NeWater

RESEARCH ACTION PLAN RHINE

Source off the Rhine

Report of the NeWater project -
New Approaches to Adaptive Water Management under Uncertainty

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Preamble

The project has assembled a group of enthusiastic people with different scientific and practical background. In and of itself, the project presents a major challenge and a practical lesson in social learning in order to promote and guide the research process to profit from the diversity of knowledge and experiences. We welcome feedback and suggestions from anyone reading this report since it defines the basic structure of what we intend to do in the project.

All teams involved are grateful for the support of the European Commission in providing funds for this research and to the national organisations contributing to the project.

Claudia Pahl-Wostl

Coordinator of WB1
NeWater project
August 2005

Introduction and objectives of the RAP

Major objective for the ***'Research and Action Plan'*** (RAP) is the integration of

- NeWater research in work packages,
- the work of case study teams,
- the stakeholder needs in basins.

It serves as **the** document where preliminary work of case study teams is used to derive case study specific research issues. These research issues shall serve as point of departure for the development of a case study specific research and action plan for the next couple of months but also for the entire project duration. The connexion of the RAP document to a processing strategy (see annex 1) shall support the integration of basin and stakeholder specific research requirements. This is the challenging condition for a long-term involvement of case study partners/stakeholders in NeWater.

Beside its integrative function, the RAP processing shall help to overcome some challenges where case study work and work packages related requirements had a lack of guidance and progress due to heterogeneous expectations resulting from heterogeneous interpretations of some aspects of the 1st 18-month Implementation Plan. Finally the case study specific RAPs shall become part of the next 18-Month Implementation Plan and needs approval of the NeWater General Assembly in November.

RAP structure

Chapter 1 of the RAP is devoted to the first crucial phase "Analysis, Problems, Current State, Management Regime" where the research programme in the NeWater basins is determined in a participatory process. The analysis is guided by a management questionnaire (1.1) and a protocol for a rapid vulnerability assessment (1.4). This analytical work is complemented by a general geographical (political and physical) description of the basin (1.2), by a report of tools used for IWRM (1.3, coming from WB 4), and stakeholder input on basin specific concerns and stakeholder roles in the basin. In chapter 1.6 case study specific concerns and research issues shall be derived from results of 1.1- 1.5 as a joint task of case study teams and work blocks.

Chapter 2 summarizes which work packages of the NeWater project are involved in the implementation of the research agenda. It shall also help to set up the case study teams, since it comprises the research affiliation on NeWater partners.

Chapter 3 describes in more detail the next steps of implementation of the research agenda for the next months. Chapter 3.1 give the interrelations of`

- case study specific research issues,
- research and stakeholder activities,
- and responsibilities.

Chapter 4 give the case study budget.

Annex 1 Gives the result of the Management questionnaire.

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1 Basin description summary

From an economic point of view, the Rhine is the most important river of western Europe. The Rhine basin covers an area of about 185.000 km2, distributed between 9 countries. The Rhine is 72nd on the list of the world's principal rivers with a length of 1.320 km. It is the only river connecting the Alps with the North Sea. Two thirds of its basin are situated in the Federal Republic of Germany. The Alpine countries, of which Switzerland is the most important, form 20% of the area. More than 50 million people live in the Rhine basin. The river is one of the world's most intensively navigated inland waterways and of major importance for the supply of water to large socio-economically important areas. Changes in the discharge regime can have severe consequences for safety, for the water availability for shipping, industry, domestic use, agriculture, the natural environment and recreational purposes.

1.1 First Characterization of Water Management Regimes in the NeWater Basins

1.1.1 Introduction

The characterisation of water management regimes were done on the level of sub cases (described in 1.2 and 1.6). In Annex I the questionnaires are listed. In 1.1.2 we have listed the summary of the management and governance style.

1.1.2 Issues of management and governance in the basin

Based on the information in the questionnaire (Annex I) a first characterisation of the management regime and governance has been made. In the case of a transboundary catchment it is of course very hard to make an simple classification which is true for all the cases and is consistent on all levels. Therefore table 1.1 gives an image of these issues on the level of the Rhine catchment.

Table 1.1 First classification management Regime Rhine Catchment, based on Annex I.

Dimension	***Prevailing Regime***	**Prevailing**	**Between**	**Integrated, Adaptive**	***Integrated, Adaptive Regime***
Governance	Centralized, hierarchical, narrow stakeholder participation		**X**	**X** Relatively decentralised government structures, many interactions in formal and informal actor networks.	Polycentric, horizontal, broad stakeholder participation
Sectoral Integration	Sectors separately analysed resulting in policy conflicts and emergent chronic problems		**X**		Cross-sectoral analysis identifies emergent problems and integrates policy implementation
Scale of Analysis and Operation	Transboundary problems emerge when river sub-basins are the exclusive scale of analysis and management		**X**		Transboundary issues addressed by multiple scales of analysis and management
Information Manage ment	Understanding fragmented by gaps and lack of integration of information sources that are proprietary		**X**	**X** Lot of joint research, information exchange, but still gaps in certain types of information, communication about uncertainties / assumptions / needs etc.	Comprehensive understanding achieved by open, shared information sources that fill gaps and facilitate integration
Infrastructure	Massive, centralized infrastructure, single sources of design, power delivery	**X** At present mainly large-scale infrastructur e (but might be appropriat)	**X** but also trends to decentralisation of infrastruction, eg detention reservoirs on Upper and Middle Rhine instead of dike reinforcement		Appropriate scale, decentralized, diverse sources of design, power delivery
Finances and Risk	Financial resources concentrated in structural protection (sunk costs)		**X** (the prevailing and adaptive description can exist at the same time)		Financial resources diversified using a broad set of private and public financial instruments

1.2 Spatial scales / Geographical focus

The case studies Rhine is divided into sub cases on different spatial scale, the catchment and transboundary scale and the local, waterboard level.

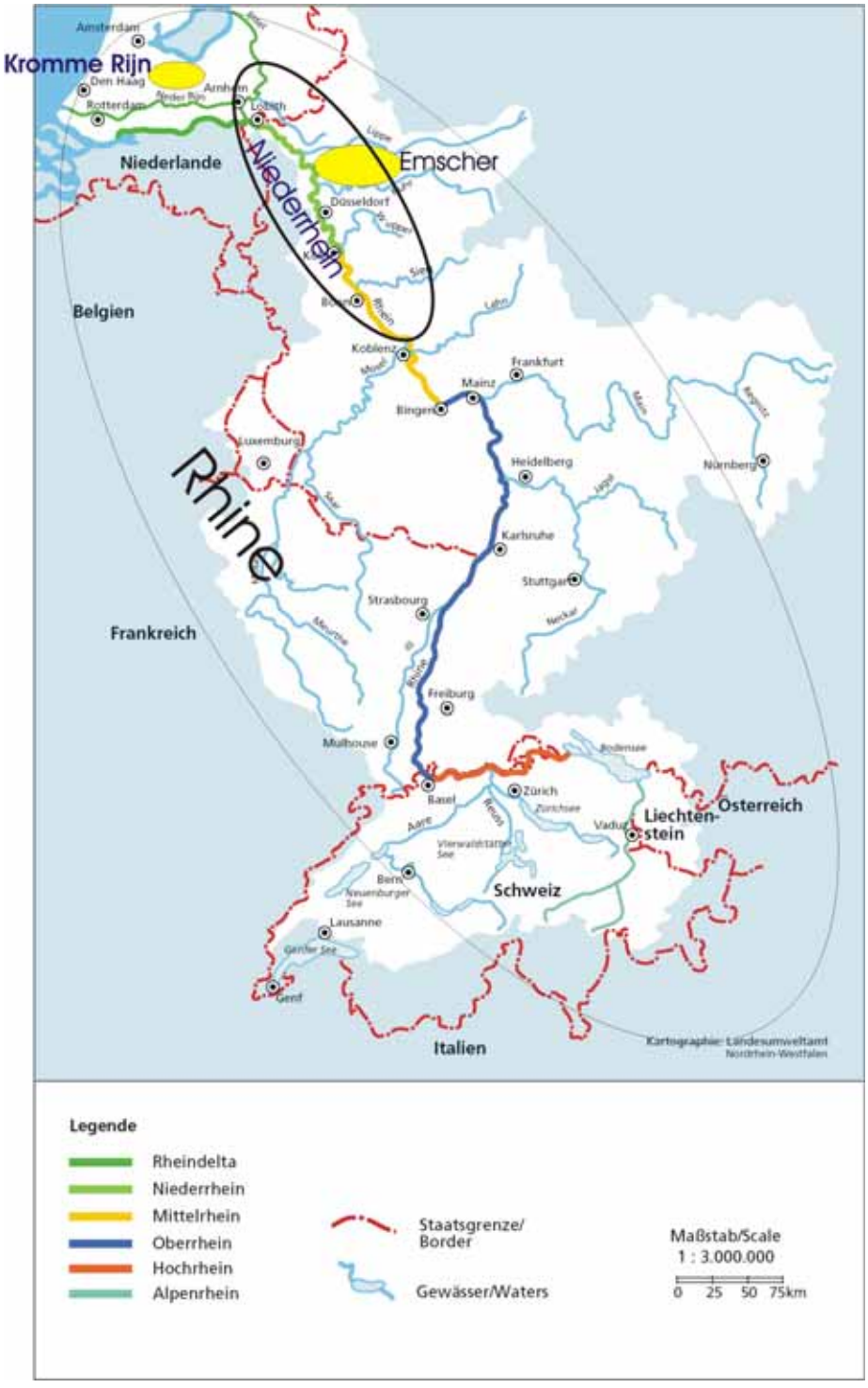

Figure 1.1 Location of the sub cases in the Rhine basin.(LUA, 2002).

Catchment and transboundary scale

Rhine Catchment
The main research issue on the catchment scale will be investigation of **the possibilities of integration** of Water framework directive (WFD) with EU flood initiative (Flood management plan FMP) into one catchment management plan on the catchment scale.

Niederrhein – Transboundary case focused on flood protection.
This case is linked to the transboundary (international) German Dutch working group on flood protection. The main goal of this study is to investigate current cross-boundary cooperation on flood risk and drought adaptation strategies between Nordrhein-Westfalen and the Netherlands under climate change. The geographical focus is on the Niederrhein river basin and the Dutch Rhine Delta. The research will assess possible discontinuities in the fine-tuning process between both Rhine countries.
The reseach done in Newater is strongly linked with the Dutch project ACER (see text box "Niederrhein regional case study")

Local / Water board level

Emscher. ***The Emscher Genossenschaft (EG)*** is the main actor for the restoration of the Emscher, being an association with responsibility for both flood protection and waste water treatment – a very unusual institutional setting. The Research in the Emscher is also linked to the Dutch project Acer.

Interests in the case study are mainly the analysis of the current management strategies - how far is the EG in the transition towards adaptive water management?
What were the incentives to move in this direction? What were / are barriers? Another question is the role of stakeholders and the public in the process and the experience with participation. What are their current problems in the implementation process? And what are areas of cooperation? Given the fact that the EG has organized quite a few participatory settings, we intend to start with individual interviews to assess the current situation rather than a stakeholder workshop.

The Waterboard "Hoogheemraadschap De Stichtse Rijnlanden" ("HDSR") manages the water in the part of the Rhine-West subbasin. Part of its area is the catchment of the "Kromme Rijn" ("Curved" or "Bending" Rhine). The "Kromme Rijn used to be the main course of the Rhine flowing to the sea at Katwijk, until the Rhine found a new course to Rotterdam and the "Kromme Rijn" was even blocked from the Rhine completely. Water from the Rhine can be let in in the "Kromme Rijn". The "Kromme Rijn" now drains the water from the surrounding area which includes the sandy ridges of the "Utrechtse Heuvelrug", a glacial deposit with hills till 50 m. asl. The total catchment of the "Kromme Rijn" is approximately 35,000 ha.

The land use of the catchment is diverse: Woodland at the "Utrechtse Heuvelrug", with a drinking water extraction area, with a large nature reserve and several large estates and some villages. At the bottom of the "Heuvelrug" is a zone which use to be wet because of the seepage water from the "Heuvelrug", but is not so wet anymore because of the reduced seepage due to the drinking water extraction and the drainage of the fields which are largely used for pastures and some agriculture. In the bottom of the valley, there is agriculture, with an emphasis on horticulture.

Due to the proximity of the big city of Utrecht (300,000 inhabitants) and some smaller towns, there is a lot of recreation in the area: walking, cycling, and canoeing.

In the Water Framework Directive terminology, the "Kromme Rijn" is classified as R6: small flowing river on clay/sand. It is chosen as a WFD pilot of the R6 class for the Rhine West sub

basin. This means that in 2006 objectives for the area will have to be determined and in 2007 preferential measures.

This is an excellent opportunity for Newater to see **how adaptive water management could be implemented.** Especially for workpackage 1.4: Integration of Spatial Planning and Integrated Water Resource Management the “Kromme Rijn” pilot looks like an attractive For the waterboard the input from Newater can help to develop the water management plan in an adaptive way. This means that Newater can assist the water board with the hydrological modelling of the area, the spatial planning aspects and the stakeholder participation. The latter will be done in an innovative way.

NiederRhein regional case study

Joint case study commissioned under the NEWATER and ACER projects

In recent years, the Netherlands and Germany have been confronted on several occasions with water-related problems caused by high water levels in the rivers (1993 and 1995) and by excessive rainfall (1993, 1994 and 1998). Also extreme droughts (2003) are increasingly drawing attention to water managers Traditionally, water management in the Netherlands (and somewhat less pronounced in Germany) has been focused on flood control measures such as river training and construction of embankments. After the high floods in the 1990’s Dutch authorities acknowledged that this strategy is not sufficient to maintain safety standards in the future. Together with climate changes, i.e. more intense precipitation rates and hence more rainfall runoff is expected, a new sustainable flood risk strategy is imperative. This strategy would be based on minimizing the consequences of flooding: the new paradigm in water management became ‘learning to live with the floods’. Similar developments can be observed in Germany where sustainability is being addressed in new flood storage and retention areas by, for example, combinations with nature areas

It is acknowledged that the effect of new flood risk strategies in both the Netherlands and Germany can be further optimized if they are applied to the whole basin with improved cross border cooperation. This notion has been underpinned by recent large scale flooding events across Europe, which showed that flood risk management demands an international approach in order to minimize the impact of such floods in the future. Hence, several (inter)national programs have been initiated focusing on the development of transnational flood risk management in the Rhine basin. An example is the cooperation between the Netherlands and Germany in the NiederRhein area.

The Niederrhein comprises that section of the River Rhine that runs from the German city of Cologne (Köln), more downstream to gauging station Lobith (NL) across the Dutch-German border. One challenge is fine-tuning cross border policies, such as the difference in flood safety standards between the province of Nordrhein-Westfalen (Germany) and the Netherlands. Furthermore, recent studies (e.g. IRMA-SPONGE) showed that adaptation measures taken in the Niederrhein basin largely influence discharge levels in the Netherlands. And, it is still not clear if measures that are currently being implemented upstream in Germany are effective to cope with extreme floods or droughts downstream in the future (ICPR, 1998; Hooijer *et al*., 2004).

Goal and Research questions

The main goal of this study is to investigate current cross-boundary cooperation on flood risk and drought adaptation strategies between Nordrhein-Westfalen and the Netherlands under climate change. The geographical focus is on the Niederrhein river basin and the Dutch Rhine Delta. The research will assess possible discontinuities in the fine-tuning process between both Rhine countries. For achieving the goal, the following research questions have been setup (indicated with a link to either the Newater or ACER projects):

1.3 Current use of tools for IWRM

The inventarisation of tools resulted in the following list:

Table 1.2 Existing IWRM Tools (CEH and Cranfield, 2005[1])

Tool	Problem life cycle				Functionality					Topics						Tool types							Intended users / user friendliness				Scientific verification of tool				Extent of current use of tool				Relevance for NeWater					Comments
	Identification	Designing	Implementation	Evaluation	Data handling	Model simulation	Communication	Participatory processes	Monitoring and evaluation	Surface water	Groundwater	Ecology	Economic aspects	Governance	Uncertainty aspects	Guideline (written, video, oral, etc.)	Questionnaire/checklist	Database and GIS	Model code with simple relations	Model code with complex processes	DSS	Role playing game	Scientists	Professionals (e.g. consultants)	Water managers	Stakeholders	General public	Not verified	Poorly verified	Moderately verified	Well verified	Not documented	Only in hypothetical cases	Used in a few case studies	Widely professional use	Uncertainty	Supports transparent processes	Interactive scenario planning	Compare scenarios (decision support)	General tool – not particularly for AM	
Toolbox Room for the River							■	■	■	■		■	■												■	■	■			■				■			■	■		www.ruimtevoorderivier.nl
Integrated basin model for the Rhine	■									■			■		■			■	■				■		■	■		■	■		■				■		■	■		Only parts not verified and document
Complex Integrated System Analysis (CISA)	■				■		■	■				■	■	■		■	■						■	■	■	■		■					■						■	
Participatory modelling	■	■			?	?	■	■		■	?	?	■	■	■			?	?	?			■		■	■			■					■		■	■	?	?	■	
AlterrAqua		■			■					■	■							■					■	■					■					■					■	
MSS; Modflow-SIMGRO-SOBEK		■				■				■	■									■			■	■				■			■			■				■		
Waternood		■				■						■	■					■					■	■					■						■				■	
Waterwise		■				■				■	■	■	■						■				■	■					■				■				■	■		Model optimization
MSS+; Modflow-SIMGRO-SOBEK+ waterquality modules (working name)		■		■	■	■	■			■	■	■						■		■			■	■	■	■			■					■			■			
The Yactclub	■	■	■	■			■	■				■		■		■							■							■				■	■	■				
Podocarpus National Park	■	■	■	■			■	■		■	■	■	■	■	■	■		■					■	■	■	■			■				■		■	■	■			
Hydro-Social Adaption Framework (HSAF)																																								

1.4 Baseline Rapid Assessment of Vulnerability for Adaptation (BRAVA)

1.4.1 Introduction to BRAVA

During the BRAVA meeting in Leipzig (September 12, 2005) and during a case study meeting in Amersfoort (September 27, 2005) the vulnerability matrix was completed. Summary results and conclusions from BRAVA .

A first rapid vulnerability assessment for the Rhine was carried out during the Rhine case study meeting in Amersfoort on September 26th 2005. The assessment was made by three groups, which focussed on sub cases Rhine/Niederhein, Emscher and Kromme Rijn. Three

[1] CEH and Cranfield University (2005) Review of current IWRM practices in the NeWater river basins. Desk study concept October 2005. (Newater deliverable 4.1.1)

groups came up with different results, but tried to fill in the threads and the exposure units. Next step is to combine these results and identify the mayor treats and exposure units.

The results of the three vulnerability assessments do have some common issues. The treats named in at least two of the assessments are: Climate, floods, droughts and water quality, agriculture, increasing urbanisation and Industrial pollution will have impact. In general the same exposure units were identified.

Rhine /Niederrhein

The assessment for the Rhine and Niederrhein mainly focussed on the scale of the Rhine catchment. Three main groups of threats, climate socio-economics and governance, were identified. The sub categories under these treats were partly filled in, mainly because of the time constraint. In the case of climate the picture is more complete. In table 1.3 circles were drawn around groups and the responsible working package (*italic*) was assigned.
The conclusion is that climate is a treat to most of the exposure groups. Not only floods and droughts but also the water quality is important. Therefore not only the safety (under exposure unit Housing and people) is affected, but also the WFD-issues. Other issues raised were the non-integration of planning (different authorities responsible for) and also the time scale problem (political agenda versus long term implementation of f.i. flood protection measures of WFD implementation)

Table 1.3 Vulnerability matrix Rhine

			Climate		Socio Economic		Governance
							Time scale
	Treats	Floods	Droughts	Quality	Flow regime	Non integtaion of spatial planning	Shot term politics v.s Long term implemenation
Exposure units		*wp 2.2*					
Energy			+				
Agriculture		+	+				
Recreation			*wp 2.3* *wp 1.5*	+			
Nature			+	+	+	*wp 1.2* *wp 1.3*	+
Navigation		+	+		+		
Drinking water				+			
Industry	*wp 1.2* *wp 1.3*	+				+	
Housing and People		+				+	+

Source Meeting case study Rhine september 2005 Amersfoort

Emscher

The assessment for the Emscher case resulted in table 1.4, where the main vulnerability exposure units are linked to threats that influence the units. The basic idea is that a threat perturbs the water system and consequently, the exposure units are being impacted. The impact was quantitatively assessed by scores from 0- -5 (-5 = high negative impact).

Table 1. 4 Vulnaribility matrix Emscher

	Threats						
Exposure units	Climate Ch Floods	Climate Ch droughts	Pollution Industry	Political change	Demography	Econom change	Agricult Policies (EU+ National)
Industry	-2						
Ecology	-3	-1	-5	-3			-2
Health	-1		-3				
Recreation	-1		-5				
Quality of Life	-1		-5				
Infrastructure	-4			-3		-3	
Personal Possessions	-2						
Political credibility	-2	-1	-5				
Agriculture	-1	-4		-3			
Cult. Heritage	-2						

Threats:

- Climate change: Changes in climate may change the frequency of floods and droughts
- Pollution: changes in industrial waste water outputs or pollution polices by the government may change the quality of water
- Political change: changes in political setting may change ongoing water management such as the development of flood storage areas as ecological valuable areas
- Demography: changes in demography may change the requirements from civilians on the quality of the water system. Also, less people in the Emscher region my lower tax income for the Emscher waterboard.
- Economic changes: Changes in economy may change subsidies to water management by different priority setting of the government
- Agricultural policies: Changes in agricultural policies may influence the use of water as well as the quality of water (e.g. less pesticides)

Major conclusions:

- Floods and water quality are threats for a wide group of exposure units
- Contrarily to what might appear when considering the table, this dos not mean that floods are the biggest threat. Priorities have not been set by considering the vulnerability.
- This goes with the fact that water quality is seen as a bigger challenge than water quantity by the Emscher Genossenschaft, the main stakeholder in the basin.
- The table can only serve to give a very rough overview, as it would also need to be discussed with the stakeholders and other experts.

Some notes for further study:

- The scale of 0-5 only lists negative impacts. May be better to use ++ to – scale.
- In this table, all effects of the drivers on the exposure units are equally probable. In reality, priorities can be set provided by policy makers, or quantitative information from scenario analysis can be used.

- Time scale has been neglected: vulnerabilities of the exposure units to the drivers may change over time (in the Emscher very important due to the Emscher reconstruction)
- Related to the time aspect: there are feedback loops over time that are not addressed.
- There are overlap in threat and exposure units.
- Threats could be grouped
- Threats are originating from different scales (EU, regionetc.)

Kromme Rijn

A first vulnerability assessment for the "Kromme Rijn" area within the waterboard HDSR ("De Stichtse Rijnlanden") in the Netherlands was carried out at a workshop in Amersfoort on September 26th 2005. The results were later adjusted after consultation with the waterboard.

The group at Amersfoort was not very happy with the term "threat", as a certain pressure can also be seen as an opportunity. Therefore, in the vulnerability matrix, we use the more neutral term "pressure". A *positive* score indicates an *opportunity* for improving the system functioning, a *negative* one indicates a *threat.*

In the region considered flooding is not a main issue, though certainly of relevance. In the table the distinction is made between internally induced flooding and the threat from the river Rhine.

The main problems centre on water quality and desiccation. For ecological exposure units the influence of climate change can be either positive or negative. The relationship is not so simple, because *wet* terrestrial ecology is in some cases *positively* influenced by extra drought. In that case drought enhances the capillary rise to the root zone. This means extra Ca-rich groundwater for the pH-buffering (* in table below). In the case of extra flooding, it is the quality of the water that determines whether or not the influence on wet terrestrial ecology is positive or negative (^).

Agriculture is influenced from both the climate and the policy side; the viability of agriculture is in question. The influence of desiccation by agriculture on agriculture itself (#) is a mix of reducing the crop damage caused by too wet conditions, and by increasing the crop damage by too dry conditions. The negative impact of agricultural policies on agriculture is due to the (ongoing) reduction of market protection, meaning lowering of prices due to competition from outside the EU. In this sense the policies are a threat. On the other hand more funds are becoming available for individual income support, especially if other functions are serviced. So in this respect the policies are an opportunity ($).

Table 1. 5 Vulnaribility matrix Kromme Rijn

	Pressures									
Exposure units	Climate change Floods In/extern.		Climate change Droughts In/ extern.		Pollu-tion by Industry	Desic-cation by Agricult.	Pollution by Agric.	Demo-graphy	Environ-mental Policies	Agricul-tural Policies
Industry	-1	-4	-1	-2	0	0	0	3	-3	0
Terrestrial Ecology, dry types	-2	0	+5	0	0	3	-2	-2	2	3
Terrestrial Ecology, wet types	-5/5 ^	0	-5/5 ^	0	-1	-5	-5	-5	5	3
Aquatic Ecology	-4	0	-5	0	-1	-5	-5	-4	5	3
Health	-3	-5	0	-2	-1	0	-3	-3	3	3
Recreation	3	0	-3	0	-1	-1	-1	-4	5	3
Personal Possessions	-3	-5	-1	-1	0	0	0	0	0	0
Agriculture	-2	0	-5	0	0	-3/5[#]	0	-2	-5	-4/4[$]
Cult. Heritage	0	-5	-2	-2	0	-1	0	-5	2	2

For explanation of special symbols in table, see text above.

1.5 Stakeholder roles and feedback

The stakeholder will participate on the level of the sub cases. The stakeholder process is under development. The first contacts have been made and interviews have been made. Meetings and workshops will take place after month 12.

An overview of the stakeholders and the connection with the sub cases is given in table 1.6.

Table 1.6 Sub cases Rhine and stakeholders

Catchment and transboundary level	Stakeholders
Global scale Rhine	ICPB, CC-Rhine, working group B – Integral River Basin Management), CHR
Transboundary – Niederrhein	German Dutch working group on flood protection (main partners) Province of Gelderland; Rijkswaterstaat and MURV of NRW
Local/ waterboard level	
Emscher	The Emscher Genossenschaft (EG)
Kromme Rijn	The Waterboard “Hoogheemraadschap De Stichtse Rijnlanden” (“HDSR”)

ICPR / CC-Rhine is the commission that deals with basin wide implementation of WFD and in the future with the implementation of the new flood directive.

CIS-B. The CIS (Common Implementation Strategy) The implementation of the Water Framework Directive raises a number of shared technical challenges for the Member States, the Commission, the Candidate and EEA Countries as well as stakeholders and NGOs. In addition, many of the European river basins are international, crossing administrative and territorial borders and therefore a common understanding and approach is crucial to the successful and effective implementation of the Directive.
In order to address the challenges in a co-operative and coordinated way, the Member States, Norway and the Commission agreed on a Common Implementation Strategy (CIS) for the Water Framework Directive. The working group B deals with IWRM.

CHR
The International Commission for the Hydrology of the Rhine basin (CHR) is an organisation in which the scientific institutes of the Rhine riparian states formulate joint hydrological measures for sustainable development of the Rhine basin. The CHR was founded in 1970 following advice by UNESCO to promote closer co-operation in international river basins. Since 1975, the work has been continued within the framework of the International Hydrological Programme (IHP) of the UNESCO and the Operational Hydrological Programme (OHP) of the WMO. The member states of the CHR are: Switzerland, Austria, Germany, France, Luxembourg and the Netherlands.
CHR's mission and tasks are:
- Expansion of the knowledge of the hydrology in the Rhine basin
- Making a contribution to the solution of cross-border problems

German Dutch working group on flood protection This group consist of the Ministry of Enviromnet (MURV) of North Rhine Westfalia, the province of Ge;lderland and Rijkswaterstaat. Present are also waterboards from both sides of the Dutch-German border. This group is the main stakeholder (or group of stakeholders) for the sub-case Niederrhein.

The Emscher Genossenschaft (EG) is the main actor for the restoration of the Emscher, being an association with responsibility for both flood protection and waste water treatment – a very unusual institutional setting.
The EG works in a very innovative way, with an excellent public relations department and good communication with stakeholders and the general public. The EG has developed and partly implemented innovative approaches in integrated flood management (real time forecasting tools, areas to be flooded temporally). It also experienced problems with e.g. legal restrictions to apply innovative tools in flood management, conflicts with real estate owners whose property suffered a decline in value due to new flood management schemes. The EG participates in a couple of EU projects, in particular a transboundary INTERREG project on floodplain restoration.

For the sub-case study of the Emscher further major stakeholders are the members of the Emschergenossenschaft, including the municipalities in the river basin and major industries, as well as mining companies.

Further the Ministry of Environment of the Land NRW is a major stakeholder for the Emscher, also dealing with floods, the implementation of the WFD and the Emscherumbau. The Ministry of Environment is thus a common stakeholder for the Emscher and the Niederrhein sub-basins. Also the sub-branches are of importance, especially for the implementation of the WFD: the Staatliche Umweltämter.

The procedure for the participation will differ per sub case, however the set up will be that the appraoches can be compared.

Waterboard Stichtse Rijnlanden. This waterboard is the main stakeholder for the sub-case de Kromme Rijn.

1.6 Participatory definition of research needs

In this chapter the connection between the research done in WB1 and WB2, specified per wp, and the sub-cases for the Rhine are given along with the research question. The reseach agenda has been defined on the sub-case level and has been discussed within the case study team-meetings and also with the stakeholders in sub-cases.

The working packages involved in the Rhine case are given in table 1.7:

Table 1.7. Working packages involved in the Case study Rhine

Working package	**Sub-case**
WP1.1 Adaptive management regimes	Emscher
WP1.2 Governance, institutions and participation	Governance on whole Rhine; Participation on NiederRhein, Emscher
WP1.3 Transboundary regimes	Niederrhein
WP1.4 Integration of IWRM and spatial planning	Kromme Rijn
WP1.5 New Methods of Managing Buffering Capacity	Whole Rhine
WP1.7 Methods for the transition to adaptive management	Emscher and Kromme Rijn
WP2.2 Understanding the consequences of climate hazards and climate change	Whole Rhine and Niederrhein
WP2.3 Resolving conflicts between water quantity, water quality and ecosystems	Whole Rhine
WP 2.5 Resilience and Adaptive Capacity of Complex Water Systems	Emscher
WP2.6 Scenarios and future trends in driving forces for IWRM	Whole Rhine and Niederrhein

On working package level the following connection exist with the sub-cases. Included are the partners which are involved.

Table 1.8 Sub cases and the working packages involved

Sub case	**Working package and Institutes**
Global scale Rhine	1.2 (IvM); 1.3(RBA); 1.5(Cemagref); 2.2(WUR) 2.3 (Alterra); 3.2 (RIZA)
Transboundary – Niederrhein ,	1.2(IvM); 1.3(RBA); 2.2(WUR); 2.3 (Alterra); 3.2 (RIZA)
Emscher	1.2(IvM); 1.7(USF;COPP,ICIS/DRIFT); 2.5(USF, Seecon)
Kromme Rijn	1.4(Alterra, RIZA); 1.2(IvM);1.7(ICIS/DRIFT,UT, COPP)

1.6.1 Sub case Rhine Catchment (lead RIZA)

The sub case Rhine catchment deals with the more basin wide issues, such as governance, trans boundary regime, buffering capacity, climate impact, ecology, EU legislation e.o. Because not all the issues have the same scale some of the issues are also or only dealt at the sub case level. Therefore the scaling issue concerns the whole CS Rhine and puts together the different sub-cases. The scaling question is a joint effort for all CS members under the umbrella of the sub-case Rhine Catchment. Everybody will bring in his experiences in respect to scaling and this would enable to link the sub-cases in a coherent way.

Wp 1.2 Governance
Role of insurance companies: desk study for the whole basins Rhine, Orange, Amu Darya; will be decided on September 5th. (IvM)

WP 1.3 Transboundary regimes (RBA**)**
The RBA Centre is responsible for the following product:

- A state-of-the-art review of transboundary river basin management;
- Analysis about how the EU can support transboundary flood management, based on the Niedderrhein case.

WP 1.5 – New methods for managing buffering capacity (Cemagref)
The storage capacity of reservoirs is often designed to have a major buffering effect on surface water resources. Buffering behaviours can be found in various water related systems. This work package will focus on:

- Hydrological and hydrogeological regimes
- Reservoir management
- Aquifer management
- Impact of climate change

The objective of WP 1. 5 are:

1) Develop the applications of buffering capacity concept to water quantity issues
2) Establish a practical methodology (scoring system) to assess various components of buffering capacity
3) Build simple modeling architectures (basin scale, lumped models) to test a wide range of adaptive management alternatives in case studies context
4) Identify water management practices to increase buffering capacity (including both physical conditions and institutional framework)

The general objective is to build operational tools supporting buffering capacity management. In the Rhine case the focus will be on Reservoir management and Aquafier management.

WP 2.2 Understanding the consequences of climate hazards and climate change. (WUR, MPI)

This wp will work on the scale of the whole Rhine. This wp will generate information on the effects of climate change (and land use change?) on the hydrology, which is again input for the Case Niederrhein.

Wp 2.3 Resolving conflict between water quantity and water quality and ecosystem**s.** (Alterra, RIZA)

This wp will focus on water quality problems in relation with water quantity and questions about water quality problems in which area + environmental flow. An important aspect for NeWAter is, that beside the focus on flood issues there should also be attention for the

WFD-issues. This wp will provide information to sub-cases which are more focussed on flood issues.

Within the implementation of the WFD there is not very much attention for f.i. the climate and other uncertainty issues. This has been recognised, as a research need, therefore there is a strong motivation for including the water quality aspects. The Rhine will be one of three cases. The other two are Nile and Amu Darya.

Wp 2.6 Scenarios and future trends in driving forces for IWRM (CERS)
WP 2.6 will only compile a country-specific description of driving forces (demographic change, economic development, technological change and others. WP2.6 decided to select the Elbe, Tisza and Orange as the cases where we want to make some investigations in more detail.

1.6.2 **Sub case Niederrhein (Lead Newater – RIZA ; ACER- IvM)**

For achieving the goal, the following research questions have been setup (indicated with a link to either the Newater or ACER projects): The NeWater work in the sub case Niederrhein is closely linked with the ACER-project. Therefore both activities of both projets are listed here.

ACER: This project aims to develop new cross boundary adaptation strategies for the Rhine basin under climate change (till the year 2050) and to investigate the robustness of these strategies. For this an integrated basin wide model will be developed.

NEwater: NeWater aims at studying the transition from currently prevailing regimes of river basin water management into more adaptive regimes in the future. NeWater identifies key typical elements of the current water management system and focuses its research on processes of transition of these elements to adaptive IWRM. Each key element is studied by novel approaches.

Governance and Institutions

Newater WP 1.2 (IVM)

- What are the main national water policies in the riparian countries in the Rhine basin?

Transboundary policies

Newater WP 1.3 (RBA)
The RBA Centre will explore the use of models in participatory processes in transboundary flood management. The activities in the Niederrhein area will be focused on developing a shared vision on transboundary flood management and identifying strategies to reach this desired situation. Modelling will support the development of shared insight in current and future behaviour of the flood management system, incorporating physical, socio-economic and institutional aspects, as well as uncertainty and change. The following questions will be adressed in the sub case Niederrhein:

- What is the current institutional structure in the Niederrhein area (including actors networks, law, policy and influence EU)?
- Which shared long-term vision can be developed for flood management in Nordrhein-Westphalia and Gelderland?

Scenario's

ACER (KNMI)

- What scenarios related to climate change can be projected for the Rhine basin (both floods and droughts)

- See also the involvement of WP 2.2 and 2.6 listet under the sub case Rhine.

Adaptation measures

ACER (IVM)
- What are the current flood risk and drought measures of the Netherlands and Nordrhein-Westfalen with respect to the Rhine Delta and Niederrhein respectively?
- Are the proposed adaptation measures to flood risk control and drought mitigation in Nordrhein-Westfalen effective to guarantee Dutch safety standards during extreme flood events?
- How effective are proposed measures to mitigate extreme droughts, with and without CC

Participation

Newater - WP1.2 (RBA)
- Which participatory methods can be applied to support problem framing, vision development and strategy development in the Niederrhein area?

ACER (Seecon)
- Facilitating participatory approaches in the NiederRhein area

Models

NeWater WP 1.2/1.3 (RBA)

– What are the important factors and relations in the physical, socio-economic and institutional flood management system in the Niederrhein area?

Newater WP 2.2 + ACER (WUR)
- Hydrological model for the whole Rhine basin
- ACER (IVM –WL)
- Hydrodynamic model for the Rhine
- ACER (VU, Alterra)
- Atmospheric model

Newater WP 2.3 (Alterra)
- Water quality model for the Rhine

*Performance of adaptive regime*s

Newater- WP1.2 (IVM, WUR)
- What relation can be found between institutional settings and the development of measures in the NiederRhein area. What are possible changes in the future?

ACER (IVM)
- Which new institutional settings are needed between Germany and the Netherlands in order to develop more robust strategies to adapt to both floods and droughts under uncertainty
- Can we prioritize measures in developing robust adaptation strategies under uncertainty?

1.6.3 Sub case: Emscher case study (Lead USF)

The Emscher sub-case is also a joint case study with the ACER project

WP 1.1 /WP 1.2 / WP 1.7
USF; IvM
Emphasis lies on management paradigms, with much attention on the question of flood protection. The management style of the Emschergenossenschaft (Genossenschaftsprinzip) and role of stakeholders will be analysed (lead USF), in view of an element of adaptive management. In a joint effort of USF and IVM, the management styles and role of stakeholder will be compared with the ones of the Dutch water board “Stichtse Rijnlanden” that are investigated under the lead of IVM.
Attention will further be drawn to the question of spatial misfits in the Emscher basin (co-operation of the different entities like municipalities, Kreise etc.)
There is a further interest to approach the the scale issue (international river basin, Niederrhein, Emscher, Stichtse Rijnlanden) together with the other partners of the CS Rhine, also in view of bottom-up and top-down processes in the field of flood protection.
IVM further works on the risk management process in the Emscher basin.

WP 1.2
USF
As part of WP 1.2, an actor and rule based methodology will be applied to analyse the adaptiveness of institutions as well as interactions between different kinds of institutions, e.g. formal and informal, market based and governmental. An agent-based model will be developed to represent institutional dynamics. It will be applied to compare different institutional regimes regarding their ability to accommodate future uncertainties and to simulate how different management strategies affect coping capacity with extreme climatic events. This model has the Emscher as a basis and uses information from stakeholders meetings. However, it will be a conceptual model and not be spacially explicit. On this conceptual level, it can be used to test different hypotheses about the adaptiveness of management regimes. Its proximity to the Emscher case study will make it possible to be used in a participative process.

WP 1.7
USF
As part of WB1.7 modelling exercise, a simulation model that helps understanding transitions towards adaptive managing regimes is being developed. The goal of this model is to elucidate alternative paths of possible managing solutions. This model considers that the cultural setting where the managing activities are carried on promotes different managing styles and possibilities of change. This model will be applied in the Guadiana, Emscher and Amudarya case studies.

DRIFT/ICIS
DRIFT/ICIS has a limited role in the Emscher subcase. For a better understanding of the success factors (and barriers) in transitions in water management, a short transition analysis of historical developments will be made. This will be as much based on information gathered in other NeWater activities and possibly complemented by a few key interviews.
The available resources for activities by DRIFT/ICIS in the Emscher region are limited, therefore if and to what extent DRIFT/ICIS will be involved in the subcase will depend largely on the opportunities to cooperate and learn from other NeWater activities in the subcase.

COPP
COPP research objectives in WP1.7 are:
- to better understand the frames and frame differences adopted by stakeholders,
- to discover if and how stakeholders enlarge, revise or adapt their frames as a result of collaborative interaction with other stakeholders,
- to identify favourable conditions, triggers and obstacles to deal constructively with frame differences.

- The research activities in the Emscher case will consist of :
- (additional) interviews with stakeholders to get (further) insight into the multiparty situation at (inter)organisational level,
- observing (and if possible taping) the multiparty sessions to registrate how stakeholder representatives interact with each other (at the individual level).

If necessary, COPP can also contribute to the Emscher case with his experience in designing multiparty settings.

WP 1.7/ WP 2.5
USF / Seecon
As part of WP 1.7 and WP 2.5, a stakeholder process of the Emschergenossenschaft will be supported and analysed. (participatory transition) Emphasis lies on the role of models for participative processes and knowledge elicitation for models. Resilience will be analysed using mental models through participatory, stakeholder-driven assessment.
It is aimed to develop and implement a participatory process on a flood protection measure together with the Emschergenossenschaft and to reflect that process in an "action research".

1.6.4 Sub case Kromme Rijn (Lead RIZA)

Wp 1.2 Governance (IvM)
Participation and making of a Catchment vision

Wp 1. 4 Integration of IWRM and spatial planning (Alterra, RIZA, IvM and UTW**)**
Set up an integrated Waterwise model for the area and use it in conjunction with the AMR-method (Aerts and Droogers, 2004; Walsum et al. 2005)[2].

The following activities are envisaged:
- Set up an integrated Waterwise model for the area and use it in conjunction with the AMR-method (Aerts and Droogers, 2004, Van Walsum et al. 2005).

The issues that will be addressed are:
- water quality problems caused agriculture through nutrient loading of groundwater and surface water;
- desiccation problems caused by agricultural drainage and drinking water extraction;
- possibilities for micro/meso storage of water to ameliorate flooding (internal caused);
- influence of housing on the 'damage' function of flooding;
- indirect effects of flooding;
- ecological effects (terrestrial and aquatic);
- agricultural income effects (wetness and drought damage);
- risk management of climate variability and uncertainty
- spatial planning aspects, chorological and topological
- stakeholder interactions, for building of water-space partnerships

WP 1.7 Methods for the transition to adaptive management (COPP, ICIS/DRIFT)
COPP explores the possibilities for transition towards adaptive water management by using the framework of multiparty collaboration and social learning. These processes are based on respect, involvement and the development of commitment.

[2] Aerts, J. and Droogers, P. 2004. Climate Change in Contrasting River Basins: Adaptation Strategies for Water, Food and Environment. CABI Books, London, 288pp

Van Walsum, P.E.V., J.C.J.H. Aerts, J. Krywkow, A. van der Veen, H. der Nederlanden, M. Q. Bos, B.T. Ottow. Framework for integrated design of water and land management systems; towards robust water-space partnerships as a basis for adaptive water management. Report to the NeWater project, Wageningen, 2005.

In multiparty situations as river basins are, much ambiguity results from the different perspectives and frames that the stakeholders bring to the dicision-making process. Different stakeholders will understand the situation differently, prioritize different problems, include or exclude different issues and favour different kinds of solutions. For reaching effective collaborative water management it is crucial to deal with this ambiguity by tuning the different frames into collectively acceptable problem domain definitions.

The research objectives therefore are :
- to better understand the frames and frame differences adopted by stakeholders,
- to discover if and how stakeholders enlarge, revise of adapt their frames as a result of collaborative interaction with other stakeholders,
- to identify favourable conditions, triggers and obstacles to deal constructively with frame differences

Our research activities will consist of interviews with stakeholders to get insight into the multiparty situation at (inter)organisational level. The multiparty sessions will be observed (and if possible taped) to registrate how stakeholder representatives interact with each other. If necessary COPP can also contribute to the Kromme Rijn case with his experience in designing multiparty settings.

ICIS/Drift will carry out a transition analysis (multi-level/multi-phase/multi-change) for the region in order to understand and asses in which direction the region is developing. For this, ICIS/Drift will consult stakeholders using in-depth interviews. ICIS/Drift will help organizing focus groups with regard to the process design in order to develop transition paths based on transition framework methodology.

The research questions are:

- In which direction is the Amstelland region (incl. Kromme Rijn) developing?
- Can we characterize this as the unfolding of a transition?
- Can the (Amstelland incl. Kromme Rijn) long term vision be regarded as adaptive?
- What does this mean for physical infrastructure?
- What does this imply for the current water management institutions?
- What do stakeholders see as possible transition paths?
- What are barriers and oppurtunities?
- What needs to be done on the short term?

Summary

The Figure 1.2 shows the activities within both the NEWATER and the ACER projects structured around each case study area. All modelling activities are depicted in purple/blue. A green box shows case studies where water management measures will be assessed and evaluated with a model

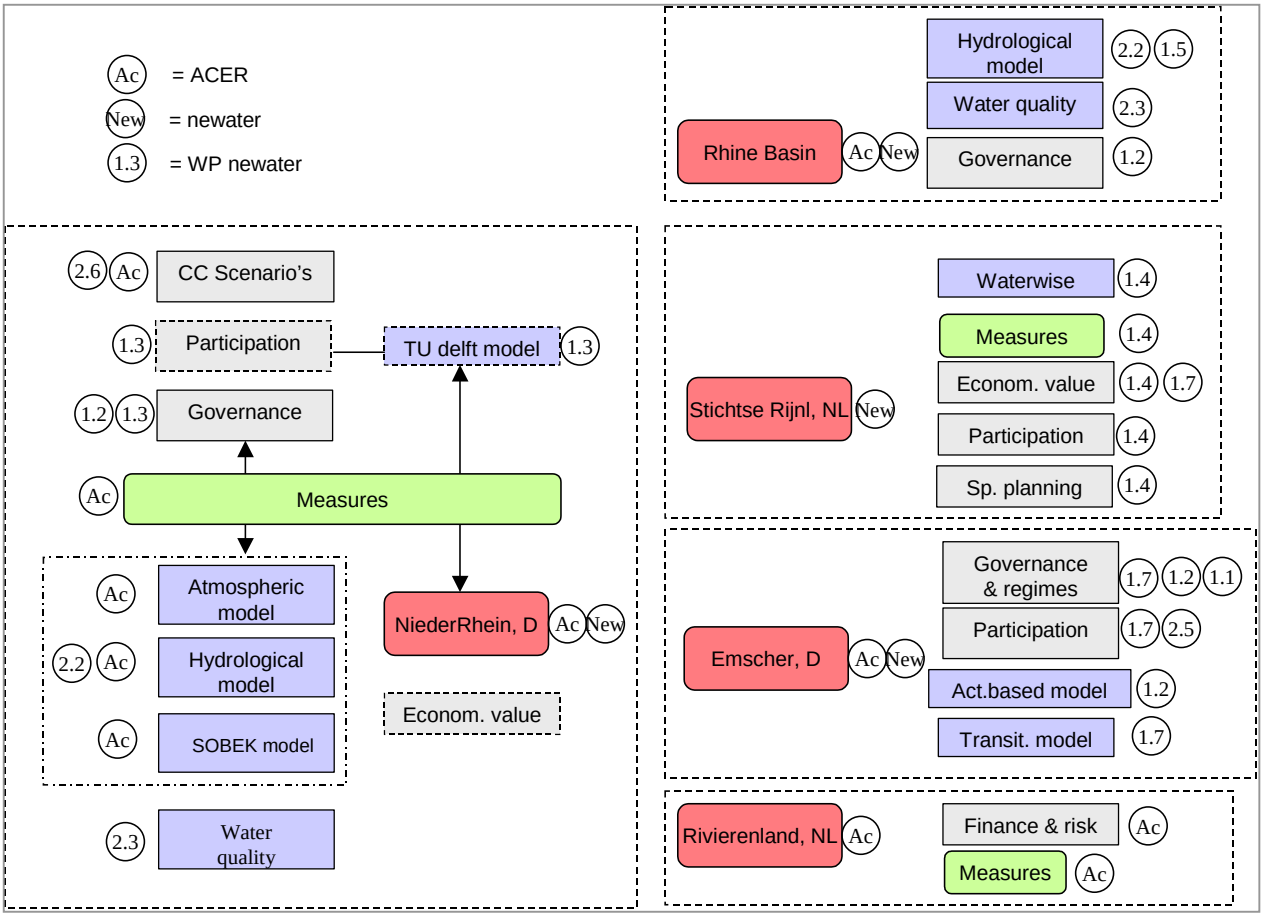

Figure 1.2 Activities and interconnection of Newater and ACER

2 Activities to Month 18

2.1 Research Activity tree

In figure 2.1 and 2.2 the research questions along with the connection with the research is listed. The research tree is made for the 4 sub cases and is listed in 4 figures because of the readability. In some cases the same research question are dealt in two or sometimes in all the cases, to be able to do comparisons. One of these is the issue of scales.

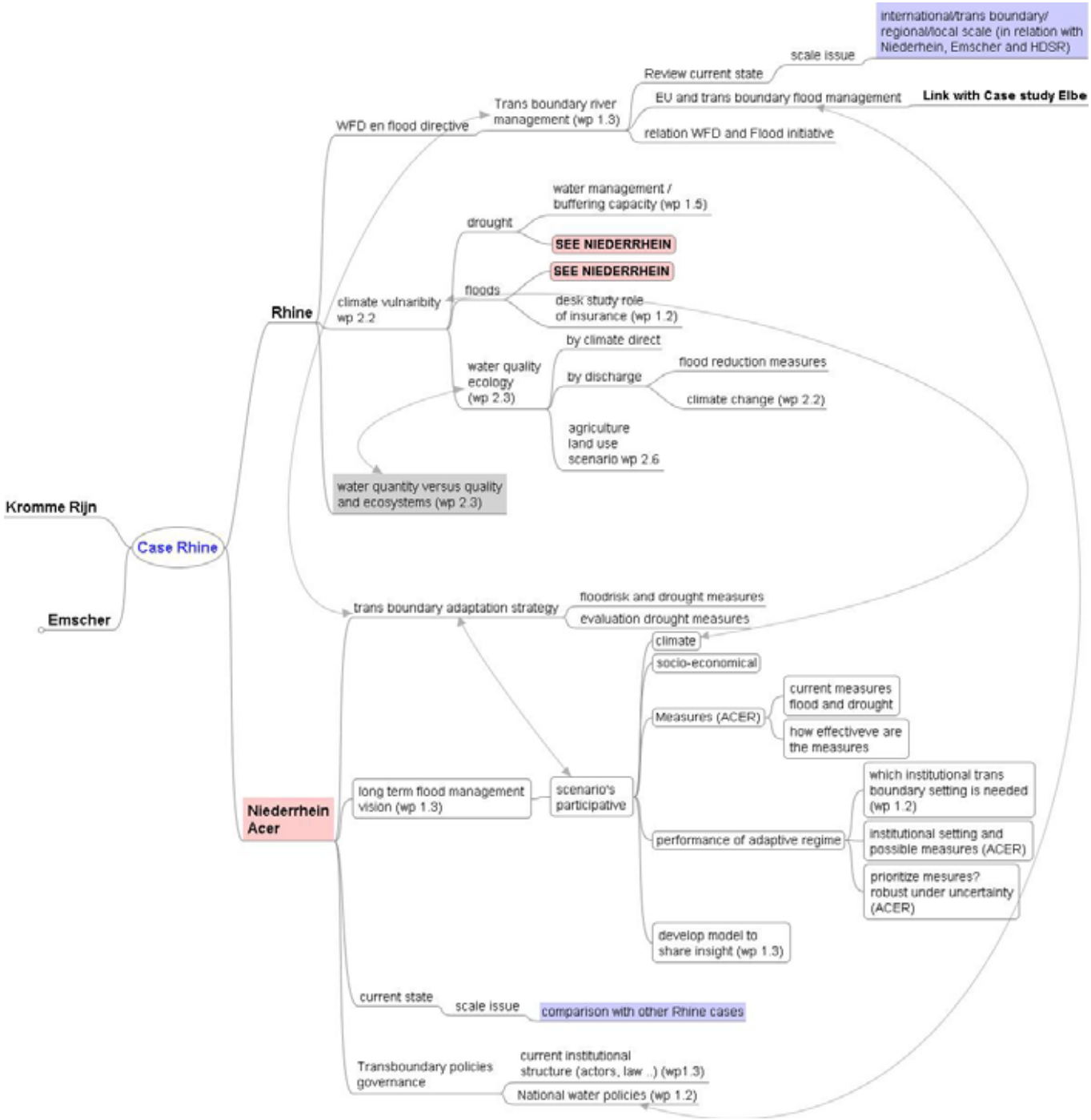

Figure 2.1. Research activity tree sub cases Rhine and Niederrhein/Acer

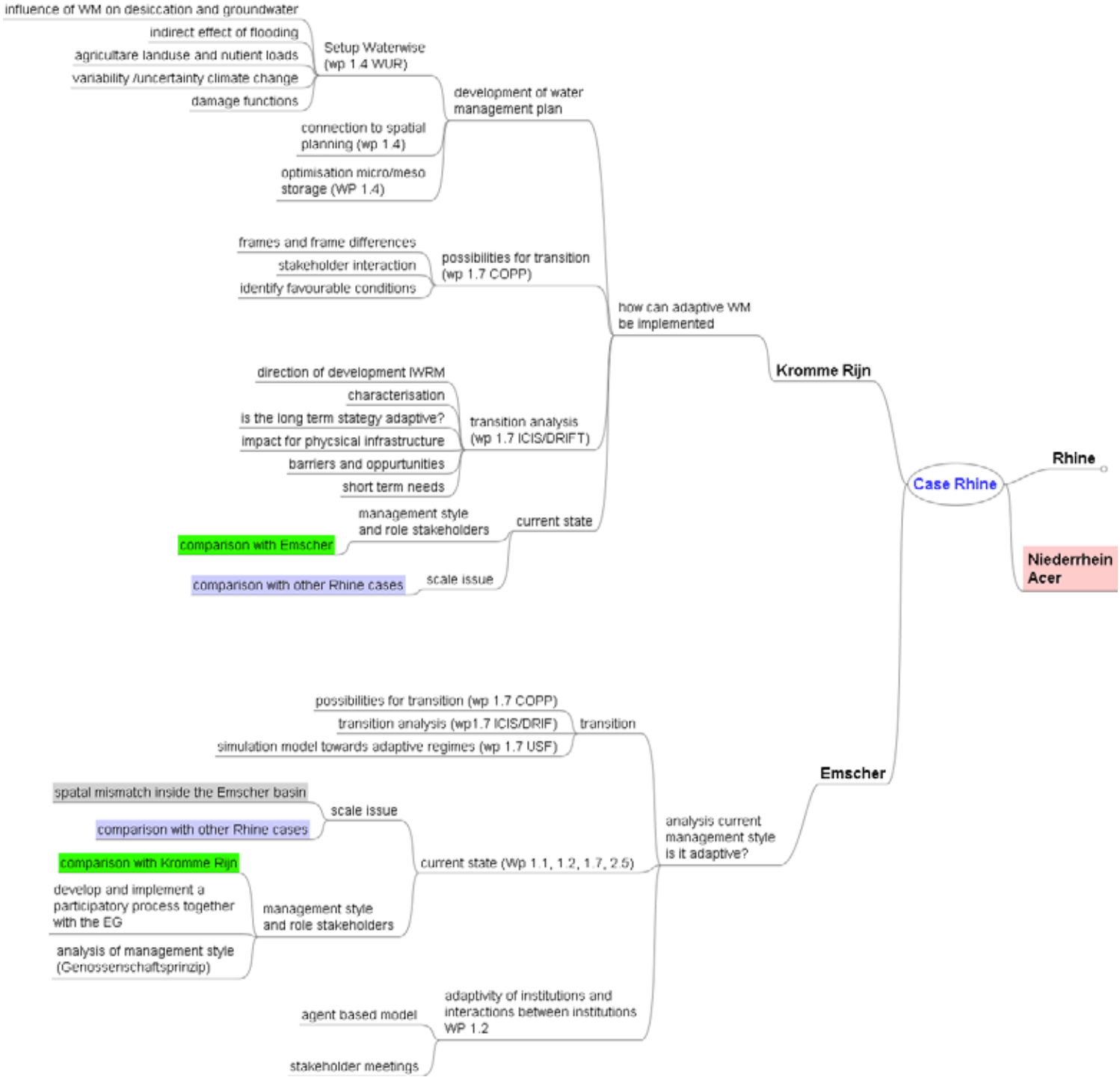

Figure 2.2 Research activity tree sub cases Emscher and Kromme Rijn

2.2 NeWater work plan (from DoW for the Rhine)

RIZA will be the lead scientific partner. RIZA is also one of the stakeholders, representing the downstream part of the basin. Contacts have been established with the Emschergenossenschaft responsible for the water management in the Emscher sub-basin and involved in a large transboundary German-Dutch InterReg project on flood plain protection. Cooperation will be established with the Commission for the Hydrology of the Rhine Basin (CHR), and additional work will be done to involve the other stakeholders in the inception phase.

The work in the Rhine basin will follow a procedure which is broadly common across all case study basins. It will consist of co-ordination, data collection and synthesis, stakeholder processes and interactions, and evaluation and synthesis of the results. There will be three phases, of which two are in the first 18 months of the project. The first is an inception phase in which an assessment of the current situation is carried out, leading to definition of the issues where improved understanding and methods are needed. This will be carried out by synthesis of the existing information, combined with the stakeholder process. Based on this, the research agenda for the activities within WBs 1 and 2 to be carried out in the Rhine basin will be defined, and the needs for tools and capacity building will be determined.

In the next phase, improved management strategies and tools will be developed and applied practically in the basin. These activities are described under WBs 1, 2 and 4, but the co-ordination of the work in the basin is considered as part of this work package. The application of the new methodologies and approaches will be carried out via an interaction between the researchers and stakeholders and practical managers in the basin. This will be vital in order to monitor and redirect some of the research priorities within each topic as needed.

The tasks under the work package (for the first 18 months only) can be broken down as follows:

3.2.1 Initiation. Contacts will be made with all relevant actors (researchers, stakeholders, practitioners, managers, etc), and the activities will be planned and co-ordinated, including the development of a protocol for baseline data collection and assimilation.

3.2.2 Baseline data collection and assimilation. A knowledge base on the wide range of issues relevant to IWRM in the basin will be developed by interviews and by synthesis of the existing research and consultancy reports.

3.2.3 Adaptation of stakeholder approach to needs of basin. The generic stakeholder process (WP3.1) will be adapted to the needs and culture of the basin.

3.2.4 Initial stakeholder workshop in the basin. This will have participation from all relevant stakeholders; it will include presentation of the possibilities for research in the basin (from WBs 1 and 2) and obtain feedback on the needs for research, tools and capacity building.

3.2.5 Report on current status in the basin. Based on the output of tasks 3.2.2 and 3.2.4, a report on the current status of the basin in relation to water and IWRM issues in particular will be prepared. It will cover all the relevant issues, providing a baseline against which progress during the project, and beyond, can be measured.

3.2.6 Define needs for research, tools and capacity building. A common workshop with participants from key stakeholders in all NeWater case study basins will be held (organised as part of WB6, Project platform). It will include: discussion and interaction on updated NeWater ideas on possible new methodologies, tools and capacity building; a review of results on scientific status and current practice; and discussion and conclusions on needs and barriers for new approaches. This will help to define needs which are in common across the different basins, and to derive benefits from synergies and inter-comparisons. Based on this, a research agenda will be defined for the work packages which are going to carry out research in each basin. The needs for tools and capacity building will also be determined.

3.2.7 Applied research in the basin and existing tool enhancement. Following the research agenda and needs assessment in Task 3.2.7, the research activities and tool enhancement will be carried out (work under relevant parts of WBs 1, 2 and 4).

3.2.8 Stakeholder interaction and evaluation, as required for individual research themes. The applied research activities will be co-ordinated, reviewed and evaluated as part of a process of frequent interaction between the researchers, stakeholders and practical managers in the basin. This process is to ensure there is sufficient and continuous interaction between research and stakeholders and the adaptation of ongoing activities; the approach will be flexible, and will be worked out according to the needs of each research activity as it proceeds.

Deliverables

D 3.2.1 Report Baseline assessment of the Rhine basin.

D 3.2.2 Report Stakeholder report defining needs for research, tools and capacity building.

D 3.2.3 Report Research agenda for the thematic work packages (in WBs 1 and 2) defining the research to be carried out in the Rhine basin.

Milestones and expected result

Month 2: Generic design of stakeholder process available (WP3.1)

Month 2: Materials on research methods available for presentation to stakeholders (from WBs 1,2)

Month 11: Research agenda for the thematic work packages (in WBs 1 and 2) defining the research to be carried out in the Rhine basin, and needs for tools and capacity building (link to WB 1,2,4)

2.3 Involved work packages and NeWater partners

In chapter 1.6 the work packages involved in the case study Rhine along with the Newater partners are listed.

Work packages planning to work in the Rhine basin are:

- WP1.1 Adaptive management regimes
- WP1.2 Governance, institutions and participation
- WP1.3 Transboundary regimes
- WP1.4 Integration of IWRM and spatial planning
- WP1.5 New Methods of Managing Buffering Capacity
- WP1.7 Methods for the transition to adaptive management
- WP2.2 Understanding the consequences of climate hazards and climate change
- WP2.3 Resolving conflicts between water quantity, water quality and ecosystems
- WP2.5 Resilience and Adaptive Capacity of Complex Water Systems
- WP2.6 Scenarios and future trends in driving forces for IWRM

2.4 Case Study Teams

The members off the case study team Rhine are listed in table 2.1.

Table 2.1 Case study team consist of the people from the wps, who work in the Rhine case.

Sub case	**Working package and Institutes**	**People**
Global scale Rhine	1.2 IvM	Gert Berkers; Jeroen Aerts and Dave Huitema
	1.3 RBA	Tom Raadgever and Erik Mostert
	1.5 Cemagref	Julian Lerat
	2.2 WUR	Ruud Hurkmans, Peter Troch
	2.3 Alterra	Cristian Siderius, Berien Elbersen and Oscar Schoumans
	3.2 RIZA	Hendrik Buiteveld
Transboundary Niederrhein ,	1.2 IvM	Jeroen Aerts
	1.3 RBA	Tom Raadgever and Erik Mostert
	2.2 WUR	Ruud Hurkmans, Peter Troch
	2.3 Alterra	Cristian Siderius, Berien Elbersen and Oscar Schouman
	3.2 RIZA	Rita Lammersen and Hendrik Buiteveld
Emscher	1.1 USF	Sabine Möllenkamp

	1.2 IvM USF	Jeroen Aerts Sabine Möllenkamp, Eva Ebenhöh
	1.7 USF COPP ICIS DRIFT	Sabine Möllenkamp, Marcela Brugnach Karina Rasche Greet François Mita Patel Roel van Raak and Rutger van der Brugge
	2.5 USF/ Seecon	Karina Rasche
Kromme Rijn	1.4 Alterra RIZA IvM	Paul van Walsum Bouke Ottow, Hermine der Nederlanden Jeroen Aerts
	1.2 IvM	Dave Huitema
	1.7 ICIS DRIFT UT COPP	Mita Patel Roel van Raak and Rutger van der Brugge Anne van de Veen and J. Krywkow Greet François

The coordination of the Sub case is done by:

Hendrik Buiteveld: Case study coordinator and Sub case Rhine catchment

Bouke Ottow: Sub case Kromme Rijn and responsible person for stakeholder process (design of process, analysis of each meeting, interviews),

Sabine Möllenkamp: Sub case Emscher

Jeroen Aerts: ACER

2.5 Preliminary identification of tool needs

In the inception phase the main effort was made in involving the stakeholders and defining the sub-cases. Therefore the preliminary identification of tools needed was less important. However some general remarks can be made on the tools needed. For the Rhine sub-cases it appears that the are models describing hydrology and hydrodynamics are available or are being developed. There is a need for tools that can be used to facilitate the stakeholder process. Tools that integrate the output of models and are able to produce results during sessions, or tools that can be used by the stakeholders themselves. In more detail this has to be filled per sub-case.

2.6 The NeWater approach to vulnerability: based on case study experiences

In section 1.4 the results of the Rapid vulnerability analysis is given. In the presented matrix per sub-case the main vulnerable sectors of issues can be identified. An other source of information on vulnerability and treats are WFD reports of the Rhine basin.

3 Research until Month 48

3.1 Main NeWater outputs from case study Rhine

This chapter briefly describes the main research components for a NeWater Case study and how these connect to activities in the work packages. Point of departure is what we would like to see as our main results at the end of the NEWATER project. This can be summarized in six product /activities 1 to 6. These activities and their interrelations are shown in Figure 3.1.

1. A data base of information on policy, water management strategies and governance structure and physical water system and socio-economic factors of relevance in the basin.
2. A description of the current management regime and the degree of adaptive capacity, which includes an analysis of the importance of key factors and their interdependence.
3. A description of how to transit towards an adaptive management regime for the NeWater basin, at different scales. This includes an analysis of possible future management regime(s) and their performance under different scenarios and the identification and partial implementation of actions at different levels
    a. Individual stakeholder groups and members (e.g. farmers association and individual farmer)
    b. Collective action of different groups
    c. Action at higher levels – European, trans-boundary commission
4. A set of concrete projects and management examples that strengthen adaptive management.
5. A set of indicators and tools that enable to measure the vulnerability and adaptive capacity of such regime
6. A set of pre operational tools to support adaptive management

The activities will be conducted at different scales as indicated at the left of Figure 3.1. Examples in parentheses are from the Rhine case study.

- Whole basin/transboundary (whole basin, International Rhine Commission)
- Large region/cross border (Niederrhein - downstream of Bonn)
- Regional/local (Rhine subbasin - catchment of the Emscher in Germany and de Kromme Rijn)

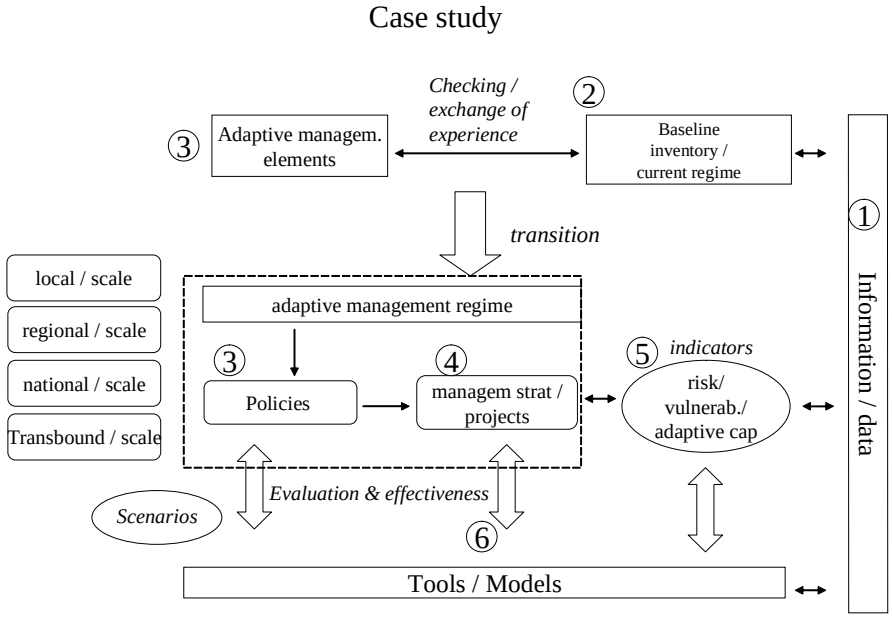

Figure 3.1. Main Newater products / activities and their inter-relations

Figure 3.1 represents research activities from the perspective of a thematic logic. Another possibility is a representation that highlights different phases and the interaction between stakeholder processes in the basins and the research activities in WBs 1,2 and 4 as shown in Figure 3.2.

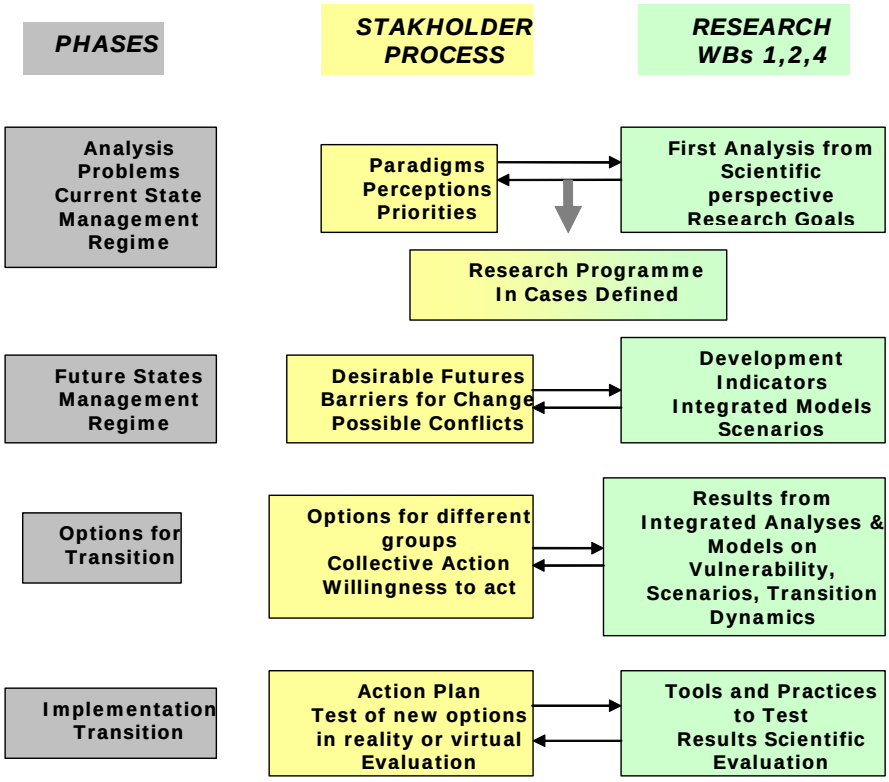

Figure 3.2 Phases and Interaction between Stakeholder Process and activtities in WBs 1,2,4.

3.2 Relation of main outputs to WP activities

It is important to note that the current activities as listed in WBs and WPs in the NeWater proposal are *not* covering the whole range of activities that would be needed to analyse and facilitate a transition in a NeWater basin towards a more adaptive management regime that is adapted to the needs and conditions of the basin under consideration. This would simply be too ambitious, and is in many ways a policy issue. However, the NeWater project can contribute to the policy processes ongoing in the EU and other stakeholders in the NeWater basin by providing relevant information and examples on the above mentioned 6 issues. A perquisite for an effective transfer of this information is for every researcher to know where her/his activity is positioned within this list of six main products/activities and how they are interrelated. This is shown in Figure 3.3, for a selected number of WBs and WPs.

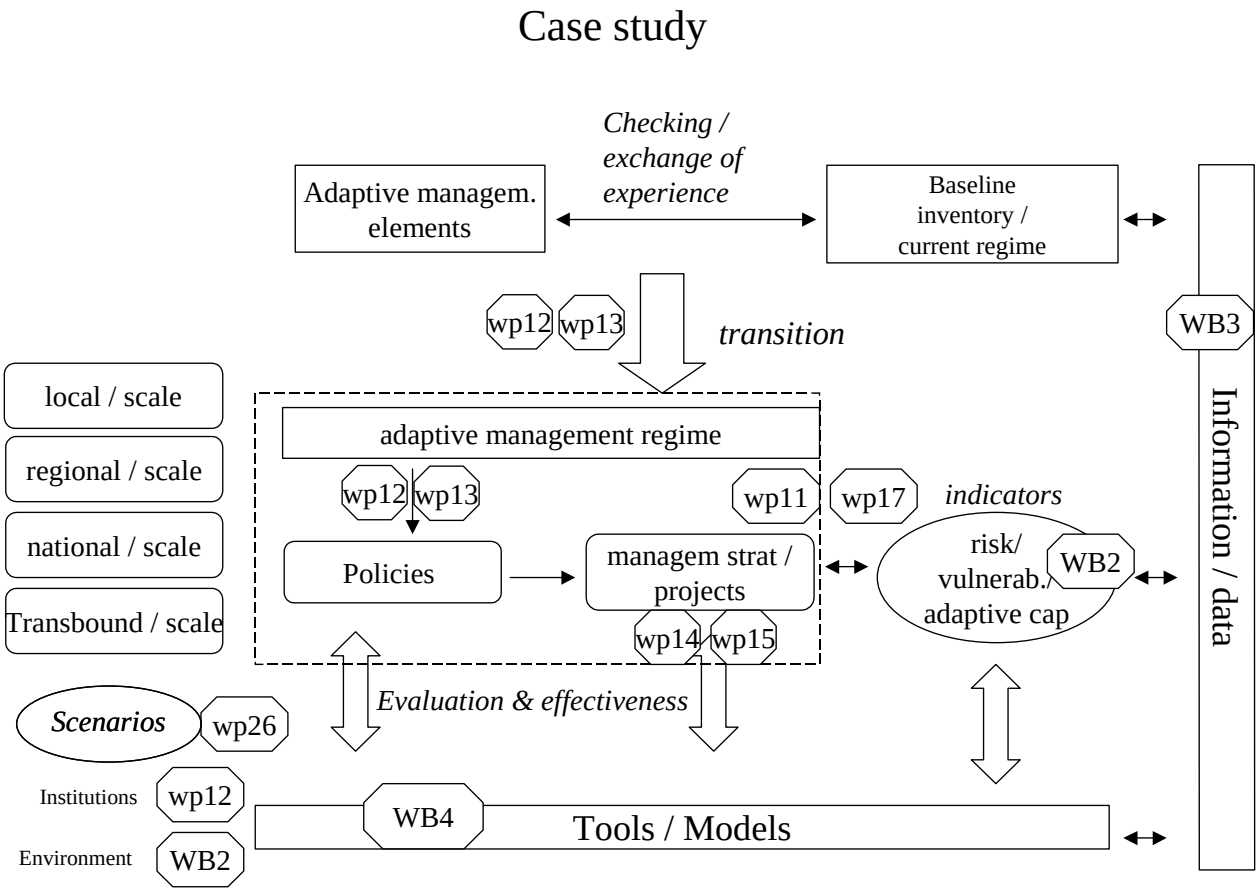

Figure 3.3. Example of the position of WB and WP activities within the main products/activities of the NeWater project.

Kernel of the project is WB 3. Here all relevant data and information on policies and stakeholders will be collected. Also, stakeholder requirements are assessed as well as a mutual understanding of the NeWater research. This is depicted in Figure 3.1 under **activity 1** at the right. WB 3 will deliver baseline information **(activity 2)** on the current status of the case study area. The information will contain both general data on the basin (water system, stakeholder processes, policies, etc) but also specific data that will provide a picture of the current degree of adaptive management and clear signs for a transition process in the basin **(activity 3).** The latter information can be classified into the adaptive management elements as described in the paper on adaptive management by Pahl Wostl *et a*l 2005.

Next step is to describe the elements needed for a transition towards a more adaptive management regime. This still relates very much to the current elements of adaptive management and is therefore similarly positioned under **activity 3**. The above main activities 1, 2 and 3 largely fall under WB1 and WB3.

A crucial link in the project must be established by connecting WB 1 and WB2. This can be done by:

1. From a WB1 perspective: look at specific –ongoing?- projects (e.g. Ruimte voor de Rivier') that are targeted at strengthening adaptive management and more specifically at the measures that are proposed by these projects **(activity 4).** Include in stakeholder processes and models for analyzing and supporting the transition (activity 3) performance indicators developed in WB2.
2. From WB2 perspective: The measures (or 'strategies') of the aforementioned projects are *the* link to both vulnerability or adaptive management indicators **(activity 5)**; only concrete measures or strategies can be used for a qualitative in quantitative evaluation of the efficacy of the 'new adaptive management regime' (in terms of vulnerability and adaptive capacity).

This leaves **activity 6**, where a variety of tools and models (WB 4) will be further developed for use by practitioners in the basins (both at policy and operational management level) that:

1. Support the simulation of changes in the physical water system
2. Support design and implementation of stakeholder processes
3. Support the development of indicators for the performance of new management regimes
4. Support conceptual development of transition process towards adaptive regimes.
5. Support decisions to be taken during the stepwise process of implementation of a new management regime

In particular activity 6 must be responsive to the needs expressed during the stakeholder process.

3.3 Description of activities to month 48

In section 1.6 the involvement of the research WP in the case study Rhine is given. Here the general tasks off the case study Rhine are given.

3.2.1 Initiation

Contacts will be made with all relevant actors, and the activities will be planned and co-ordinated.

3.2.2 Baseline data collection and assimilation

A knowledge base on the wide range of issues relevant to IWRM in the basin will be developed. It will include: the current status of the basin in terms of water availability, water use and the related physical, social, economic and environmental impacts; the expected impacts of global change; governance and institutional structures; effectiveness of the enforcement of regulations; the relationship between regional and local planning and water management; identifying drivers of change or unsustainable use; the role of culture, gender and poverty; transboundary concerns, etc. This will be carried out by interviews and by synthesis of the often extensive existing research and consultancy reports.

3.2.3 Adaptation of stakeholder approach to needs of basin

The generic stakeholder process (WP3.1) will be adapted to the needs and culture of the basin.

3.2.4 Initial stakeholder workshop in the basin

This will have participation from all relevant stakeholders; it will include presentation of the possibilities for research in the basin (from WBs 1 and 2) and obtain feedback on the needs for research, tools and capacity building.

3.2.5 Report on current status in the basin

Based on the output of tasks 3.2.2 and 3.2.4, a report on the current status of the basin in relation to water and IWRM issues in particular will be prepared. It will cover all the relevant issues, providing a baseline against which progress during the project, and beyond, can be measured.

3.2.7 Define needs for research, tools and capacity building

Based on the preceding activities, a research agenda will be defined for the work packages which are going to carry out research in the basin. The needs for tools and capacity building will also be determined. This will be done by collaboration between the WP co-ordinators, the case study co-ordinator and key stakeholders (as in Task 3.2.6).

3.2.8 Applied research in the basin and existing tool enhancement

Following the research agenda and needs assessment in Task 3.2.7, the research activities and tool enhancement will be carried out (work under relevant parts of WBs 1, 2 and 4).

3.2.9 Stakeholder interaction and evaluation, as required for individual research themes

The applied research activities will be co-ordinated, reviewed and evaluation as part of a process of frequent interaction between the researchers and stakeholders and practical managers in the basin. The ongoing assessment of the effectiveness and limitations of the new methodologies and tools will be likely to generate a requirement for further development and adaptation of the methodologies, and a number of iterations of these interactions may be needed. This process is to ensure there is sufficient and continuous interaction between research and stakeholders and the adaptation of ongoing activities; the approach will be flexible, and will be worked out according to the needs of each research activity as it proceeds.

3.2.10 Interim stakeholder workshop in the basin

In addition to Task 3.2.9, this workshop will review progress, refine the research agenda as needed, and define the new tools needed in the basin.

3.2.11 Continued applied research and new tool development

Continuation of Task 3.2.8, adapted according to the refined research agenda and needs assessment (work under relevant parts of WBs 1, 2 and 4).

3.2.12 Training and dissemination workshops in the basin

Presentation and practical application of training materials and tools will be carried out (linked to activities in WB4). This workshop will also provide a further opportunity for review and exchange on progress on the application of new management strategies for the basin. It will also be important in awareness raising and in demonstrating the benefits of IWRM to implementing and other appropriate agencies.

3.2.13 Evaluation and implementation workshop in the basin

While evaluation of the new management strategies and tools will be ongoing throughout the project, this workshop will provide for the formal evaluation of their effectiveness in the context of the Rhine basin, with a comparison to the baseline evaluation carried out early in the project (Task 3.2.5). It will also include more explicit guidance on topics such as restructuring development plans (economic, social, environmental) in order to align them to the implications of sustainable water management, and guidelines on enabling real implementation of the suggested changes, adapted to the specific circumstances of the basin.

3.2.14 Common workshop for all basins – evaluation and synthesis

A common workshop with participants from key stakeholders in all NeWater case study basins will be held. It will be concerned with the evaluation and synthesis of the effectiveness of the new approaches and tools, focussing on aspects which are in common, in order to derive benefits from synergies and inter-comparisons between different basins. [*Note*: It may

be that this should be elsewhere – e.g., the internal coordination platform – but it is here to show elements which are relevant and common to all the basins.]

4 Budget

The case study budget has been split in Training and Research. The training budget will be used for the meeting with the stakeholders and it also includes the travel cost of the stakeholders for f.i. the General Assembly. The first proposal is to divide the training budget between the sub-cases. In some cases external facilitators must be used because of the speaking language of working groups. The research budget will be used for Reseach which becomes necessary since none of the partners can do do this or has no planned capacity for the new tasks

Table 4.1: budget table until month 30

Step / Action	Training	Research	Explanation
	(100.000,- EUR)	65000,- EUR	
Travel cost stakeholders	10000		GA and other meetings
Date needs related to case study	2000		Data have must be bought from the Emschergenossenschaft. They are needed for waterwise
Research on ..		25000	A subcontracts have to be signed for research on….. Research became necessary since no NeWater partner can…
		10000	student assisstent for data collection
Stakeholder meeting	10000		meeting to study the scale issues with stakeholders from 4 Rhine sub-cases
Stakeholder meetings (sub-cases)	20000		
Facilitator(s)	5000		
Not allocated yet	58000	30000	Should be allocated after project month 24
Sum	**100000**	**65000**	

5 Annex Questionnaire – Fast Characterization of Water Management Regimes

The questionnaire serves to provide a first overview for the characterization of the current water management regimes and its degree of being adaptive in each of the NeWater Basins. It helps to design individual interviews and/or stakeholder meetings.

In this Annex 3 questionnaires are listed, one dealing with the Rhine and Niederhein, one dealing with the Emscher basin and one based on the Kromme Rijn.

5.1 RHINE

1. Management approach and strategies

1.1. General Issues

Question	Answer	Data Source
What are the major objectives for river basin management regarding water allocation, water quality, flood protection? (possible answers could be maximize economic benefits, guarantee household water supply at any price, security first etc)?	The river basin management plans present are the WFD-reports and the Flood action plan Rhine.	
To which extent is the current management paradigm characterized by a belief in prediction and control?	Mainly control	
What are the current strategies for risk management? What it the attitude towards – risk averse, risk seeking?	Averse, however the flood risk issue is not discussed in relation with other risks	
If and how are uncertainties (e.g. about effectiveness of measures, future developments of water demand) addressed and included in strategic and operational management?	Policy does not want uncertainty.	
To which extent does water management rely on hard versus soft approaches (technology versus “societal” measures such as pricing or awareness rising)?		
What are performance criteria for success or failure for water management?	Within the WFD these criteria have been formulated	
What are the consequences for success or failure?	See WFD	

1.2 Planning approach:

Question	Answer	Data Source
Does water management rely on integrated management plans at basin scale?	WFD	
Are stakeholder groups included in the development and implementation of the management plans?	Several levels, yes depending on group	
Is scenario planning used in developing and/or revising management plans – are a diversity of solutions compared for different possible future developments?		
Is any revision of management plans foreseen? If yes how often?		
What type of measures prevail in management practice (e.g. voluntary agreements, legal regulations, economic incentives).		
To which extent are emerging problems such as climate change and possible shifts in extreme weather events are taken into consideration?		
Would you describe the water management practitioners as conservative or innovative?		

1.3 Degree of fragmentation:

Question	Answer	Data Source
To which extent are the management of water quantity in terms of allocation of a scarce resource to different users and quality aspects and flood protections integrated in the current management regime?	Low flow is problem	
Is there any successful formal or informal cooperation between water management and agriculture?	Water boards	
Is there any successful formal or informal cooperation between water management		

and regional planning?		

1.4 Technological infrastructure – size, life-time, costs.

Question	Answer	Data Source
Have more recently big investments been made in large-scale infrastructure (reservoir, dams)? If yes please specify?	No reservoirs, Oberrhein, dikes	
Is there any sign for a "paradigm shift" that people take into consideration more small scale infrastructure and integrated planning?		

2. Governance Structure → mainly international / basin level

2.1 General Issues

Question	Answer	Data Source
What are the most relevant national water legislation and regulations.	International: ▪ Convention on the Protection of the Rhine (establishment and renewal goals ICPR); ▪ Convention on the Protection of the Rhine against Chemical Pollution / against Chemical Pollution; ▪ EU WFD.	Section 2.1 (Raadgever 2005) More national details: (Raadgever and Mostert 2005) (Becker 2005a, 2005b)
What government actors are responsible for which issues (quality and quantity, surface water/groundwater) in water management?	International: EU, ICPR, Arbeitsgruppe Hochwasser, CCNR, etc.	Section 2.2 (Raadgever 2005) More national details: (Raadgever and Mostert 2005) (Becker 2005a, 2005b)
Characterize briefly the main governmental actors/authorities by: their interest, goals, strategies, technical capability and/or power.		Section 2.2 (Raadgever 2005) More national details: (Raadgever and Mostert 2005) (Becker 2005a, 2005b)
If changes in the institutional make up of water management and the prevailing water management	Changes in water institutions have occurred for various reasons and in different timeframes.	Section 2.6 (Raadgever 2005)

strategy have occurred, which factors explain them (is this always a matter of extreme weather events, or are there other drivers as well) and what factors seem to inhibit these changes (ie training of water managers)? Are the changes necessarily slow and reactive or are they sometimes quick and anticipating?	The ICPR was established after the pollution became a noticeable problem. Only after serious incidents the ICPR booked some progress in implementation of legal agreements and policies to clean the Rhine. Recent flood events triggered cooperation in flood management. Flood management strategies have changed over the decades from construction and improvement of dikes to exchange of information and giving more space to the river. Policies at all levels reflect this paradigm change, which was triggered by developed (scientific) insights. National legal and administrative structures change much more slowly than policy. For instance legal safety standards in the Netherlands are still based on the value of the dike rings not too long after the flood of 1953. The implementation of the WFD requires changes in the national law and changes in organisational structure of all EU Member States. Planning and management on basin level is required.	

2.2 Stakeholder/citizen participation

Question	Answer	Data Source
What are the most relevant stakeholder groups (organized and unorganized water users, citizens, etc.) and how are they organized?	▪ Agriculture ▪ Drinking water associations ▪ Industry & Power generation ▪ Navigation ▪ Nature organisations / Fishing ▪ Citizens' and residents' initiatives ▪ Scientific community	Section 2.4 (Raadgever 2005)
Has water management been a main concern for the political system and general population or not? Is much attention paid to water issues in the media?	Attention to water management has existed for a long time. The ICPR was established after pollution became noticeable and substantial results were established only after the problem had become very urgent. Recent flood events drew political and general attention to flood management.	Section 2.5 (Raadgever 2005) More national details: (Raadgever and Mostert 2005) (Becker 2005a, 2005b)

	Concepts like 'safety' and 'flood risks' are quite abstract and concern long time scales and do therefore not seem to attract a lot of public attention. The opposite is valid when citizens are confronted with actual floods or when flood mitigation measures are planned in the area in which they live. The media also pays quite a lot of attention to water management.	

2.3 Information management and sharing

Question	Answer	Data Source
Which parties collect/produce, and which parties interpret/analyse what kind of information? Is there any joint/participative information production (experts/ public)?	The ICPR working groups and project groups monitor and collect all kinds of information about discharges, pollution, fish etc. The groups consist of national senior officials and experts. Specific tasks are dealt with by expert groups. NGOs have a role in some of the working groups.	Section 3.2 (Raadgever 2005) More national details: (Raadgever and Mostert 2005) (Becker 2005a, 2005b)
How is this information used in decision-making? (Is it used?)	It can take a long time before new information enters the national and international policy debates in the Rhine basin. Because policy debates are nontransparent processes, it is hard to determine which information does and which information does not influence the final choice of management strategies. After the ICPR working groups have developed recommendations, they can be adopted by the official national delegations. The recommendations are usually formulated in a feasible way and are therefore often adopted by the official delegations. Nevertheless, sufficient implementation of the recommendations can take a very long time.	Section 3.4 (Raadgever 2005)
What is the role of the scientific community and expert advice in the process of water management?	The scientific actors in the Rhine area have developed into an active, extensive community that cooperates on numerous levels in structural or project organisations. Examples: International	Section 2.4 (Raadgever 2005)

	Commission for the Hydrology (CHR), European Environment Agency (EEA), Joint Research Centre (JRC), projects like NeWater, NOAH, HIS, Viking, IRMA.	
Do specifically designed monitoring programmes exist with the goal to revise management strategies (monitoring present at all, for control and/or for change in strategies)?	Although there is no legal obligation for it, the implementation of the ICPR flood policy does happen in different phases to be able to evaluate the progress. It is not (clearly) determined if and how the policy can be changed based on these evaluations. The effort the ICPR puts in monitoring changes, evaluating policies and follow-up (e.g. changing policies) is little compared to the effort that is put in developing new policies (Stoks 2005). Another form of 'policy experimentation', which is frequently applied by the ICPR working groups and others, is the use of computer models to simulate and predict system behaviour.	Section 4.3 (Raadgever 2005)

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5.2 Hoogheemraadschap de Stichtse Rijnlanden

1. Management approach and strategies

1.1. General Issues

Question	Answer	Data Source
What are the major objectives for river basin management regarding water allocation, water quality, flood protection? (possible answers could be maximize economic benefits, guarantee household water supply at any price, security first etc)?	- guarantee the desired safety level (risk) with respect to flooding; - surface waters in 2015: good chemical and good ecological status (GES) or potential (GEP); - restore ecohydrological variation - servicing of diverse user functions (agriculture, recreation, ..); - conservation and reinforcement of the role of water in the landscape.	- water structure vision , 2002 - watermanagement plan 2003-2007
To which extent is the current management paradigm characterized by a belief in prediction and control?	– Quantity: the EG policy is grounded on relatively rigid safety norms – Quality management is more participative	
What are the current strategies for risk management? What it the attitude towards – risk averse, risk seeking?	- reduce risks by keeping dikes at “delta-level” (risk of 1/1250 years) (for the “Nederrijn”) - Reduce Risks of inundation. Standards are fixed in “Nationaal Bestuursakkoord Water”.	
If and how are uncertainties (e.g. about effectiveness of measures, future developments of water demand) addressed and included in strategic and operational management?	- effects on water quality through monitoring; - effects of climate change by assuming “max” scenario for 2050	
To which extent does water management rely on hard versus soft approaches (technology versus “societal” measures such as pricing or awareness rising)?	- Soft approaches becomes more and more important but hard approaches are still common;	
What are performance criteria	- for flooding, the return	

for success or failure for water management?	period of inundation, compared to the "norm" that is accepted for a certain type of land use (2015) - water quality, under discussion in relation to WFD planning. The "Kromme Rhine" is pilot in describing the ecological aims for watertype R6 (WFD). - servicing of functions: "goal realisation" of ecosystem types for nature areas and agriculture, on scale 0-100%	
What are the consequences for success or failure?	In some cases compensations are paid in the case of damages due to inadequate fucntioning of waterboard	

1.2 Planning approach:

Question	Answer	Data Source
Does water management rely on integrated management plans at basin scale?	There is a "Catchment Vision" and a "water structure vision"	
Are stakeholder groups included in the development and implementation of the management plans?	In the Catchment Vision all stakeholder groups are included	
Is scenario planning used in developing and/or revising management plans – are a diversity of solutions compared for different possible future developments?	In the "water structuur vision" a blue print has been made for following three strategies, determined by the local conditions: - "green strategy", of holding on to the water; - "blue strategy" of storing excess water; - "yellow strategy" of supplying and removing water (business as usual) In the pilot region of "Langbroekerwetering" first experiences in using Waterwise for generating alternative water management strategies at a much more detailed level	
Is any revision of management plans foreseen? If yes how often?	Every 4 years	
What type of measures prevail in	- technical measures in	

management practice (e.g. voluntary agreements, legal regulations, economic incentives).	waterways - voluntary measures by land users now starting to come into practice	
To which extent are emerging problems such as climate change and possible shifts in extreme weather events are taken into consideration?	In the "visions" there is a look-through until 2050, taking into account the "max scenario for climate change	
Would you describe the water management practitioners as conservative or innovative?	Innovative	

1.3 Degree of fragmentation:

Question	Answer	Data Source
To which extent are the management of water quantity in terms of allocation of a scarce resource to different users and quality aspects and flood protections integrated in the current management regime?	We have seen examples of clever water flow management, directed at maintaining good water quality. The waterboard follows the following general preferential order of achieving good water quality: - keeping the water clean at the source area; - keeping clean water separate from polluted water; - end-of-pipe treatment of polluted water	
Is there any successful formal or informal cooperation between water management and agriculture?	Farmers are represented in the governing body of the waterboard	
Is there any successful formal or informal cooperation between water management and regional planning?	This coordination in an embryonic stage; all plans indicated the positive attitude towards this coordination, but put it into action is a big next step	

1.4 Technological infrastructure – size, life-time, costs.

Question	Answer	Data Source
Have more recently big investments been made in large-scale infrastructure (reservoir, dams)? If yes please specify?	No	
Is there any sign for a "paradigm shift" that people take into consideration more small scale infrastructure and integrated planning?	Yes, there clearly is a shift towards integration with small-scale measures that involve the use of space, e.g. "holding on to water", for contributing to peak flow reduction	

5.3 Emscher Basin

Explanations:

EG: Emschergenossenschaft

Emscherumbau: huge reconstruction project of the Emscher, concerning water quality (construction of treatment plants) and structure of the river (reconstruction of canalised river bed); plans until 2020.

Genosse: member of the Emschergenossenschaft, forced to be a member by law.

Kreis: administrative level between the local and the Land level.

Land: regional level of administration. Due to German federalism with many competences and own elections.

Ruhrgebiet: industrial area in western Germany, encompassing several cities. Characteristics: huge agglomeration; the mining activities and metal construction industry suffered from the economic decline since the late 1950s. Nowadays, the consequences of this structural change are still an issue: unemployment, demographic decline, anthropogenic impacts on nature.

WFD: Water Framework Directive

1. Management approach and strategies

1.1. General Issues

Question	Answer	Data Source
What are the major objectives for river basin management regarding water allocation, water quality, flood protection? (possible answers could be maximize economic benefits, guarantee household water supply at any price, security first etc)?	- Emscherumbau (First priority, EG acting relatively independently, aiming also at increasing the attractiveness of the whole area, not only of the river) - Meeting of the goals of the EG members (industry, local authorities etc.) - WFD implementation - Keeping flood protection standards as usually (HQ 1/100-HQ1/200)	EG web pages Interviews
To which extent is the current management paradigm characterized by a belief in prediction and control?	Quantity: the EG policy is grounded on relatively rigid safety norms Quality management is more participative	Interviews
What are the current strategies for risk management? What it the attitude towards – risk averse, risk seeking?	- Currently, not many risks are perceived. - EG had internal discussions about climate change. The results	Interviews

	were that it has no influence on the Emscher. But anyway the measures taken would be the same if flood risks were rising. - HQ 1/100-1/200 standard for flood protection will be kept anyway.	
If and how are uncertainties (e.g. about effectiveness of measures, future developments of water demand) addressed and included in strategic and operational management?	There are some elements of flexibility in the long-term planning for the Emscherumbau. For example: as the quantities of waste water were decreasing (due to internal industrial wastewater treatment facilities and demographic change), a planned treatment plant was not constructed.	Interviews
To which extent does water management rely on hard versus soft approaches (technology versus "societal" measures such as pricing or awareness rising)?	Soft measures become more and more important, public relations of utmost importance, but due to high anthropogenic impacts on the river and the problems of the "Ruhrgebiet" in general, technology is still of high importance.	Interviews, Excursion
What are performance criteria for success or failure for water management?	Reaching the Emscherumbau in the year 2020 (vision Emschertal) Maintaining safety standards Involving and informing stakeholders and civilians	EG web pages
What are the consequences for success or failure?	Consequences for success of the Emscherumbau could be an increase in value of the whole area; could induce the renovation of old quarters near the river, better living conditions.	

1.2 Planning approach:

Question	Answer	Data Source
Does water management rely on integrated management plans at basin scale?	yes	EG
Are stakeholder groups included in the development and implementation of the management plans?	Stakeholder participation gets more and more important for the EG. Differentiation of stakeholders:	EG web pages, Interviews

	1. members of the EG (Genossen) 2. non-members of the EG (for example agriculture) 3. the general public Different kind of involvement of each group. Problem of scales: many different entities need be included on many different scales (local, Kreis, Land) In the Emscher basin, the participation processes are mainly initiated by the EG, whereas in the Netherlands, participation processes are a provision of the law. In the NL, water boards contain elected persons. Elections do not take place within the management of the Emscher.	
Is scenario planning used in developing and/or revising management plans – are a diversity of solutions compared for different possible future developments?	Some scenarios are used, especially in questions of flood protection.	
Is any revision of management plans foreseen? If yes how often?	The Emscherumbau is a long-term planning. The plan is relatively flexible, called "breathing plan" as changes and evolution is still possible.	
What type of measures prevail in management practice (e.g. voluntary agreements, legal regulations, economic incentives).	Economic "participation of the Genossen", but Genossen are also part of the management process. Legal Participative agreements	
To which extent are emerging problems such as climate change and possible shifts in extreme weather events are taken into consideration?	CC is discussed internally, but considered as insignificant for the Emscher. The current and projected safety measures are sufficient to cope with CC according to the EG	Interviews
Would you describe the water management practitioners as conservative or innovative?	Innovative in view of the big project of the Emscherumbau. And innovative when comparing	

	the EG with other German waterboards	

1.3 Degree of fragmentation:

Question	Answer	Data Source
To which extent are the management of water quantity in terms of allocation of a scarce resource to different users and quality aspects and flood protections integrated in the current management regime?	Relatively integrated, the EG has competences in water quality and water quantity management. The Emscherumbau also concerns water quality as well as the river reconstruction. In this respect the EG is similar to the Dutch water boards	
Is there any successful formal or informal cooperation between water management and agriculture?	Agriculture is not a member (Genosse) of the EG, but involved in discussions and the planning process.	
Is there any successful formal or informal cooperation between water management and regional planning?	The co-operation is more on informal level (to be checked)	

1.4 Technological infrastructure – size, life-time, costs.

Question	Answer	Data Source
Have more recently big investments been made in large-scale infrastructure (reservoir, dams)? If yes please specify?	Yes: Canalisation, treatment plants, Restoration of river bed	EG, Internet
Is there any sign for a “paradigm shift” that people take into consideration more small scale infrastructure and integrated planning?	Yes: E.g.: more than one treatment plant, Decentralised rain water management (Aldi example), subsidies / compensation (5 Euro per m2) for everyone who de-couples water from the main sewage treatment system.	Interviews

2. Governance Structure

2.1 General Issues

Question	Answer	Data Source
What are the most relevant national water legislation and regulations.	Wasserhaushaltsgesetz (every legislation influenced by the WFD) Landeswassergesetz	Rhine report
What government actors are responsible for which issues (quality and quantity, surface water/groundwater) in water management?	See Rhine management questionnaire. Very important is also the Ministry for Environmnent in NRW (MUNLV), for quantity and quality.	
Characterize briefly the main governmental actors/authorities by: their interest, goals, strategies, technical capability and/or power.	See Rhine management questionnaire. For MUNLV: powerful, as also providing money for the Emscher, interested in good flood protection standards and WFD implementation.	
If changes in the institutional make up of water management and the prevailing water management strategy have occurred, which factors explain them (is this always a matter of extreme weather events, or are there other drivers as well) and what factors seem to inhibit these changes (ie training of water managers)? Are the changes necessarily slow and reactive or are they sometimes quick and anticipating?	Changes due to - general perception of environmental standards: an open sewer is not acceptable any more - Mining activities near the Emscher river are of decreasing importance: it is only now possible to restore the river structure - The Ruhrgebiet itself undergoes structural changes since the decline of the mining industry and demographic changes such as the increase of eldery people, functional changes follow, also envisaging more space for recreation, nature etc. The whole area undergoes structural changes since the 1970s. Changes of the Emscher can be seen as a long-term consequence of these changes.	

2.2 Stakeholder/citizen participation

Question	Answer	Data Source
What are the most relevant stakeholder groups (organized and unorganized water users, citizens, etc.) and how are they organized?	Most important are the members of the EG (Genossen): Industry, municipalities, Kreise etc.	
Has water management been a main concern for the political system and general population or not? Is much attention paid to water issues in the media?	Until recently, not really, but the media now reflect the Emscherumbau and public activities of the EG. Also the Emscherumbau has its importance in the politics of the Land: The project figures in the "Coalition-Treaty" of the new NRW government.	

2.3 Information management and sharing

Question	Answer	Data Source
Which parties collect/produce, and which parties interpret/analyse what kind of information? Is there any joint/participative information production (experts/ public)?	EG Staatliche Umweltämter Umweltministerium NRW Landesumweltamt	
How is this information used in decision-making? (Is it used?)	Used for the planning processes etc.	
What is the role of the scientific community and expert advice in the process of water management?	Used when a question pops up	Interviews
Do specifically designed monitoring programmes exist with the goal to revise management strategies (monitoring present at all, for control and/or for change in strategies)?		