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Rhine River Basin

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7.1 Introduction

Basin description

The Rhine is 1300km long – 800km of which are navigable – and spreads over an area of 185,000km^2. The Rhine basin is shared by nine countries. Germany (55 per cent of basin area), Switzerland (18 per cent), France (13 per cent) and the Netherlands (6 per cent) share most of the basin (Wolf et al, 1999). The parts of the basin in Austria, Belgium, Italy, Liechtenstein and Luxembourg are very small. About 60 million people live in the basin. The average discharge at the mouth is 2200m^3 s^{-1}. The hydrology and flow distribution throughout the year are favourable for navigation, which explains why it represents one of the most important transport routes in Europe (Huisman et al, 2000). Apart from navigation the river is used as a water supply for domestic, agricultural and industrial purposes (including cooling water), for waste water disposal, hydropower generation, fisheries, and recreation.

Transboundary cooperation

There has been transboundary water management for a long time in the Rhine River basin. The first international agreements were signed in the 19th century, with the establishment of the Central Commission for Navigation on the Rhine (CCNR) and the Salmon Commission. The International Commission for the Protection of the Rhine (ICPR) was established in 1950 after pollution problems became noticeable and people realized that results could only be achieved through transboundary cooperation. Several flood events over the past decade

drew attention to flood management and to transboundary cooperation for flood management. Thus, over time awareness has developed about the interdependence of riparian countries for achieving water management objectives (Raadgever, 2005).

Main water management issues in the Rhine basin

The Rhine River has a flow regime driven by rainfall and snowmelt. Peak discharges occur in winter, originating from precipitation in Germany and France (Silva et al, 2004). According to recent research on climate change, severe floods and droughts are expected to occur more often in the Rhine basin. Proceeding downstream, the problem of flood protection becomes more severe. Moreover, increased urbanization along the river banks has exacerbated the impact of flooding. The whole river faces the problem of pollution, mainly from non-point sources. Point source pollution is largely controlled by a combination of permits and charges to regulate polluted discharges (Raadgever, 2005). In general however, the Rhine countries have sufficient resources to counter most of their water problems. Also, trust has been built between the riparian countries through long-lasting cooperation in the ICPR and the EU (Raadgever et al, 2008a).

Three sub-cases

The NeWater effort in the Rhine case study was divided over three sub-cases: the Lower Rhine, the Kromme Rijn and the Wupper. The Lower Rhine case focused on transboundary flood management; the Kromme Rijn case largely dealt with water management planning; and the Wupper case looked at participatory water management planning. Further research dealt with questions about management style and uncertainties. This chapter describes the activities and outcomes from these sub-cases.

7.2 The Lower Rhine

The flood risk context

In this book 'The Lower Rhine' refers to the lower part of the Rhine River in Germany and the upper part in the Netherlands. Flooding is a serious threat along this densely populated stretch of the river. In North Rhine-Westphalia (NRW) and the Netherlands (NL) strong dikes have been constructed to protect the land from flooding. Apart from increasing the height of embankments, other types of measures to decrease flood risk – like creating more room for the river – are currently considered and put into practice. Both NRW and NL have established a set of flood management measures to be implemented by 2015 (Rijkswaterstaat, 1998).

Since 1997, a broad range of government actors from NRW and NL have exchanged knowledge and conducted joint research in the German-Dutch Working Group on Flood Management (WGFM). Currently, important focuses

are the study of climate change consequences and spatial and socioeconomic change.

Participatory scenario study

A participatory scenario study was set up in the Lower Rhine case, initiated by the ACER and NeWater research projects in collaboration with the WGFM. Of particular importance was the need for good collaboration between researchers, policymakers, and other stakeholders from different countries (Germany and The Netherlands), and disciplines (e.g. water management, spatial planning, natural and social science). Over time some of the WGFM members limited their involvement due to time constraints and political reasons. This weakened the link between the process and formal policymaking but opened up possibilities for more intensive cooperation with other flood management stakeholders (Raadgever, submitted).

An overview of stakeholder perspectives was recorded to develop awareness among the stakeholders and to stimulate discussion. The researchers interviewed members of the WGFM and a few non-governmental stakeholders. Furthermore, a Q sorting questionnaire was administered among a broad range of flood management stakeholders in the Lower Rhine basin. Q methodology is intended to systematically elicit individual perspectives, and to group them into shared perspectives using quantitative factor analysis. The Q sorting identified a common basis of agreement and three distinct perspectives on future flood management (Raadgever et al, 2008b). Furthermore, repeating the Q sorting after the scenario study made it possible to evaluate whether the perspectives of the participants had changed.

The core of the participatory scenario study consisted of stakeholder workshops. Each workshop consisted of presentations from technical experts and others; working sessions in sub groups and plenary discussions. The workshops were facilitated by a consultancy firm specializing in participatory processes in water management. In between the workshops, the ACER project assessed the outcomes of different strategies under different scenarios. Preliminary results were fed back to the participants at the workshops.

After exploring the future more openly at workshop 1, a set of four scenarios from the literature were used in the remainder of the scenario study. The scenarios were based on two important aspects of uncertainties: values and governance (Berkhout et al, 2002). The 'values' dimension represents political and social priorities and the distribution of public and private responsibilities. The 'governance' dimension describes political and economic power relations and the spatial and structural orientation of decision making. Using scenarios from literature had the advantage that the scenarios were well grounded in science, and offered consistent data about many aspects of the future, such as economic growth and climate change; one disadvantage was that they were not specifically tailored to flood management and the stakeholders did not automatically understand or 'own' the scenarios (Raadgever and Becker, 2008). Therefore, at the workshops quite some time was spent on getting the

participants acquainted with the scenarios and to tailor the scenarios to flood management in the Rhine basin.

The collaboration among stakeholders was generally good. Joint goals could be set and there was flexibility to adapt those goals. Everyone participated actively in the workshop discussions and there was a very positive atmosphere, which may have been due to the informal nature of the proceedings. The continuity of participation in the workshops was limited however, which may have been a result of participants giving priority to their daily work (and busy schedules) and transboundary politics.

Results

The participatory scenario study had several outcomes. Firstly, the study resulted in a set of four scenarios for future flood management in the Rhine basin, a strategy for each scenario, and a set of important indicators to evaluate these scenarios and strategies.

Secondly, good collaboration in the participatory scenario study improved relations between the stakeholders from different countries, organizations and disciplines. This may be useful for future transboundary and multidisciplinary collaboration in the Lower Rhine basin.

Thirdly, this study allowed for learning between different stakeholders. In evaluations carried out after each workshop the participants stated that they had learned about how people from other countries and disciplines think about flood management, and how to think in an open way about possible futures. Changes in the participants' perspectives on future flood management were measured through the Q sorting questionnaire before and after their participation in the workshops. Analysis revealed that although the perspectives of most participants changed significantly, mutual consensus increased only slightly, and learning from the research results was limited (Raadgever, submitted). The effect of the scenario study on decision making is not straightforward. As the scenario study was not linked directly to decision making, effects are expected to manifest in the long-term.

7.3 Kromme Rijn

Case study context

In the Kromme Rijn case, cooperation was established with Hoogheemraadschap De Stichtse Rijnlanden (HDSR), a Water board in the central Netherlands. The goal of the case study was to facilitate and analyse relevant stakeholder involvement processes in the Kromme Rijn area. The participation process focused on two overlapping projects: a European Water Framework Directive pilot for the water body 'Kromme Rijn' (WFD pilot), and a water management plan for the Kromme Rijn region.

The different actors' objectives and problem frames

Different actors and stakeholders brought a variety of objectives to the process. NeWater wanted to stimulate HDSR to permit an optimal level of participation and study the effect of that participation on water management. HDSR wanted to come up with a 'maximum ecological potential' for the Kromme Rijn, in compliance with the European Water Framework Directive and a water management plan for the (mainly agricultural) area 'Kromme Rijn', including a decision on water levels and an optimal ground and surface water regime. The objectives of the Province more or less coincided with those of HDSR. The Municipalities wanted to generate a strong link between their own plans and the interests of their inhabitants. Nature organizations in general wanted to maximize new natural environments while maintaining the benefits of those already in existence. The general farmers' associations (LTO) wanted to continue farming in an effective way, without having to pay too much for water management. The NFO, the fruit farmers' organization, a branch of LTO, also wanted this; however, the water use needs of fruit farmers are different from the other (dairy) farmers. Specifically, the fruit farmers need high water availability in spring for sprinkling to prevent young buds from frost damage. The challenge of the planning team was to reconcile all these different interests and objectives. Differences in interests and problem-framing were studied from audio recordings made during meetings (François et al, 2007).

Participatory methods and tools

The planning team, consisting of NeWater researchers and personnel of HDSR, did a stakeholder analysis at the start of the project based on two main criteria: interest in and influence on the process. On the basis of this stakeholder analysis, a division was made between a 'core group' consisting of representatives of the main water authorities, responsible for the project; an 'advisory group' consisting of the members of the core group and representatives of the main responsible user-organizations and interest groups; and a 'communication group/community' consisting of the members of the advisory group and other stakeholder groups, including the local community. This 'nested' approach was adopted and evaluated as part of the process. In a first workshop with the stakeholders of the core group and advisory groups, this structure was assessed and adapted (Lamers et al, in press).

Participation activities were divided into an excursion, core group meetings, advisory group workshops and public meetings (Lamers et al, in press). The excursion with the core group and the NeWater researchers was intended to help these participants become familiar with the area and each other, and to discuss the project's requirements and possibilities. During core group meetings the project boundaries were defined and the agenda and approach for the advisory group workshops were discussed. In advisory group workshops, participants were asked to either come up with ideas, or rank, comment and/or judge proposed ideas. All inhabitants of the area were invited to public meetings on four occasions, to be informed about planned activities and give their responses.

In the final phase of the water management plan project, a 'sub-area evening' was organized for landowners adjacent to ditches that needed widening as a solution for water shortage in spring.

HDSR published four newsletters for the wider public during the project, in which the process and the results were clearly outlined. Furthermore, HDSR placed all information related to the WFD pilot and the water management plan on their website, including workshop reports, research results, calculations, presentations and newsletters.

Results

The Kromme Rijn participatory process has resulted in a shared water management plan. Evaluation results show that in this particular context the nested approach worked very well in organising the participatory process in an adaptive way (Lamers et al, in press). This approach stimulated both horizontal and vertical communication by creating a safe environment, leading to an open atmosphere and generating trust. Furthermore, the evaluation has shown that a successful participatory process requires a reflective planning team with a capacity to adapt the process when necessary. Another important lesson was the necessity to ensure that the appropriate group of stakeholders is assembled around the table at all times during the process. Stakeholder analysis is needed not just in the design phase, but throughout the process. Finally, adaptive water management requires experienced process leaders with excellent communication skills, and this human resource may not necessarily be found within every organisation (Lamers et al, in press).

There are different framing processes: frame selling, frame filling and frame negotiation. They correspond with different levels of participation: informing, consulting, and active involvement. Awareness has risen about the necessity to reflect beforehand on the level of participation desired and to communicate to stakeholders at an early stage about the influence they may have (Francois et al, 2007).

Dynamics of the case study objectives in relation to involvement of stakeholders

Initially, HDSR considered the water management plan to be a routine project for which few problems were expected. At the end of 2006 however, the tensions between fruit farmers and other landowners became much more apparent, in part because hydraulic calculations showed that the water quantities necessary at peak times were much larger than expected and were going to be higher still with the present rate of development in the fruit sector.

HDSR staff became increasingly aware that the demands of the farmers lay beyond the original task of the water board, which was simply to maintain water supply at a level necessary to prevent damage from water surpluses. With the growing requirements of the fruit sector in particular, HDSR was on the way to becoming a water provider, an entirely different task requiring changes

in both physical infrastructure and organization. When HDSR made its standpoint clear, this really boosted the awareness of the players involved and stimulated the different actors to participate at a higher level, resulting in a broadly supported water management plan. The plan, however, includes only limited solutions for the problems, based on the willingness of specific landowners to sell part of their land and it remains uncertain whether this approach will be sufficient for successful implementation.

7.4 Wupper

Case study context

The Wupper sub-case forms part of the Rhine case study within the NeWater project and was conducted in close cooperation with the ACER project. The goals of NeWater were to analyse Adaptive Management (AM) strategies, and support the implementation of AM in water management practice. Therefore, contacts formed with the main stakeholder, the Wupperverband, were very close and formalized in a co-operation treaty at the beginning of collaboration. The Wupperverband is the competent water association of the Wupper basin. Founded in 1930, it is a public corporation based on a special law and deals with water quality and quantity in the Wupper basin. Membership is obligatory for districts and municipalities, drinking water producers and industries in the basin. The members finance the work of the Wupperverband through membership fees and are represented in different bodies of the association.

The Wupper basin is a densely populated sub-basin of the Rhine, located in North Rhine-Westphalia (NRW), in Germany. To provide the population with drinking water many reservoirs have been constructed along the Wupper and its tributaries. These reservoirs shape the eco-morphological structure of the river and have modified the flow regime (MUNLV, 2005).

The major challenge facing water managers in the Wupper basin, where eco-morphological problems are of major importance, is the implementation of the European Water Framework Directive. The Dhünn basin, which is a tributary of the Wupper, currently does not qualify for 'good status' as defined by the WFD (MUNLV, 2005), although the water quality is reasonably good. This is because of the artificial water flows caused by the Dhünn dam and other barriers such as small weirs (ecological continuity) and canalized stretches of the river (eco-morphological quality). These problems affect fish population in the Dhünn (Möllenkamp et al, 2006).

Co-design and co-implementation of a participatory process in the Dhünn catchment

The major intervention in the Wupper sub-case study was the introduction of a participatory process in the Dhünn sub-basin. The aim of the exercise was to anticipate and prepare input for the formal WFD implementation process by

involving all relevant stakeholders. The main goal of the process was to identify potential measures to improve the ecological status of the river and its tributaries.

The cooperation between the Wupperverband, NeWater and ACER scientists, and process consultants took place in three phases: a preparatory phase, a process phase consisting of a series of three workshops, and continuing evaluation. The Wupperverband was the formal convener of the process, which marks a mentionable change in the administrative attitude. The action allowed the Wupperverband to redefine its field of activity and to strengthen its position. The Wupperverband at the same time admittedly incorporated the risk of failure and of an unpredictable outcome. This risk could nevertheless to some extent be externalized to the design partners – science and consultancy. They, in cooperation with the Wupperverband, performed the stakeholder and issue analysis, set up the process boundaries and design, and gave scientific advice and consultancy on the design and implementation of workshops (Speil et al, 2008). Overall, the consultants moderated the process and the scientists evaluated it.

With a variety of measures such as changes in the operation of the dam outflow, technical changes at the dam or intervention along the course of the river it seemed possible to achieve good ecological status and to reintroduce an appropriate fish population. These measures however, would affect various water users and other stakeholders downstream of the dam, such as fisheries, agriculture and recreation. The participatory process discussed existing options and the development of new measures to improve ecological quality in the Dhünn. Various tools and methods were used, such as simple models for visualization purposes, expert interviews and questionnaires. During the workshop series various tools such as moderated discussions in break out groups and mapping of stakeholder perceptions were applied.

The rather informal setting of the participatory exercise allowed more freedom and experimental design than the formal participatory process that the current WFD implementation process is offering. At the same time, the WFD was the catalyst for the process and demonstrated an inherent necessity to change actual water management practices. The directive thus provided a positive context that allowed experimentation under pressure to attain a tangible thematic output.

The major achievement of the participatory exercise was a consensual agreement of all participants on a final document specifying possible measures in the basin (Seecon Deutschland GmbH et al, 2008). This document is considered to be an important input to the ongoing formal implementation of the WFD while the participatory process used in North Rhine Westphalia is a useful model and seen as a best practice example for WFD implementation. Apart from input to systematic design (Speil et al, 2008), the participatory exercise also offered the chance to analyse some of the major challenges considered to be barriers for participatory management. The research is described in detail in Möllenkamp (Möllenkamp et al, submitted).

7.5 Comparison between the Wupper and Kromme Rijn regimes

Management style analysis in the Wupper and Kromme Rijn regimes

The ability to adapt to new conditions under different institutional settings was investigated using a comparative management style analysis of the Wupperverband and HDSR (Möllenkamp et al, 2007). Historical development, institutional settings for membership, and the roles and decision making of these agencies were compared in the light of the role of emergent leadership, social learning, and both formal and informal forms of participation by stakeholders outside the regulatory system. Two simple models were developed representing the Wupper and Kromme Rijn regimes.

A balance is struck in adaptive water management institutions between taking legitimate and accountable decisions (addressing issues and stakes of all those involved) and the effectiveness with which these decisions are taken. With regard to effectiveness, the Wupperverband seems to be performing better in the current management situation. The leadership position of the managing director of the Wupperverband stimulates effective decision-making processes and determines the strategic direction of the water agency to a large extent. The democratic structure of HDSR, despite being an adaptive element, can hamper effective decision making due to an inability to find a compromise. On the other hand, HDSR proved to be more flexible in adapting to the changing needs of inhabitants and users in the region, and to changing management goals. However, the Wupperverband is able to engage additional stakeholder groups by opening up informally by means of workshops on water management questions, such as the Dhünn workshop series co-developed by NeWater/ACER. In the long run, the transmission of social capital and institutional learning is easier between groups that share responsibility than between two leading persons in case of a management shift. Combinations of different institutional elements thus influence the capacity of both water agencies to adapt to changing conditions in an effective and legitimate way. Stronger centralized decision making may be more effective in taking decisions while more influence from stakeholders can ensure a more flexible approach.

Dealing with uncertainties in water management practice – Wupper and Kromme Rijn cases

A second comparative study was performed in the Wupper and Kromme Rijn basins, analysing uncertainties. The study was to evaluate the way in which uncertainties are framed by practitioners in water management, how they deal with them, and how this might be improved.

A series of workshops and interviews were undertaken in each sub-case study with representatives from regional entities responsible for water management, i.e. water agencies, public administration, and municipalities. The study showed that uncertainties are already recognized and integrated in the work of

practitioners. However, in the two case studies uncertainty, for the most part, is not approached in a structured way but rather dealt with by experience or intuition. The research showed that in order to develop more systematic and structured approaches it is important to make the framing of an uncertainty explicit and to identify possible framing differences, particularly in situations where several actors are involved. A cross-checking list using parameters of framing was developed by Isendahl et al (submitted) as a tool for systematically identifying improvement options when dealing with uncertainty situations. The list does not require specialized scientific knowledge or assessment and is designed to be easily applicable for practitioners in water management.

The research in the two case studies once again emphasizes that not all uncertainty can be overcome completely. It follows that because not all uncertainties can be solved or solved fully, then ultimately dealing with uncertainties is a matter of choices and priorities, which in the search for certainty are often neglected.

7.6 Conclusions

As shown in this chapter, AWM can improve water management through participation, the use of scenarios and modelling. The most important tool employed to improve participation in the three Rhine cases was the workshop. From the NeWater experience it is clear that a set process is critical for successful participation and it needs to be implemented with care. Setting up a participatory process, particularly for the first time, can be considered a risk for the organizer. Cooperation with researchers and consultants can help since this offers an opportunity to share both the burden and the blame should something go wrong.

Building trust is an important – though time-consuming – activity in the participatory process. The 'core' team of initiators should be confident about the organizers' objectives and skills. Preparatory steps in the organization and design of the different events are important elements in the building of trust and should be considered to be an important joint task. The nested design approach used in the Kromme Rijn case is also a useful means to build trust.

A rather informal approach can also be helpful in building the trust needed and to further the exchange of ideas. However, at a certain point, the process must feed into the formal process to influence policy making. This, however, does not always happen. The transboundary setting in the Lower Rhine case was probably considered too sensitive to open up formal decision making to a participatory process that could not be controlled by the governments involved. In the Wupper case on the other hand, the experience was such that the outcomes of the process were adopted as input into the formal process.

Participatory processes have led to changes in the participants' perspectives on the issues at stake. The exchange provided the opportunity to learn from technical expert knowledge as well as from other stakeholders and supported

social learning between the participants. Comparisons between two of the cases showed that strong leadership that can influence and promote decision making, is an important part of the process. Strong leadership can however reduce the flexibility of decision making.

Uncertainty can be a factor that interferes in the process as it is generally viewed as a negative factor. Explicitly framing the uncertainty can help to overcome this barrier. Having to deal with uncertainties, and to explicitly define them and make them clear to all the actors contributes to better and more considered decision making, since a wide range of management options have to be evaluated. The use of scenarios then makes it possible to explore a range of potential futures in which political interests are less prominent.

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