary Douglas offers a plausible explanation of both the successes and failures of the ecological protection of the Rhine. This approach has begun to be applied by Dutch policy makers and scientists in their efforts to increase the resilience of the Rhine delta (Middelkoop et al., 2004; Offermans, Valkering, Vreugdenhil, Wijermans, & Haasnoot, 2013).

But plural rationality theory has certainly not informed the WFD. Although it has frequently been claimed that this directive was influenced by the successful RAP (e.g. Plum & Schulte-Wülwer-Leidig, 2014), from the viewpoint of plural rationality theory the WFD appears very different from the RAP. The latter was a polyrational mix of egalitarian, hierarchical and individualistic ideas and practices. The former – with its strict timetables, comprehensive lists of priority substances, prescribed price adjustments, binding biological, hydromorphological and physical-chemical targets, limited public participation, complicated measurements methods and legalistic nature – is exclusively hierarchical. From the perspective of plural rationality theory, it is therefore not surprising that the directive has received “major criticism from politicians, water managers and scientists” (Hering et al., 2010, p. 4008), while the European Environmental Bureau (2010), which represents more than 140 environmental citizens' groups from across the EU, has called the directive a “toothless tiger”. Indeed, the European Commission recently admitted that all member states were “well short of meeting the WFD targets required by 2015”, while “differences and tensions have emerged across Europe about the future of EU environmental targets under the Water Framework Directive” (Waterbriefing, 2015). Only a less monolithic approach to water management will be able to sustain the restoration of the Rhine and other river basins.

## Notes

1. Uehlinger et al. (2009, p. 25) estimate that around €40 billion was spent on building and improving sewage treatment facilities in the Rhine basin between 1970 and 1990.
2. Previously, this approach was often called 'cultural theory'. To avoid confusion with post-essentialist cultural theories, the term 'plural rationality theory' is increasingly favoured.
3. This section is based on semi-structured interviews held in 1996 and 1997 with 54 stakeholders in the Rhine basin (Verweij, 2001), analysis of primary documents, and close reading of secondary literature. Recent corroboration for the Dutch part of the basin comes from Offermans and Cörvers (2012).
4. Data retrieved from <http://www.bayertechnology.com/unternehmen/zahlen-fakten.html> (11 October 2015) and [http://www.infraserv.com/de/unternehmen/daten\\_und\\_fakten\\_inkl\\_standorte/](http://www.infraserv.com/de/unternehmen/daten_und_fakten_inkl_standorte/) (11 October 2015).

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