NeWater

DELIVERABLE 5.1.2
THE EUROPEAN PLATFORM

Overview of results

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

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Policy Summary

Overview

This report gives an overview of the NeWater work package 5.1 on the European platform, aiming at capitalising upon results from European IWRM research, comparing these results with the requirements for Adaptive Water Management concepts and furthering the results of this analysis to a wider audience. This report provides an overview of the results and includes the documents that were produced. The final results of the work package are captured in the book 'Timmerman, Jos G., Claudia Pahl-Wostl and Jörn Möltgen, 2008. The Adaptiveness of IWRM, IWA-publishing'.

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1 Introduction

1.1 Background

The European IWRM Platform (WP5.1) has as a main task to link the NeWater project to relevant past and ongoing EU projects, with the aim to provide an efficient mechanism through which NeWater would be able to capitalise on existing results and achievements of these projects, minimize redundancies, and therefore further substantiate its added value to the European Research Area (ERA). NeWater dedicates a part of its budget to activate this platform through regular meetings and other forms of information exchange. This platform will also substantially contribute to overall ERA objectives of establishing a (virtual) collaborative network of EU institutions with a focus on a particular theme of EU concern (water).

The forum has organised sessions at (project) conferences, electronic conferences and dedicated workshops on particular IWRM issues. This report gives an overview of the activities of the platform.

1.2 Analysis of IWRM in European research

Within the FP6 Integrated project NeWater an EU IWRM specialist platform is set up. A first meeting of this platform was held during the World Water Week in Stockholm (August 23, 2005). Several representatives of European IWRM research attended that meeting. Input to this meeting was a document entitled 'European IWRM – research outline analysis of projects' contribution for the purpose of selecting topics for synthesis' (Blind et al, 2005). This document was developed on the basis of a questionnaire that was send out to project coordinators of selected EU FP4 and FP5 research projects with a focus on water management. Based on this document and subsequent discussions the following conclusions were drawn from the meeting:

1) The level of maturity of issues in IWRM is varying (Note that the issues were identified within the preparation of NeWater);
2) There is a huge amount of EU funded research available on most of the topics;
3) There is interest in synthesizing the EU-funded research with respect to the topics. Such a synthesis should serve one or more of the following needs:
    - The increasing need from the research perspective to capitalize past EU-funded research.
    - The EC's need to feed discussions on research programmes (e.g. FP7)
    - The need of the application community to get access to research results.
    - The increasing need to support policy development by research findings.
    - The need to develop a comprehensive overview of the IWRM state of the art (based on EU funded projects) as input to high level discussions such as the World Water Forum (Mexico, 2006).
4) There are relevant other initiatives such as INCO-IWRM analysis and Harmoni-CA analysis;

Following this meeting a series of policy papers were developed that would act as input for the session to be convened at the World Water Forum in Mexico.

1.3 Preparations for book manuscript

From the discussion, the following topics were identified that were considered important to determine the state of the art in relation to the adaptiveness of IWRM:

1. IWRM & Adaptive Water Management
2. Governance, institutions & participation
   2.1. Participation and informal institutions
   2.2. Transboundary regimes
   2.3. Financial and legal frameworks
3. Vulnerability & exposure to shocks & stresses in River Basins
4. Role of EU politics in Water Management Policies
5. Advanced monitoring systems for adaptive management
6. Integration of IWRM & spatial planning
7. Understanding consequences of climate hazards & change
8. Social dimensions of IWRM: poverty alleviation, gender & health

Based on this list, potential authors were selected and approached to write up a chapter on the topic.

1.4 WWF4 Session FT5.15: Broadening perspectives in the face of increasing risks

From the session it was concluded that Adaptive Water Management is a promising extension of IWRM to deal with water related risks and changing conditions. The concept and procedures should be developed further. The concepts should be illustrated by local actions. The interaction of implementation and concept development is crucial both in building scientific evidence and in the communication of the concepts. Specific recommendations for future research and action are:

- Intensify observation of the hydrological characteristics and the performance of economic, societal and environmental indicators and identification of decisive factor(s) guiding the future water system.
- Establish processes of social learning fine tuned to the objectives of communities at various levels by encouraging local actions and securing policy support.
- Improve flexibility in the system through small-scale structures supported by local society through a participatory process considering hydrological, physical and organizational changes.
- Develop and test approaches that allow water users and managers to cope with uncertainty instead of trying to eliminate it.
- Create space for creative and out-of-the-box thinking. Entrenched perceptions and beliefs block innovation and change.
- Train a new generation of water management practitioners skilled in participatory system design and implementation.

2 List of documents produced in WP 5.1

- European IWRM – research: outline analysis of projects' contribution for the purpose of selecting topics for synthesis - a discussion starter to the European IWRM platform, Michiel Blind, Fred Hattermann, Jos Timmerman and Bea Sikorska.
- Further procedure towards synthesis and Mexico; Consequences from Stockholm meetings
- Towards adaptive management by Integrating IWRM and spatial planning; IWRM in the North - Policy brief, Hans de Moel and Jeroen Aerts
- Adaptive Water Management and managing change, Claudia Pahl-Wostl and Paul Jeffrey
- Advanced monitoring information system to support Adaptive management; IWRM in the North - Policy brief, Raffaele Giordano and Michele Vurro
- Public involvement in water management; IWRM in the North - Policy brief, Dave Huitema
- Transboundary regimes and the role of information; IWRM in the North - Policy brief, J.G. Timmerman and E. Interwies
- Local Action reporting FT 5.15 - Broadening perspectives in the face of increasing risks (FT 5.15)

3 European IWRM – research: outline analysis of projects' contribution for the purpose of selecting topics for synthesis - a discussion starter to the European IWRM platform

3.1 The European IWRM platform

Main source: Description of Work NeWater

NeWater includes international and thematic platforms. Two main platforms can be distinguished, the European IWRM Expert platform and the Global IWRM research to application platform. The purpose of the platforms in general is to reach or contribute to the following NeWater objectives:

Objective A: To initiate an world-wide research to application platform for effective scientific and cross policy cooperation in dealing with the high complexity and limited predictability of integrated water resources management on a river basin scale that contributes to constructive dialogues with the Global Water Partnership (GWP), World Water Council (WWC), International Union for the Conservation of Nature (IUCN) and other efforts. (NeWater objective 17)

Objective B. To share experience and innovations in dialogues, publications and action, to further the European Research Area and to support the implementation of the Water Framework Directive and EU Water Initiative. (NeWater objective 16)

Objective C. To assess current practice in IWRM and draw lessons for the transfer of new scientific methodologies for IWRM practitioners. (NeWater objective 18)

The European IWRM platform mainly focuses on the last objectives, and through those activities supports objectives 17 and 16. It has as key task to link the NeWater project to relevant past and ongoing EU projects, with the aim to provide an efficient mechanism through which NeWater would be able to capitalise on existing results and achievements of these projects, minimize redundancies, and therefore further substantiate its added value to the European Research Area (ERA). NeWater dedicates a part of its budget to activate this platform through regular meetings and other forms of information exchange. This platform will also substantially contribute to overall ERA objectives of establishing a (virtual) collaborative network of EU institutions with a focus on a particular theme of EU concern (water).

The proposed tasks carried out under the umbrella of the European IWRM platform are:

Task 1 European IWRM projects knowledge exchange forum: The platform will bring together experts from former and ongoing EU projects relevant to NeWater. It will facilitate the direct exchange of results of from NeWater & from the scientific community outside the project. Platform members will be leaders of relevant project clusters and network. A key focus of the platform will be to consolidate and integrate activities from relevant EU networks to the implementation process of the Water Framework Directive. (NeWater task 5.1.1)

Task 2 European IWRM projects conference forum: The platform will organise sessions at (project) conferences, electronic conferences and dedicated workshops on particular IWRM issues. The platform sessions will focus on specific topics. These topics will be discussed from the viewpoint of science, consultancy and operational water management, to ensure applicability of the scientific findings from relevant EU FP5 projects and to direct scientific developments within the NeWater project. Based on the outcomes of these sessions and the intermediate results from the NeWater project, additional topics will be determined for the platform. Session will include targeted presentations from different EU FP5 and other projects and discussions between participants. Selected platform members may be invited to draft a position paper as an input to a session. (NeWater task 5.1.2)

Task 3 European IWRM projects knowledge dissemination forum: The main findings from the sessions will be summarised in session reports that will be disseminated to the larger IWRM community, possibly for discussion in a larger electronic conference. Next to this, results of the sessions will be submitted as papers for publication in scientific journals as appropriate. In addition selected platform members can be invited to write thematic synthesis paper on topics relevant to NeWater. Results from the platform will be made available through the project website for discussion and application in the wider IWRM community. (NeWater task 5.1.3)

The proposed deliverables produced under the umbrella of the European IWRM platform are:

D 1 Synthesis papers from sessions at (project) conferences and dedicated (electronic) workshops on selected IWRM themes (Application of models in operational water management; Institutional arrangements and participatory processes; Transboundary regimes, others) (NeWater deliverable (5.1.1)

D 2 Thematic sessions of the European IWRM expert platform to build and capitalizing on the results from previous and ongoing relevant EU projects, especially from the 5th Framework program (NeWater deliverable (5.1.2) 4

3.2 Purpose of this document and the IWRM platform meeting

This document servers as input to the first meeting of the European IWRM platform on the 23rd of August, during the World Water Week 2005 in Stockholm. The purpose of this first meeting is to establish the platform, to discuss a whole range of IWRM issues, and to determine and decide on the way forward. More specifically, the objectives of the document and meeting are:

1) To learn about and capitalize on past and ongoing European research on IWRM.
2) To learn and discuss the relationship between IWRM and Adaptive Water Management
3) To identify relevant other initiatives concerning 'integration of IWRM research' and identification of research gaps, and discuss collaborative actions with these initiatives.
4) To identify candidate IWRM issues for detailed synthesis. In relation, identify key people to lead the development of these synthesis papers, and determine how the underlying document should be elaborated.
5) To discuss and possibly decide on input(s) to the 4th World Water Forum in Mexico, March 2006, where EU supported research on IWRM and research applications need to be presented as broad as possible.

To facilitate these discussions, the current document provides a huge amount of relevant information. It also provides a first clue on opinions of scientist regarding a number of IWRM issues.

3.3 Approach & reading guide

The summary analysis contains the overall results of the questionnaire. This questionnaire contained questions regarding the maturity of IWRM issues. The issues provided were directly related to issues addressed in NeWater, but the possibility was given to provide additional topics. 'Analysis per issue' provides and discusses the maturity information on selected IWRM issues received via the questionnaire. The questionnaire allowed linking specific products of particular projects to the IWRM issues. The chapter provides readers definitions and deliverables concerning these particular topics. Several relevant publications on topics are included, based on inputs from respondents and by no means provide a complete overview of relevant (project) publications. 'Reported additional issues' provides the results on the question if the questionnaire covered all relevant issues. Chapter 5

introduces three other initiatives that aim at synthesizing available knowledge: (1) EU-INCO review of water research 1994-2005, (2) The WFD implementation Gap analysis and (3) Harmoni-CA concerted action synthesis proposals.

3.4 Summary analysis

The summary analysis contains the overall results of the questionnaire. This questionnaire contained questions regarding the maturity of IWRM issues. The issues provided were directly related to issues addressed in NeWater, but the possibility was given to provide additional topics. The next figure presents the results of the questionnaire, which was returned by 17 respondents. In between brackets the number of respondents who had no opinion on a specific issue is shown.

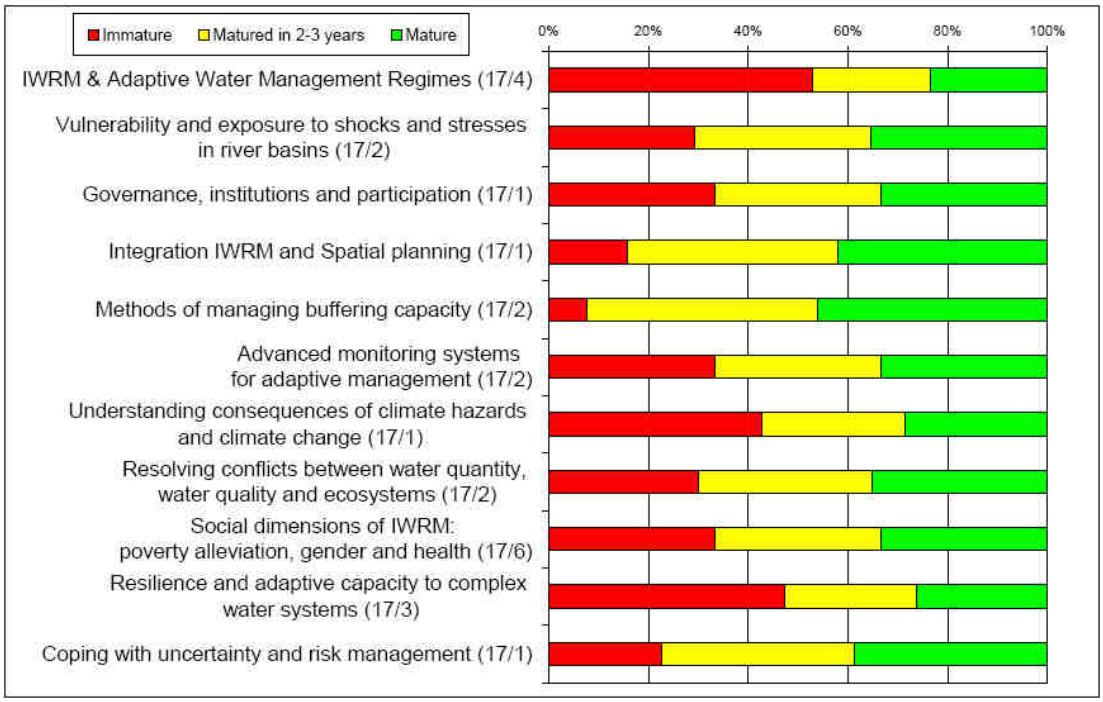

Figure Results from the questionnaire

From the perspective of NeWater it is comforting to know that many respondents agree that key issues in IWRM, addressed in NeWater are not yet fully matured. But it should be noted that several respondents are (in)directly linked to the project. On the other hand it is also clear that on many issues specialists' opinion is that much is already available and matured to practical use. For several topics the detailed analysis per issue actually shows that much is available, since respondents have brought forward numerous products and papers. But, the relevance of the products that were brought forward is disputable, since the identified issues were very broadly defined. From the specific point of view of NeWater, the identified issues are brought forward specifically with respect to 'adaptive management' and uncertainty, and this particular aspect has yet to be elaborated within the individual work packages.

It should also be noted that the results of this exercise have a lottery component. It is clear that when looking into more projects and addressing many more project managers, the load or relevant European projects and publications on IWRM issues will increase. However, despite its preliminary character the analysis shows that key topics addressed in NeWater transcend the themes traditionally addressed by European Water Management Research.

The conclusion on availability of much relevant EU research is supported by the simple keyword matching presented in ANNEX IV. Indexing the short abstracts of the projects in

the annex with key terms of the NeWater-IWRM issues has produced this annex. The results are summarized as follows:

Keyword	Projects
Adaptive	1
Climate	17
Gender	1
Governance	4
Health	6
Institution	8
Integration	30
Monitoring	14
Participation	11
Planning	22
Resilience	1
Risk	11
Scenario	19
Spatial	5
Sustainability	11
Transboundary	5
Uncertainty	7
Vulnerability	3

Though this key word search was not very much context based it is relatively trustworthy, given the fact that the summaries of projects are short and very much to the point. It should be noted that there are many other European projects that have so far not been included.
The purpose of the NeWater IWRM platform is to facilitate synthesis, for the benefit of the European IWRM science and policy communities, and if possible to support the NeWater research efforts and make sure that available knowledge is integrated. The results presented above provide a first indication on what topics synthesis of European Work may be beneficial to highlight achievements, success and failure in the transfer between research and application and identify knowledge gaps. But, more topics have been identified which may also require a closer analysis and should be included in the discussions concerning selecting topics.

4 Annex I: Further procedure towards synthesis and Mexico; Consequences from Stockholm meetings

4.1 Synthesis on IWRM and European Research on adaptive management: from the 5th to the 7th framework program

Time: Tuesday 23 August 2005 from 13:30 to 17:00 hours

4.1.1 Participants:

Tony	Alan	INCO
Carlos	Aquilar	GWP
Michiel	Blind	RIZA (NL)
Tom	Brabben	HR Wallingford (UK)
Tom	Downing	SEI (S)
Geoffrey D.	Gooch	Linköping School of Management (SW)
Alan	Hall	Global Water Partnership
Fred	Hatterman	PIK (D)
Pierre	Hecq	European Commision
Hans Jorgen	Hendriksen	GEUS (DK)
Pavel	Kabat	Alterra (NL)
Ramón	LLamas	Universidad Complutense de Madrid (ES)
Maria	Manez	University of Osnabrueck (D)
Jörn	Möltgen	University of Osnabrueck (D)
Claudia	Pahl-Wostl	University of Osnabrueck (D)
Per	Stalnacke	NIVA (No)
Madeleine	Van Mansfeld	Alterra (NL)
Consuelo	Varelo	Madrid University (ES)
Noniko	Yamaguchi	Japanese waterforum
Istvan	Zsuffa	Vituki (HU)

4.1.2 Major outcomes

During the European platform meeting a general agreement has been found which shall lead to a number of position and/or synthesis papers about water related research funded by the EC. Writing synthesis and position papers addresses several scopes and target groups:

- An assembly of the state of the art for the scientific community; information sources for the 7th EU framework programme.

- Overview of technical and scientific developments for application community.
- Supporting European policy development.
- Sharpening and presenting the understanding of the European state of the art and vision in IWRM research towards World Water Forum in Mexico 2006.

There was no definitive conclusion on which topics should be prioritised. On some topics leading authors were mentioned, on others some people expressed interest on contributing. The NeWater coordinators offered to facilitate the upcoming process and to find key and contributing authors from the platform that were not present at the first platform meeting. The intended topics should be somehow parallelized to activities and papers from the Global platform.

This co-ordination process between the European and the Global Platform required some adjustments at the time schedule and overall procedure, summarized in section 3.

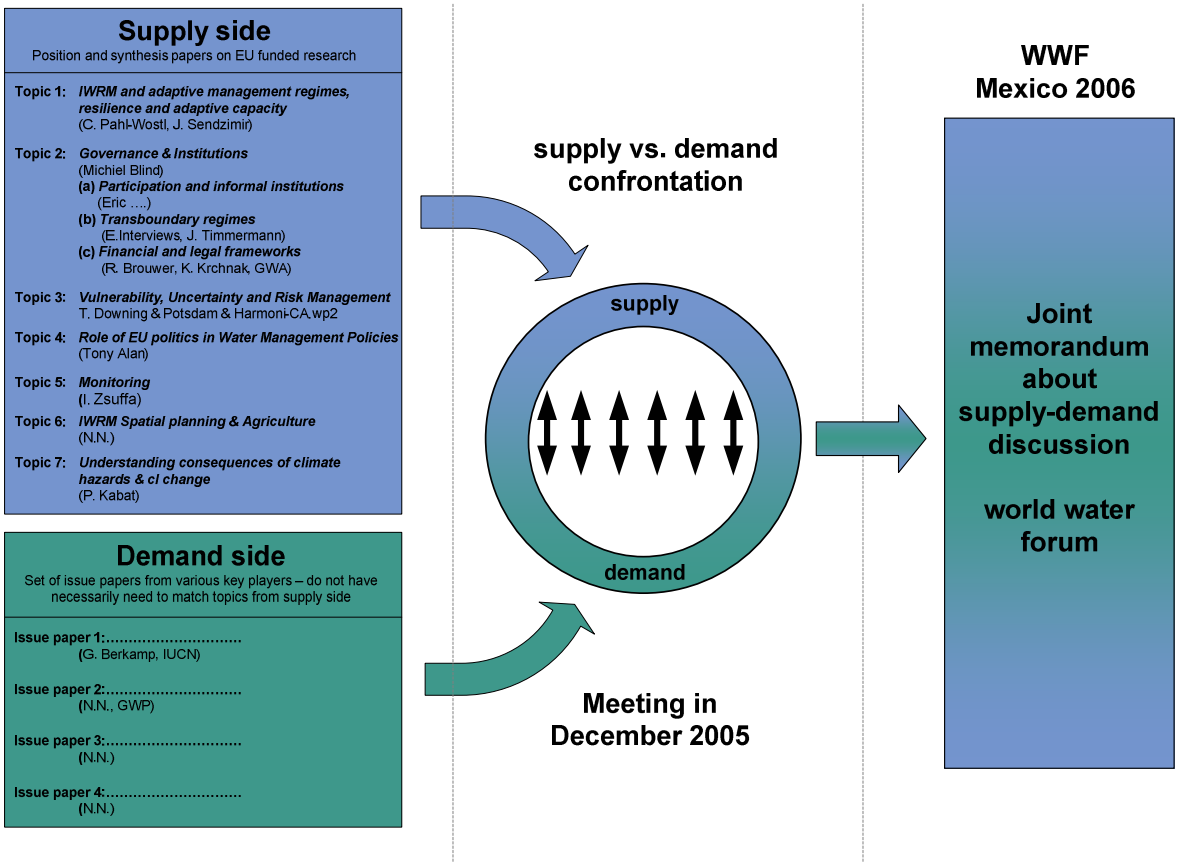

Fig. 1: *Parallel approaches of European and Global Platform, confrontation meeting in December 2005, outcomes of this will be presented at WWF in Mexico 2006.*

4.1.3 Consequences for procedure

The facilitating platform organisation group identified 6 topics, which are to be synthesized:

Topic 1: IWRM and adaptive management regimes, resilience and adaptive capacity (C. Pahl-Wostl, J. Sendzimir)

Topic 2: Governance & Institutions (Michiel Blind)

(a) Participation and informal institutions (Eric ….)

(b) Transboundary regimes (E.Interviews, J. Timmerman)

(c) Financial and legal frameworks (R. Brouwer, K. Krchnak, GWA)

Topic 3: Vulnerability, Uncertainty and Risk Management T. Downing & Potsdam & Harmoni-CA.wp2

Topic 4: Role of EU politics in Water Management Policies (Tony Allan)

Topic 5: Monitoring (I. Zsuffa)

Topic 6: IWRM Spatial planning & Agriculture (N.N.)

Jumping across scale is a criterion for each of the topics listed above.

Procedure to position papers:

1) Ask relevant NeWater WP leaders (or if obvious direct external platform members) to spent in total 2 days (+1 assistant day) on:
    a. Further specifying the topics (context)
    b. Defining a list of keywords
    c. Using the keywords to search Cordis and Life project databases for relevant finalized and ongoing projects.
    d. Asking the scientific officers in Brussels to point towards relevant projects
    e. Indicatively adapting generic matrix to the purpose of the issue.
    f. Selecting 1-3 project-coordinators or WP leaders and inquire on willingness to contribute. And on willingness to take the synthesis lead. (Preferred are the persons on the IWRM platform list, especially those who attended)
2) Alterra to
    a. Determine TOR of outsourcing to external main author
    b. Outsource the synthesis
3) Outsourced party to
    a. Collect information / or ask project managers to do steps (d) and following
    b. Write a brief summary of the project with respect to the title (issue) of the paper
    c. Adapt the matrix in conjunction with the co-workers
    d. Fill-in the cross table per project (this could be done by asking the relevant project managers – with obvious acknowledgement)
    e. Fill in the relevant deliverable (which may be papers and software)
    f. Write conclusions (If there are many more than 10 projects, limit position paper to 10, and advice for full synthesis in the end; Focus on rows that are almost completely filled or empty)

"Generic" matrix on scoring of projects

Title of the paper		E.g. "Resilience and adaptive capacity of complex water systems"
Aspect addressed		EU Project 1….
Gender Issues		
Scale -	Citizens	

participation		
	NGO’s	
	Formal Institutions	
	Informal Institutions	
	Companies & consultants	
	Local government (operational)	
	Local government (policy)	
	Regional government (operational)	
	Regional government (policy)	
	National government (operational)	
	National government (policy)	
	Continental (e.g. EU)	
	Water authorities	
Scale - Natural	River water quantity	
	River water quality (macro)	
	River water quality (microp)	
	River water ecology	
	River water quantity	
	River water quality (macro)	
	River water quality (microp)	
	River water ecology	
	Lake water quantity	
	Lake water quality (macro)	
	Lake water quality (microp)	
	Lake water ecology	
	Lake water quantity	
	Lake water quality (macro)	
	Lake water quality (microp)	
	Lake water ecology	
	Lake water quantity	
	Lake water quality (macro)	
	Lake water quality (microp)	
	Lake water ecology	
	Lake water quantity	

	Lake water quality (macro)	
	Lake water quality (microp)	
	Lake water ecology	
	Precipitation and Evaporation	
	Quality of precipitation	
Scale - Sectors	Drinking Water	
	Sanitation	
	Agriculture	
	Living & Recreation	
	Ecosystems	
	Transport	
Scale -spatial	Square meter	
	Local	
	Regional	
	National	
	European	
	Global	
	Water body	
	Sub-basin	
	River basin	
	Transboundary	
Scale-temporal	Short term operational forecast	
	Mid-term 1-10 years policy support)	
	Long term (climate change)	
Level of integration with other IWRM topics	List of NW and other IWRM topics to be included here	

List pf relevant deliverables (papers, reports, software)

Project	Content	Availability
Deliverable title; Project		

List of successes from projects final discussions

Project	Content	
Success ID; Project		
Gap ID –failure; Project		

List of gaps from projects final discussions

Project	Content	Solution research initiated?
Gap ID –failure; Project		

5 Annex II: Towards adaptive management by Integrating iwrm and spatial planning; IWRM in the North - Policy brief

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5.1 Summary

This policy brief will explore possible links between water management and spatial planning to better cope with future uncertainty caused by trends in climate change and long-term social and economic developments. Moving towards more adaptive management of water resources and spatial planning will allow for more flexibility and lower risks. This brief will use Dutch examples and EU research and policies to show that risk management is the area in which Integrated Water Resource Management (IWRM) and spatial planning should develop means to cooperate and develop joint adaptive strategies. This policy brief will address directions for a framework in which it is attractive for both sectors to work together in order to develop such an adaptive environment.

5.2 Background

Adaptation in water management is increasingly seen as an inevitable answer to the challenges posed by long term developments such as climate change. Questions are posed however, whether current water management practices and regimes are able to comprehend, process and anticipate future uncertainties associated with long term water management adaptations.

Traditionally, water management is a rather sectoral field, creating technical solutions to cope with water management problems like floods and droughts. Though water managers have successfully used their techniques to cope with water related problems in the past, it becomes increasingly clear that predicted long-term developments might not be tackled with these techniques alone. As there is much uncertainty on how exactly future trends will develop and hence how one should calculate costs and benefits of the necessary investments, a different approach for managing water resources seems required (Gleick, 2003).

The key to dealing with future uncertainties in the NEWATER project is the concept of adaptive management, which differs from ‘reactive’ management by not just responding to certain conditions, but also by assessing possibilities that are still to come. This is achieved by taking a time-integrated view of involved risks and creating flexible adaptive management concepts (van Walsum et al., in prep). Adaptive management builds on developing robust institutional partnerships between water managers, other sectors and private companies. With the ever-growing demand for land and the associated pressure on current land use, a particularly important partnership is that between water management and spatial planning. Most adaptive measures require space that is usually already designated to a specific sector, meaning that it has to compete or be combined with other land claims. Integrating spatial planning with water management will make the measures more robust and decreases the costs of potential events.

In this policy brief we will explore how partnerships between water management and spatial planners can jointly contribute to the concept of adaptive management. We will also briefly go into the state of current EU funded projects with regard to this collaboration.

5.3 Towards adaptive water management

The research area's water management and spatial planning have complementary knowledge which, when combined, are very valuable with respect to adaptive water management.

In order to make the transition to an adaptive management structure, three key elements, among many others, have to be addressed:

1. Sectoral integration
2. Creating Partnerships
3. Creating joint methods for risk management

5.4 Sectoral integration

During the last 7 years Europe has been hit by more then 100 major floods, killing 700 people, displacing half a million others and causing at least 25 billion euro in economic losses, not to mention the environmental damage (Commission of the European Communities, 2006). However, up to now the only policies of the European union related to water management were focused on water quality (e.g. Water Framework Directive, Nitrate Directive, Urban Waste Water Directive, Bathing Directive etc.). Only very recently (18 January 2006) has the first concept of a new directive on the assessment and management of floods been proposed. The aim on this new directive is to reduce and manage the risks that floods pose. Under this directive a water manager has to make flood risk assessments, draft flood risk maps and draw up risk management plans to prevent and limit the effects of floods (Commission of the European Communities, 2006). The European commission recognizes the higher probability of flooding due to climate change and the increasing economic value of flood-prone areas, which indicates the need for water management and spatial planning to come up with more flexible measures to handle future developments. Governments should encourage this by creating a framework in which partnerships are stimulated through legislations that make it attractive to both parties. This can already be seen, though on a limited scale, in Japan and England, where such legislations already exist.

Including water as an important element in spatial planning has long been a wish of policy makers (van Walsum et al., in prep). Different approaches have been developed to achieve this, from both a spatial as well as a water point of view, each with it's own advantages and disadvantages.

An example from the spatial planners perspective is the 'strata' approach in the Netherlands. This approach divides the geographical space into 3 layers (Vonk Noordegraaf, 2003):

- Base layer, consisting of the soil, water and biotic systems.
- Network layer, consisting of all kinds of infrastructure ranging from roads and waterways to pipe-lines and digital networks.
- Occupation, the use of space by human activities (housing, agriculture, nature etc.)

The strata approach states that the base layers should be indicative for the networks, and together these layers are conditioning factors for the occupation of the space. Especially water and infrastructure play an important role in this aspect. Emphasis is on long-term developments over the short- and the mid-term gains (Vonk Noordegraaf, 2003). This method takes an integrated point of view, but generally lacks the flexibility that is needed to be successful and is therefore more often used as an analysis tool rather then a policy tool(van Walsum et al., in prep).

There is a vast portfolio of research being done in the fields of water management and spatial planning. European funded research projects taken from mainly the Cordis database1 have been plotted in a graph, roughly displaying the level of IWRM and spatial planning that's involved in the project (fig. 1). The ESPACE and FLOODsite projects are good examples of projects that aim to incorporate future uncertainty into water management and minimise risks by robust spatial planning. These projects will be finished in 2007 and 2009 respectively and their results could form a solid basis for further integration of the spatial planning and water management sectors.

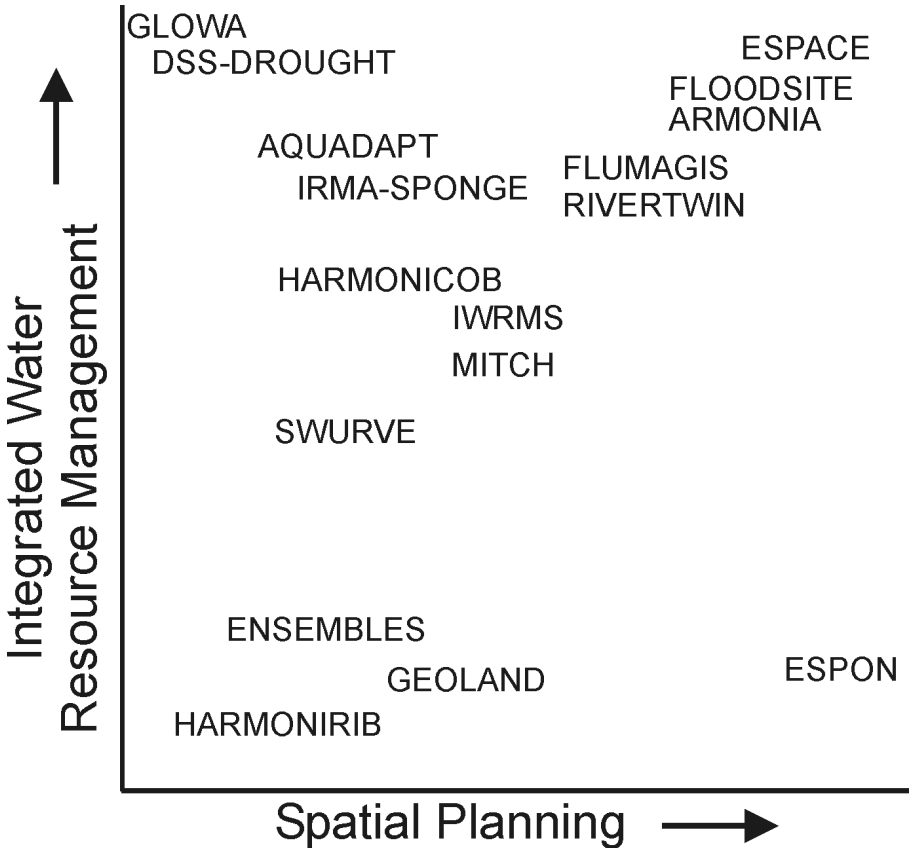

Figure 1: *Distribution of EU funded projects by the level of spatial planning and water management that's involved.*

5.5 Partnerships

Institutions should be aware that, because of the high uncertainty and possible impact of long term developments, they will have to live with change and risk management. Partnerships between different institutions would greatly improve their capabilities to cope with these new challenges. These partnerships are essential for different reasons (van Walsum et al., in prep):

- Equitable sharing of cost and benefits , e.g. of measures that involve 'upstream' costs and 'downstream' benefits;

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1 http://ica.cordis.lu/search/index.cfm?dbname=proj

- Adapting to unforeseen future conditions, as it is assumed that these partnerships are able to swiftly generate new sets of adaptation measures ('strategies'), dependent on the challenges they face.

This concept has led to the development of public private partnerships (PPPs) between water managers and private real estate investors. Furthermore, the Dutch water sector for instance, has developed partnerships with the agricultural sector as well as environmental managers, mainly to share land for multiple purposes (e.g. water storage on agricultural land). Key to the establishment of these partnerships is the role of spatial planners, as they can oversee of the often competing claims for space from the different sectors, including water managers (van Walsum et al., in prep). To make the transition to adaptive water management, spatial planners and water managers have to cooperate and develop new sets of adaptation strategies that are robust under different future scenarios.

A good example of such cooperation can be found in the north of the Netherlands. East of the city of Groningen, the area 'Meerstad' is being developed. Local governments, as well as the national government, the water board and real estate companies work together to build 10.000 houses in an effort to combine the advantages of both urban and rural living2. Besides room for housing and recreation this area also has room for water, in the form of a lake with a capacity of 3 million m3 water. This will prevent the area of flooding due to heavy rainfall, as happened to parts of the nearby city of Groningen in 1998. This form of adaptive management, with involvement of multiple stakeholders, is seen as the way to go in the future by the Dutch Minister of VROM (ministry for housing, spatial planning and environmental protection).

5.6 Methods for implementation

During the 20th century, Dutch water policies mainly relied on the construction of infrastructures (dams, dykes etc.) and legislation to protect their people from water floods and droughts. Standards on how well these measures should protect the people are based on historical climatic and hydrological data (e.g. flood chances of once every 1250 year). However, current long-term developments are of such a magnitude that we can no longer base future projections on the past (Kabat et al., 2005). Many areas protected by dykes for example, now hold much higher economic value when compared to the time that the protection standards were set. Damages from possible floods will therefore have much higher impact. Besides that, projections of future climate show that precipitation patterns will change significantly, influencing the chances of river floods and flooding due to rainfall, rendering the old standards outdated.

A new approach to protect our land is therefore needed where future uncertainties and the potential damage of a certain event are incorporated. Risk (defined as: vulnerability * probability damage, fig. 2) management is a way of dealing with this issue. In risk management not only the probability, but also the damage of certain events are considered, which is what matters in the end. The concept of risk management is nothing new in the field of spatial planning research. The EU- ESPON project for instance, has created European risk maps of 4 technical and 11 natural hazards: including floods, landslides, forest fires etc (Schmidt-Thomé et al., 2004). The final report of project 1.3.1 shows the spatial pattern of natural and technological hazards in Europe per NUTS3 region and identifies possible impacts of climate change on selected natural hazards. Aggregated maps, using weighting systems, of hazards were also created (fig. 3). In water management however, the concept of risk management is relatively new. Standards of flooding in the Netherlands for example, are still only based on the probability of floods and potential damage is not incorporated.

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[2] See: http://www.meerstad-groningen.com (dutch only)

Contrary to the spatial planners however, the water management sector has been familiar with the concept of climate change and it's implication for the current flood-standards, something which spatial planners often lack or only marginally include.

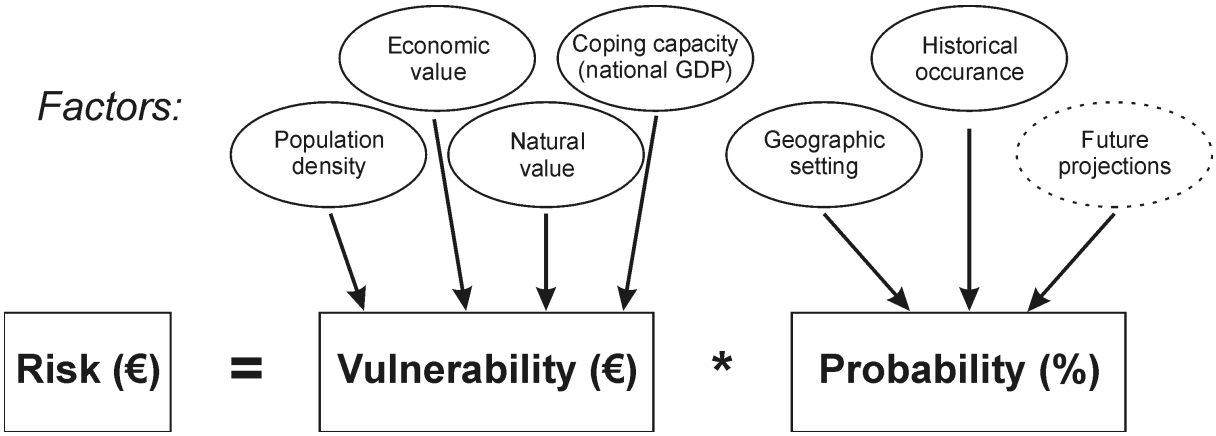

Figure 2: *Definition of risk management (adjusted from Schmidt-Thome (2004)) as used by spatial planners. Water managers often use the probability in their assessments and do not incorporate vulnerability. They do however take into account the effects of future climate chance, whereas spatial planners often fail to incorporate this decently.*

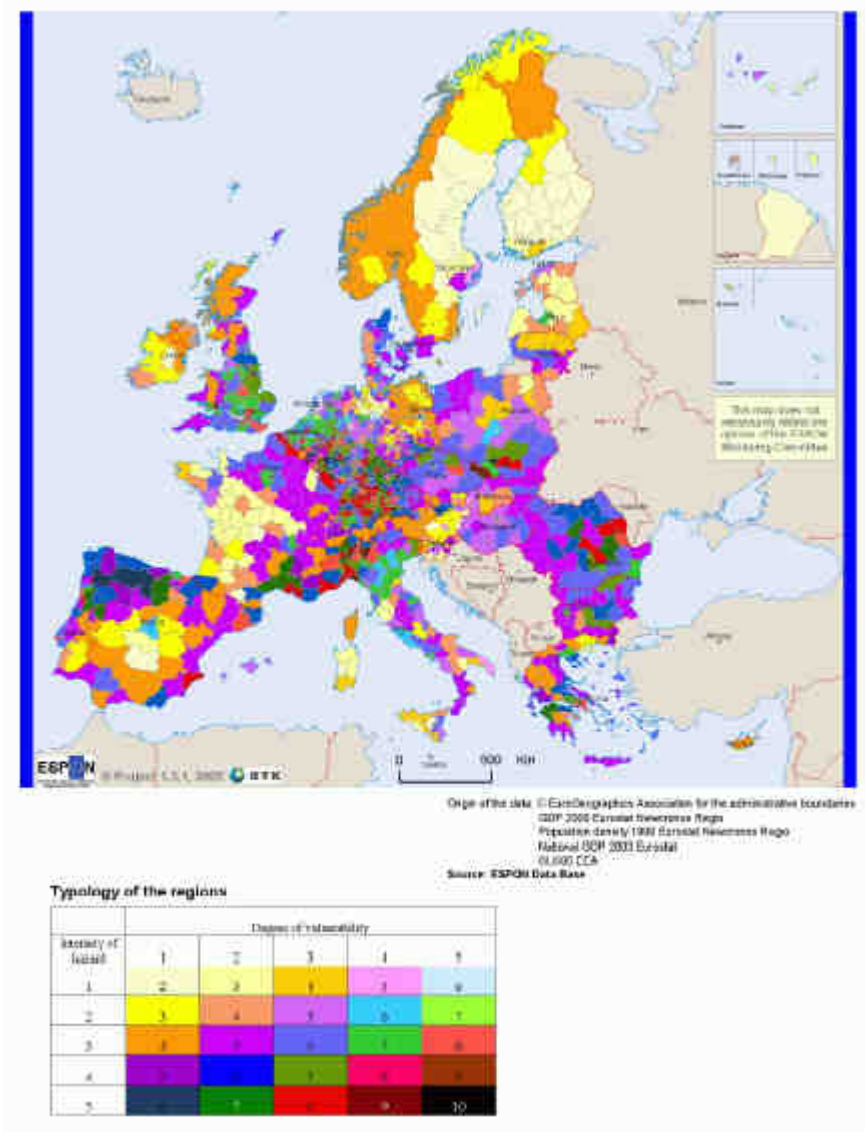

Figure 3: *Aggregated Natural Risk Map from the ESPON report (Schmidt-Thomé et al., 2004). Sum of the risks of all selected natural hazards for the NUTS3 regions in Europe. These kind of maps can be used by spatial planners to find the best-suited area for a certain development.*

Hoes (2005) has been one of the first to combine these two elements: incorporating both climate change and potential damage in a cost-benefit analysis of water management measures. For the Northwest of the Netherlands he investigated the risk of flooding for four future scenarios and the effect of measures using a hydrodynamic and a damage model (fig. 4). He concludes that not flooding, but damage of flooding is the problem, and policy should not be based on preventing floods, but damage resulting from floods. Besides that, the combined effect of climate change and spatial planning is stronger then the sum of their separate effects, indicating that they can't be studied separately.

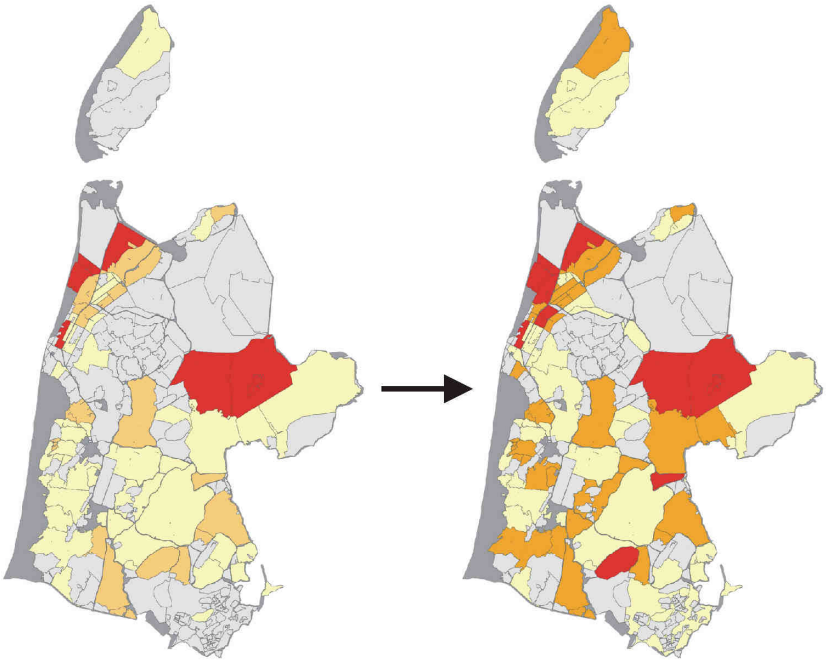

Figure 4: *Risk Map of the Northwest of the Netherlands (Noorderkwartier) for the present situation and the projected situation in 2050 using a +10% increase in precipitation (after Hoes, 2005). Potential damage (in Euros), probability of flooding and the effect of measures are combined in this study into a cost-benefit analysis.*

5.7 Insights and recommendations for policy makers

The key to link adaptive water management and spatial planning in the future is to make the transition towards a risk management approach. Adaptive measures should not be based on the probability of events, but on potential damage and / or vulnerability of the water system to long-term developments such as climate change. Spatial planners and water managers need to cooperate to effectively prepare for water related problems and minimise the damage of possible events.

5.8 Key Recommendations to policy makers:

- Policy makers should create a framework for PPP's between, amongst others, water managers and spatial planners
- Water management should be central in spatial planning
- Common methodology in managing water resources should move towards risk management.

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6 Annex III: Adaptive Water Management and managing change

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6.1 Summary

In recent years water management is facing a number of serious challenges. Innovations in management styles are required to meet the perceived need for integrated management approaches and a stronger emphasis on the human dimension in times of increasing uncertainty and complexity due to climate change and globalization.

This policy brief highlights recent developments in adaptive water management taking into account complexity and uncertainty. Key insights from European Research on adaptive management and social learning suggest the need for a paradigm shift in water management towards collaborative governance and integrated, adaptive water management regimes. In order to implement insights into practice it is required to train a new generation of water management practitioners skilled in participatory system design and implementation

6.2 Background

Over the past decade, a major change in the rhetoric surrounding water resources management has been evident. The debate is now dominated by an increased awareness of integrated management approaches taking into account environmental, economic and social considerations and by the search for solutions which go beyond technical end-of-pipe solutions. The importance of improving water governance is now widely recognized.

The European Water Framework Directive (WFD) is a major piece of European legislation that provides a significant opportunity for a change in Water Policy. The WFD has a holistic goal of achieving a good state of all European Waters by 2015 based on the development of River Basin Management Plans. It prescribes the involvement of all interested parties and the general public in developing, implementing and updating such plans. In a similar spirit, the European Water Initiative launched during the Sustainability Summit in Johannesburg 2002 aims at supporting developing countries to implement Integrated Water Resource Management Plans by 2020.

One can summarize that the need to involve a wide range of stakeholders and foster social learning can be explained by several insights that are not entirely new but have only recently been seriously taken into account in management practice:

- Increasing interdependence between government bodies and other stakeholders (e.g. collective decisions, distinctive competences and complementary contributions needed) reduces the efficacy of a traditional command and control management style and requires a shift towards a more interactive and participatory style.
- Increasing complexity of natural resources management (e.g. a shift towards integrated approaches in management objectives, integrated solutions instead of technical fixes, increased awareness for the complex nature of socio-ecological systems) requires an enhanced capacity for learning and innovation and the need to involve a wider group of stakeholders.
- Increasing uncertainties (e.g. climate change, dynamic socio-economic conditions) require a more adaptive and flexible management approach to realise a faster coping cycle which allows rapid assessments of and implementation of the consequences of

new insights. This requires new skills and capabilities, informal management structures and the inclusion of expert knowledge as well as local lay knowledge.

Such changes in perception and regulatory frameworks imply a need to take into account the full complexity of those systems being managed. At the same time one observes an increase in uncertainties due to climate change and globalization. In particular, in developing and threshold countries, socio-economic change proceeds at an unparalleled fast pace. The established planning approaches in water management developed in industrialized countries that rely strongly on the ability to predict the effect of management measures and design systems that can be controlled are less appropriate in highly uncertain and complex situations.

However, progress in developing, and in particular in implementing, innovative management approaches has not kept pace with the expressed need for a change in management paradigms and practices. Integrated and adaptive management approaches are required that perform well under complex and unpredictable conditions and that can be tailored to the institutional, cultural, environmental, and technological settings of river basins.

6.3 Progress in European Research

Several ongoing and recently completed European projects have addressed adaptive management and related topics.

6.3.1 Adaptive management (highlight different traditions, system approaches in contract to technical approach in water management)

Adaptive management can more generally be defined as a systematic process for continually improving management policies and practices by learning from the outcomes of implemented management strategies. Flexible governance systems and adaptive management strategies which take into account different kinds of uncertainties are urgently needed because:

- Ambiguity (= more than one legitimate and plausible interpretation) exists in defining operational targets for different management goals to be achieved and conflicts of interests require participatory goal setting (not by experts only) and a clear recognition of uncertainties in this process.
- The outcomes of management measures are uncertain due to both the complexity of the system to be managed and to uncertainties in environmental and socio-economic developments which influence the performance of implemented management strategies.
- New knowledge about system behaviour may suggest options for change in management strategies.
- Changes in environmental and/or in socio-economic conditions may demand change in management strategies.

“Adaptive management is learning to manage by managing to learn” where learning encompasses a wide range of processes that span the ecological, economic and socio-political domains in the testing of hard and soft approaches (Gleick 2003). In this respect adaptive management emphasizes (as does IWRM) the importance of the procedural nature of management without claiming that the process is an end in itself but by explicitly recognizing that management strategies and even goals may have to be adapted during the process.

What are the requirements for adaptive management in river basins?

1. New information must be available and/or consciously collected (e.g. indicators of performance of management regimes, indicators for change that may lead to desirable or undesirable effects) and monitored over appropriate time scales (longer than those mandated by short-term political objectives).
2. The actors in the management system must be able to process this information and draw meaningful conclusions from it. This can be best achieved if the learning process unites actors in all phases of assessment, policy implementation and monitoring. If the information collected answers the questions (hypotheses) they posed, then the science and the management are transparent to all involved.
3. Change must be possible in ways that are open and understandable to all actors. Management must have the ability to implement change based on processing new information in a learning process where it is clear as to who decides how and when to change management practices, based on which evidence and why.

Adaptive management must be based on a sound understanding of the complex dynamics of river systems and improved concepts for catalyzing and managing processes of learning and change.

6.3.2 A co-dynamic perspective on human-environment interactions

Another set of insights have been generated by work on complex, co-dynamic and co-evolutionary processes (see Winder et. al, 2005 and McIntosh & Jeffrey for discussions of the differences between these conceptual models). So how can a complexity-embracing, co-dynamic model of change contribute to questions of water management policy? The first point to emphasise here is that such an understanding allows a better "positive" depiction of complex dynamics and thus can act as a basis for a more informed decision and intervention. Secondly, interventions designed distant, hierarchically or spatially, from the intended level of effect are likely to fail as it is more difficult (or comes with higher "transaction" costs) to recognise and adapt to local conditions. Indifferent as they are to the diversity of local behaviours (e.g. EU policies versus diverse regional socio-cultural realities) they are likely to be ineffective and not "selected". Additionally, given the limited possibility for prediction of a change path, massive interventions are inherently more risky. Multiple small-scale policy "experiments" where sub-elements may be "selected" according to local conditions, followed by close continuous monitoring and process revision following implementation are preferable in this respect. Theories of Adaptive Management may indeed be useful in this context.

On the other hand, a co-dynamic view recognizes the importance of large-scale events and systems in relation to lower-level ones and the potential of a macro-micro level gridlock. For example, development policies may continue to favour large infrastructure based solutions to water stress despite evidence of in-effectiveness because of a lock-in of bureaucracies and policies at institutional levels and as conditioned by the overall political environment. It is thus some proper combination of diverse intervention at different hierarchical/spatial scales, which is preferable from a co-dynamic perspective.

The preference for small-scale, diverse interventions is supported by insights from studies in synergetics and self-organisation/chaotic mathematical models. These emphasise how small changes which are spatially and temporally resonant to system dynamics events, rather than large energetic changes, are the ones that cause large results.

A co-evolutionary (as distinct from a co-dynamic) perspective suggests that if there is something close to a dominant selection criterion in the "survival" of "populations" (policies, firms, etc) this is not efficiency, but "learning", i.e. the ability to continuously adapt to the co-changing and at times unexpectedly and dramatically altered, conditions. Coevolution

balances between stressing the limits to rationalism and forecasting vs. the need for creating and working towards (uncertain) visions of the future.

Flexible planning approaches, such as the Strategic Niche Management approach, fit this perspective well. In terms of policy analysis, studies such as socio-technical scenarios or visions, where alternative "futures" are explored fit much better with the philosophy of coevolution than conventional "policy assessment" or "policy evaluation" models.

6.4 The role of social learning and change in adaptive governance[3]

What is social learning?

Social learning in river basin management refers to developing and sustaining the capacity of different authorities, experts, interest groups and the public to manage their river basins effectively. Collective action and the resolution of conflicts require that people recognize their interdependence and their differences and learn to deal with them constructively. The different groups need to learn and increase their awareness about their biophysical environment and about the complexity of social interactions.

Why is social learning needed to move towards and to sustain integrated, adaptive water management?

As pointed out previously, technical infrastructure (e.g. large technical infrastructure for flood protection), citizen behaviour (expectations regarding safety in floodplains, risk perception) and habits, and engineering rules of good practice are often mutually dependent and stabilize each other with the effect that changes towards new and improved resource management schemes are blocked (Pahl-Wostl, 2002). Social learning is assumed to be crucial to break up such "lock-in" situations. It is required for implementing change towards and for sustaining adaptive management practices.

A new concept for social learning in river basin management has been developed in the context of the European project HarmoniCOP. Figure 1 represents the framework for social learning developed to account for learning processes in water resources management (Craps et al, 2003; Pahl-Wostl, 2002). The framework is structured into context, process and outcomes and a feedback loop to account for change in a cyclic and iterative process. The context refers the governance structure and the natural environment in a river basin. To improve the state of the environment implies in practice implies most often a change in the governance structure.

[3] The concept of Social Learning has been investigated in two European project: HarmoniCOP (Harmonizing Collaborative Planning) and SLIM (Social Learning for the Integrated Management and Sustainable Use of Water at Catchment Scale). More information can be found on the project webpage - www.harmonicop.info and http://slim.open.uk.

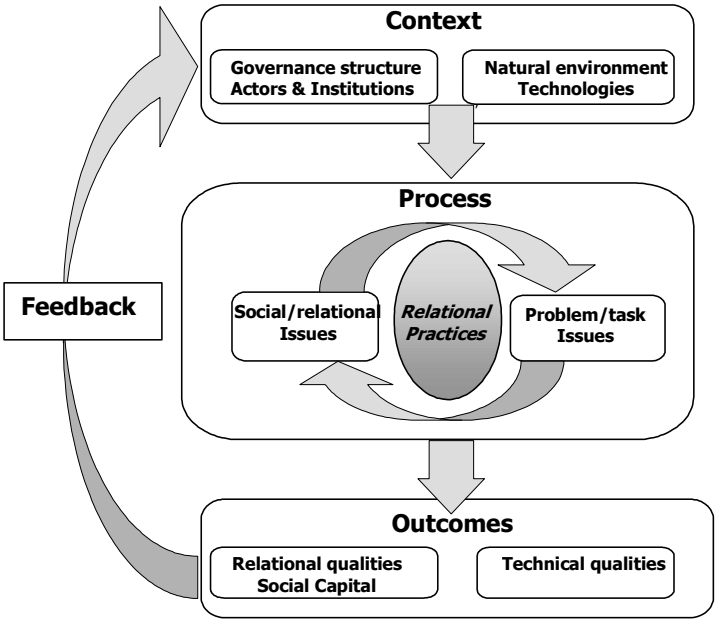


Figure 1 Conceptual framework for social learning in resources management. In the centre are multi-party processes that are influenced by the context in which they are embedded and that produce outcomes that may lead to changes in the context and thus to a cyclic and iterative long-term process of change.

The process concept referring to multi-party interactions in actor networks has two pillars (Figure 1). They relate to the processing of factual information on a problem (content management) and engaging in processes of social exchange (social involvement). Social involvement refers to essential elements of social processes such as the framing of the problem, the management of the boundaries between different stakeholder groups, the type of ground rules and negotiation strategies chosen or the role of leadership in the process. The following box illustrates the role of framing in more detail.

In particular during the initial stages of dealing with a problem **Framing and Reframing of a Problem Domain** determine the direction of the overall process. Actors hold frames that determine how they give sense and meaning to information and their physical and social environment. Frames may derive from culture, social role, scientific disciplines etc. Differences in the framing of an issue are among the key reasons for problems in communication and entrenched conflicts among actors. The framing of an issue includes for example what is at stake and who should be included and in which role. Processes of framing and reframing are essential elements of social dynamics in a group during processes of negotiation of meaning. Powerful actors often impose their frame, their interpretation of an issue, onto a process. A relational practice may be a moderated role playing game or policy exercise where actors are willing to reflect and discuss about their own perspectives and listen to others. Social learning must not lead to consensus but to develop the ability to deal with differences constructively.

The overall social learning process in a group leads to both technical qualities such as the improvement of the state of the environment, and to relational qualities and social capital such as an increase in the capacity of a stakeholder group to manage a problem.

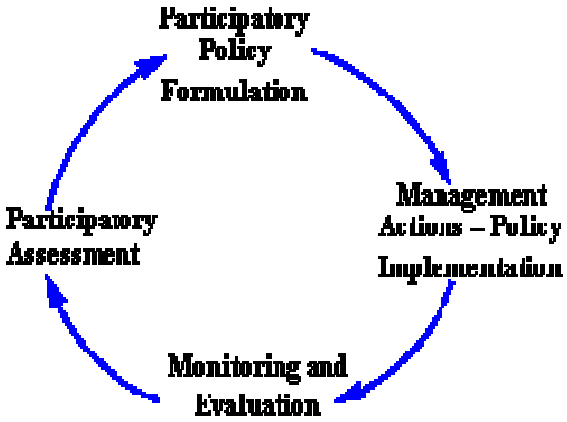
The following table summarizes results from the case studies in HarmoniCOP regarding factors that constrain and that support social learning.

Factors constraining SL	Factors supporting SL
STRUCTURE - CONTEXT	**STRUCTURE - CONTEXT**
• Centralised political and economic systems • Privatisation and commercialisation of environment. • Bureaucratic systems. • Political secrecy and poor public access to information.	• Increased decentralisation of power • Move away from bureaucracy • Political recognition of the positive value of the public voice • Greater environmental awareness by members of the public • Developing a more consensus based culture
PROCESS	**PROCESS**
• Lack of clear objectives & process for involvement • Lack of time and effort taken to build trust • Lack of process to explore common ground rules and manage conflicts constructively • Lack of process to link planning at different levels of scale • Ineffective communication of technical issues	• Provision of sufficient time and resources • Opportunities for participation early enough in process • Use of facilitators and process management • Definition of commonly accepted ground rules • Explicit recognition of different perspectives

6.5 Moving towards integrated and adaptive water management

New approaches are currently explored in the NeWater project on Adaptive Water Management Under Uncertainty (www.newater.info). NeWater will develop new methods for integrated water management taking into account the complexity of the river basins to be managed and the difficulty in predicting the factors influencing them, e.g., climate, socioeconomic developments. NeWater will focus, in particular, on the transition from current regimes of water management in a river basin to more integrated, adaptive approaches.

NeWater takes into account the fact that water management is a political process and that the implementation of all policies are to some extent experiments. Adaptive management is needed as a systematic process for continually improving management policies and practices by learning from the outcomes of implemented management strategies. The whole adaptive management process requires a number of steps that are part of an iterative policy cycle:



- In the definition of the problem different perspectives need to be taken into account in a participatory process.
- The design of policies should include scenario analyses to find strategies that perform well under different possible future developments and to identify key uncertainties.
- Decisions should be evaluated by the costs of reversing them.
- The design of monitoring programmes should include different kinds of knowledge to become aware of undesirable developments at an early stage.
- The management cycle must include institutional settings where actors assess the performance of management strategies and implement change if needed.

The implementation of such a management approach is only possible if certain structural conditions are fulfilled. Hence the implementation of adaptive management needs integrated system design.

Which features of a management regime render it more adaptive to maintain environmental, economic and social sustainability in a fast changing and uncertain world?

Some structural requirements for a system to be adaptive have been summarized in the following table. Two different regimes are contrasted as the extreme, opposing ends of 5 axes in the following table.

Dimension	**Prevailing Regime**	**Integrated, Adaptive Regime**
Governance	Centralized, hierarchical, narrow stakeholder participation	Polycentric, horizontal, broad stakeholder participation
Sectoral Integration	Sectors separately analysed resulting in policy conflicts and emergent chronic problems	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	Transboundary issues addressed by multiple scales of analysis and management

Dimension	Prevailing Regime	Integrated, Adaptive Regime
Information Management	Understanding fragmented by gaps and lack of integration of information sources that are proprietary	Comprehensive understanding achieved by open, shared information sources that fill gaps and facilitate integration
Infrastructure	Massive, centralized infrastructure, single sources of design, power delivery	Appropriate scale, decentralized, diverse sources of design, power delivery
Finances and Risk	Financial resources concentrated in structural protection (sunk costs)	Financial resources diversified using a broad set of private and public financial instruments

The characteristics of integrated adaptive regimes are to be regarded as working hypotheses since the change towards more adaptive regimes is yet slow and empirical data and practical experience thus limited. One possible reason for this lack of innovation is the strong interdependence of the factors stabilizing current management regimes. One cannot, for example, move easily from top-down to participatory management practices without changing the whole approach to information and risk management. Hence, research is urgently needed to better understand the interdependence of key elements of water management regimes and the dynamics of transition processes in order to be able to compare and evaluate alternative management regimes and to implement and support transition processes if required.

NeWater will develop indicators to analyse if and why certain attributes of a regime make management more adaptive and if and why a more adaptive management regime supports the achievement of the goals of an integrated and sustainable water management integrating social, economic and environmental dimensions as promoted by IWRM.

6.6 Key insights and recommendations for policy makers

- The complex socio-ecological nature of river basin environments and the inherent uncertainties associated with their management have to be taken into account in policy development and implementation.
- Selected management strategies should be robust and perform well under a range of possible, but initially uncertain, future developments.
- The design of transparent and open social learning processes is a key requirement of sustainable water management regimes.
- Effort has to be devoted to building trust and social capital for problem solving and collaborative governance.
- An increase in, and maintenance of, the flexibility and adaptive capacity of water management regimes should be a primary management goal
- Trust in a collaborative process is a more robust strategy in conditions of uncertainty then any belief in prediction and control.
- Entrenched perceptions and beliefs block innovation and change. Space has to be provided for creative and out-of-the-box thinking
- There is a significant need to train a new generation of water management practitioners skilled in participatory system design and implementation.

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7 Annex IV: Advanced monitoring information system to support Adaptive management; IWRM in the North - Policy brief Tuesday 18 March 11:00 - 13:00

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7.1 Summary

Increasing knowledge of the complexity of the processes in water systems has led to a growing demand of environmental information. The importance of the environmental information increased along with the necessity to ensure an appropriate access to the information concerning the environment to all the parties interested in the decision-making process.

In this “informational” perspective of the environmental decision-making, the environmental monitoring networks play a fundamental role since they have been widely used to increase the knowledge of the state of the environment.

Starting from the inadequacies of the current monitoring systems, the properties of an Advanced Monitoring Information System able to support the Adaptive Water Management are described. Above all, an innovative monitoring system has to be adaptive and flexible, able to deal with environmental changes and to adapt to changes in political context and societal values, to incorporate new information, technologies and scientific results, and it has to be tailored for specific ecosystems.

7.2 Background

Policies and decision making processes on environmental issues have to be based on appropriate information and modelling results, as widely acknowledged in literature. Sound knowledge, reliable information and accurate data are vital for good environmental decision-making.

Moreover, the importance of the environmental information increased along with the necessity to ensure an appropriate access to the information concerning the environment to all the parties interested in the decision-making. The principle of access to environmental information is directly connected to the goal of improved public awareness to environmental issues and improved participation in environmental decision making. In fact, to achieve public participation in environmental decision-making, the public must gain access to environmental information, data and knowledge. The principle of access to environmental information has been also established by the UN conference on “Environment and Development”, held in Rio De Janeiro (1992). According to the Agenda 21 document, the authorities have to facilitate and encourage public awareness of the environmental issues and public participation in the decision process by making information widely available. Moreover, it pays particular attention to the role of the information in the sustainable environmental resources management. In a sustainable development perspective, everyone is a user and provider of information.

The transition towards an adaptive approach to the water resources management is causing changes also in the role of information in decision-making.

Adaptive management refers to a “learning by doing” process in which the outcomes of the implemented strategies are used to iteratively refined and improve the management policies.

The adaptive management can be considered as a continuing process of action-based planning, monitoring, researching and adjusting with the objective of improving the implementation and achieving the desired goals and outcomes. It improves managers' understanding of ecosystem functioning through the implementation of carefully designed management interventions and monitoring programs.

Several framework have been proposed to describe the adaptive management process, but in all of them great importance is given to the monitoring and evaluation phase as source of information to support the learning process (fig.1):

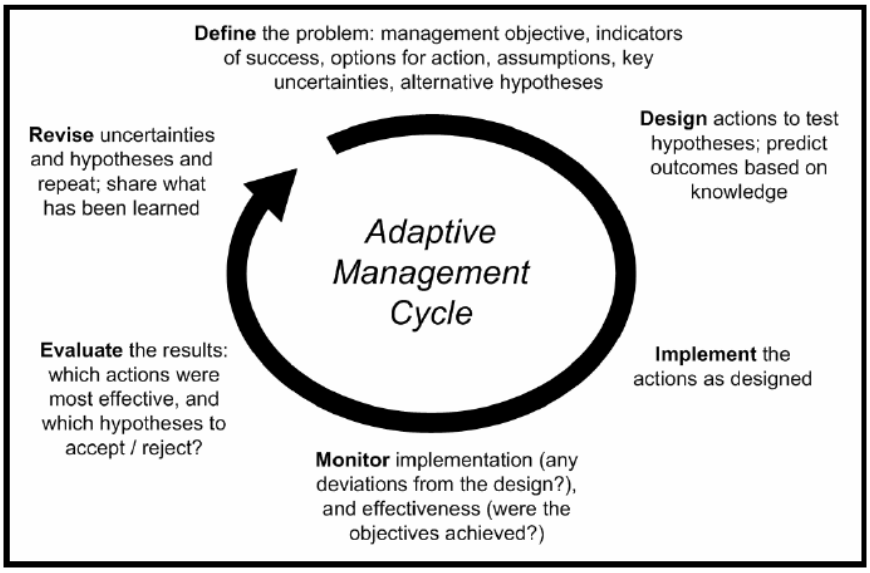

Fig.1: Adaptive Management Framework

According to this framework, responding to information gained through monitoring activities is fundamental to the adaptive management approach. Information distilled from monitoring is used both to determine the effectiveness of implementation activities, and to test the hypotheses that originally formed the basis of the management action.

The availability of new information and the ability of a system to process this information are at the basis of the adaptive capacity of the system.

Starting from a review of both the scientific literature on monitoring information system and the EU funded projects, some recommendations are provided to policy makers to define monitoring systems able to support the Adaptive Water management.

7.3 Monitoring Information System for the Adaptive Management

In an adaptive perspective of the water management, information and information production process have to support the increase of the knowledge and the improvement of the management plan. To play this fundamental role, novel monitoring systems are required to support the decision making process, able to provide timely identification and warning of emerging environmental problems and effective feedback on the adequacy of policies and programs. Moreover, the novel monitoring systems have to be able to provide information also in data poor areas integrating different sources of information.

The transition towards an advanced monitoring information system starts from the understanding of the shortcomings of the current monitoring systems.

7.4 Key deficiencies of the current monitoring system

Although the linked process between environmental monitoring and decision making is widely acknowledged, according to the scientific literature, there are several key deficiencies in traditional monitoring networks hampering the usability to support the Adaptive Water Management. They are not much successful in providing timely identification and warning of emerging environmental problems; in delivering effective feedback on the adequacy of policies and programs; in providing policy-makers with a sound basis for action. But, above all, traditional monitoring systems are less successful in delivering information to the public, stakeholders, research personnel, and managers so as to raise awareness, educate and provide the basis for informed decisions and choices. The data collected by these systems are not always available to the public or are not easily understandable, limiting data access and consequently the public debate on the state of the environment. Thus, the issues of information availability and comprehensibility have to be dealt with.

The usability of the monitoring information for the decision process has to be considered. Nowadays policy makers and water managers are overwhelmed with data and information that may or may not be of use to them. Therefore, there is a call today for less quantity of information and more targeted, tailor-made, information. The information needs is the crucial step in the information-producing process to decide what it's needed to know. The information needs are different for different stakeholders. This requires to elicit from stakeholders their information needs.

7.5 European Researches regarding the Monitoring systems

To define the properties of an innovative monitoring system, a review of the EU funded research project dealing with the design of innovative monitoring system have been carried out. Many projects have been found and some of them have been analyzed in this study: ECOWAT, WATERMAN, WATERCRM, SEWING, CEEAM.

Most of analyzed projects deals with the assessment of water quality developing new methodologies and technologies to detect pollutants (e.g. polyaromatic hydrocarbons, cyclodienes, polychlorinated pesticides and volatile organic hydrocarbons) in the water bodies, mainly rivers.

The issues that have been addressed by these research projects are main related to risk management and public health safety. Some of them (ECOWAT, WATERMAN) deal also with some aspects of the IWRM such as the integration among different models and decision support system. On the other hand, little attention has been given to important issues of the Adaptive Water management such as the uncertainty assessment and propagation, participation of informal institutions.

The involvement of the stakeholders in the implementation of the projects is always limited. The various levels of the governmental agencies (local, regional and national) are often the end users of the knowledge developed during the project implementation. These projects still consider the monitoring systems as a "one-way" information dispenser. There is no chance for the interaction among the information producers and users. Moreover, only the institutional stakeholders have been taken into account as possible users of the monitoring information. The enhancement of the information accessibility for the non-expert people is not the aim of the projects.

One of the main features of an innovative monitoring system is the adoption of an holistic view, considering the relationships between the different sectors. In the analyzed project, the interactions are mainly pressures of one sector on another. ECOWAT starts considering the possible pressures of the agriculture and fishery on the nature and ecosystem. WATERMAN

considers the possible pressures on water resources and drinking water due to industrial and agricultural activities.

Also HarmoniRib is interesting for the aim of this study. One of the aim of the HarmoniRiB project is to collect information on the current practices with respect to the water resources monitoring. The project concentrates particularly on the ways users can access the data. Moreover, HarmoniRiB identifies the challenges that have to be met in creating a database suitable for supporting the Water Framework Directive. Moreover, HarmoniRib deals with uncertainty in hydrological studies. The overall goal of HarmoniRiB is to develop methodologies for quantifying uncertainty and its propagation from the raw data to concise management information.

Other interesting projects aim to develop useful information systems rather than deal directly with environmental monitoring. Among them, we reviewed the MANTRA_East project. One of the aim of the project is the definition of the properties of an information system able to support the integrated water resources management, with particular attention to the transboundary water management. This project focuses on how the information is perceived and appreciated in a water decision process, and how to improve the information production and the usefulness of this information. From an experimentation concerning the Lake Peipsi water management, some recommendations have been derived highlighting the requirement of different formats to present information to different users, the necessity of cause-effects relationships, the importance of socio-economic information and the importance of the links between information production and decision-making. Most of this recommendation are described in the last section.

7.6 Towards an Advanced Monitoring Information System

As stated previously, adaptive management is based on the integration between different sources of knowledge. The monitoring system has to be joined with the shared platform through which the different sources of knowledge that can support the adaptive process are integrated (fig.2). Hence, the advanced monitoring systems have to be designed starting from an integrated perspective of the environmental phenomena. The sectorial approaches have to be overcome.

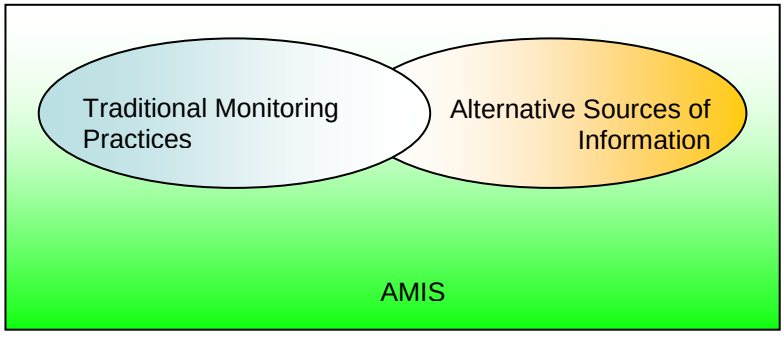

Fig.2: Integration among different sources of information

In particular, how best to integrate the scientific knowledge, resulting from the implementation of “formal” monitoring activities, with that deriving from a stakeholder-based approach is becoming an interesting field of research. Many attempts have been made to design monitoring systems able to collect local knowledge to be used in the decision-process. The environmental data collected by citizens have been used to keep communities, elected officials, and government agencies informed about the problems that need to be addressed, increasing public awareness.

In an innovative monitoring system design the distinction between information users and producers is not as clear as in the traditional monitoring system. In fact, on one hand the stakeholders need the monitoring information to deepen their knowledge in order to participate in the decision process. On the other hand, they take part also in the information production process as elements of the community-based monitoring. Thus, in an innovative monitoring system the information needs have to be defined in a collaborative environment, allowing all the stakeholders to highlight the interesting information and to define the way to collect the information.

Another important characteristics of an innovative monitoring system is information diffusion. Dissemination of information is crucial to the development of a learning-oriented management system. Improved access to information and public participation in decision-making enhance the quality and the implementation of decisions, contribute to public awareness of environmental issues, give the public opportunity to express its concerns and enable public authorities to take due account of such concerns. The advanced monitoring systems has to provide information easily comprehensible also for non-expert system.

Above all, an innovative monitoring system has to be adaptive and flexible, able to deal with environmental changes and to adapt to changes in political context and societal values, to incorporate new information, technologies and scientific researches, and it has to be tailored for specific ecosystems.

7.7 Insights and recommendations for policy makers

The first step to define an Advanced Monitoring Information System concerns the information needs that have to be defined involving the different stakeholders.

The adaptive degree of a monitoring system is strictly related to the significance of the feedback between information production and the decision-making processes. In fact, the adaptive approach to monitoring design iteratively refines the monitoring design as a result of experience in implementing the monitoring program, assessing its results and interacting with the users. Thus, the importance of learning in an adaptive perspective can be extended also to the information production process. In this perspective, the information needs are not “static”, but they have to follow the dynamics of the environmental phenomena to be monitored.

The information needs definition has to be considered as an iterative process that should meet both users and producers needs. From the users’ side, the monitoring should support natural resources managers, policy makers, and the public in refining the monitoring questions, revising the implementation of management plans, and setting monitoring priorities. Regarding the information producers, the adaptive monitoring should support monitoring system designers in revising the monitoring design by providing a tangible foundation for discussing user needs; gaining the insights necessary to minimize the most prominent technical barriers; enhancing the efficiency of the collection, analysis, and assessment systems; and refining the monitoring questions.

7.8 Key recommendations:

- Adopt an integrated perspective of the monitoring activities
- Integrate different sources of information, both technical and stakeholders-based
- Consider the information as pervasive, supporting all the phases of the decision process
- Involve the stakeholders in the information needs definition process

- Enhance the accessibility of the information also for non-expert people
- Adopt a “learning-by-doing” approach in monitoring system design (continual feedback between information producers and information users)

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8 Annex V: Public involvement in water management; IWRM in the North - Policy brief, Tuesday 18 March 11:00 - 13:00

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8.1 Summary

This policy brief gives arguments for and against involving the public in water management decision-making. Water managers can benefit from participatory processes in that they gather new insights, become better aware of different perspectives on water management, or gain more support and understanding from the part of the public. Arguments against public participation include a potential fall in accountability of the decision process, potential problems with representativeness of those participating, possibly a lack of motivation of the public and sometimes a low awareness of water issues. In this policy brief, we present different methods for involving the public in water management decisions and devise a list of criteria with which one can evaluate participatory processes. We make a general evaluation of available methods and dig somewhat deeper into two specific methods: focus groups and citizens' juries that have been applied in Sweden, Estonia and the Netherlands. Public participation is a process structured by national, regional and local differences in culture, institutions and physical circumstances. This brief does not explicitly deal with such issues but it can be expected that the conditions for public participation in the three countries studied here are relatively favorable to public participation. Lessons learned here may apply with extra force under less favorable conditions.

8.2 Background

Water management used to be seen largely as a technical, infrastructure-building task. These days, there is greater awareness that seeing water management purely in a technical way is a too narrow perspective. Water projects, small and large, increasingly become subject of opposition, and need to be evaluated from a much broader perspective than mere technical feasibility. Water managers these days need a higher level of public awareness and understanding of the problems they face and they need active help from the citizenry and stakeholders in finding acceptable solutions. This requires knowledge from the public about the economic consequences of certain choices and about the local circumstances in which choices need to be made. Interestingly, the Water Framework Directive calls for 'public participation' in order to ensure protection and a sustainable use of the European river basins. According to the preamble of the Directive, all interested parties need to be involved in the production, review and updating of the river basin management plans: 'The success of the Directive relies on close cooperation and coherent action at Community, Member State and local level as well as on information, consultation and involvement of the public, including users' (2000/60/EC). The Directive distinguishes between 'stakeholders' and the wider public in the sense that information and consultation are prescribed for both categories, active involvement only for stakeholders. How information, consultation and active involvement take place, is communicated in a 'guidance document on public participation' that was developed to facilitate the implementation of the WFD in respect of its public participation requirements (CIS, 2001).

8.3 Public participation: advantages and disadvantages

Public participation is here defined as a group of procedures designed to consult, involve and inform the public to have an input in public (government) decisions. Public participation can be approached in various ways. Here we look at public participation from an instrumental perspective, implying that we present participation as a means rather than an end.

Public participation may have certain disadvantages. It is often considered to be time consuming and expensive while the results are often not so tangible, as will be discussed below. Also, participants tend to be unrepresentative of the general population, and it does seem that participants are often disappointed because they expect that their findings are taken very seriously, whereas this is not always possible. Finally the added value in terms of information gathering is often contested.

Yet, public participation does have potential merits for water managers that are in line with their needs. First of all, participation may increase public awareness, understanding of problem that are being faced and acceptance of solutions chosen. By involving citizens and organized interest groups in decisions that will affect themselves, water managers may expect a higher rate of acceptance and thus compliance on the part of the public, resulting in quicker decision-making and less litigation. Secondly, participation may enrich the decision-making process with relevant viewpoints, interests and information about the water issue that could not have been generated otherwise. It helps to rule out overlooking something, which may improve the decisions. Thirdly, participation may increase the legitimacy of decision-making, as it enables the stakeholders to engage in deliberation about the necessary decisions and makes them co-responsible for the decisions that are made and the actions that are taken. Fourthly, participation may increase the accountability of decision-making, as participants get an inside view of how decisions are made while their arguments (hopefully) play a role in the decision making process. Finally, participation may result in learning. Stakeholders, government and scientific experts enter into a dialogue and, by interaction and debate, they learn how to collectively manage a river basin and deal with conflicting views and interests.

Our discussion so far has emphasized the perspective of the water manager. Needless to say, the perspective of the public often may differ. Again reasoning in an instrumental vein, the public may appreciate participation because they want to learn or develop their opinions on a certain matter, or they want to exert a certain influence on the decision process, or they use the participation process as an avenue to show their position. It is often assumed that public participation enhances the public spiritedness of participants and has positive effects for the feeling of political involvement. There are some disadvantages for participants too: they will be unsure about the effectiveness of their partaking, they have to invest time, etc.

8.4 Methods for public participation

The table below is based on Rowe and Frewer (2000: 8-9). These two researchers have made a full inventory of participatory methods mentioned in the academic literature. The methods listed are generally also mentioned in the European Guidance on public participation methods for the Water Framework Directive. It is assumed that the reader will be familiar with most of these methods, except the final three. Negotiated rule making refers to government-initiated processes in which legally binding norms (e.g. emission limits) are set. The citizens' jury and the focus group are explained in greater detail later in this paper.

Method name	**Participants**	**Duration**	**Characteristics**
Referenda	Potentially all members of a population,	Single event	Voting, choice of one of two options. All participants have

	realistically a significant proportion		equal influence, outcome often binding
Public hearings	Interested citizens, limited number because of size venue	Weeks, months, sometimes years	Presentation of plans in open forums. Public may voice opinions
Opinion surveys	Large samples, usually representative	Single event, minutes	Written questionnaire of telephone survey. Used for information gathering
Negotiated rule making	Small number of representatives of stakeholder groups	Uncertain. Strict deadlines normally apply	Working committee of stakeholder representatives. Consensus required on a certain matter (often a regulation)
Citizens' jury/panel	Twelve to twenty members of the public, roughly to be representative of the population	Days (four-ten)	Lay panel with independent facilitator questions expert witnesses. Conclusions made public via report of press conference
Focus groups	Small groups of five to twelve selected to be representative of public	Single meeting of a few hours	Free discussion on general topic which is recorded; little input from facilitator. Used to asses opinions/attitudes

Obviously, these methods can be used alongside each other, and they have many variants. The table does not mention ‚webpanels', but these are becoming increasingly popular and they combine advantages of citizens' panels with those of opinion surveys.

8.5 Evaluating methods

Again drawing on Rowe and Frewer (2000: 19-20) we suggest a range of criteria from which to evaluate participatory processes from. These criteria are directly connected to the goals that both water managers and participants may have. In addition to presenting some criteria, we indicate how the above-mentioned methods ‚score' on the different criteria so that the reader can match goals and different methods. Our table includes two methods, citizens' juries and focus groups, which will be discussed in greater detail in the next paragraphs.

	Referenda	**Hearings**	**Opinion survey**	**Negotiated rule making**	**Citizens' jury/panel**	**Focus groups**
Representativeness of participants	High	Low	Generally high	Low	Moderate	Moderate
Independence of participants	High	Generally low	High	Moderate	High	High
Early	Variable	Variable	Potentially	Variable	Potentially	Potentially

involvement?			high		high	high
Influence on policy	High	Moderate	Indirect	High	Variable	Liable to be indirect
Transparency to public	High	Moderate	Moderate	Low	Moderate	Low
Resource accessibility	Low	Low-moderate	Low	High	High	Low
Task definition	High	Generally high	Low	High	Generally high	Variable but may be high
Structured decision making	Low	Low	Low	Moderate	Potentially high	Low
Cost effectiveness	Variable/low	Low	Potentially high	Potentially high	Moderate to high	Potentially high

8.6 Spotlight on citizens' juries

In this section we will briefly present a deeper analysis of the use of citizens' juries in water management. We will base our analysis on our experience with the EU funded project River Dialogue, in which the experimental use of the method was tested in three different countries at the same time (Sweden, Estonia and the Netherlands; see www.riverdialogue.org). Here, we focus on some particularly salient findings that are relevant for more participatory methods; a more elaborated analysis can be found in Huitema (2004) and Kangur (2005).

We start with some remarks on the representativeness of the participants by looking at those who volunteered to participate in the jury after receiving an invitation to join.

Country	**Number of invitations sent out**	**Number of positive replies in time (%)**	**Reported overrepresentation of**
Sweden	1,500 (mail)	44 (3.3 %)	Low education level 40+
Estonia	800 (insert in newspaper)	49 (6.1 %)	Men 30+
Netherlands	2,000 (mail)	61 (3.05 %)	Men 30+ Highly educated

The willingness to participate is very low and older people are overrepresented in all three countries involved. There is apparently no consistent overrepresentation of men and people with higher education levels in the case of these three juries, even though this is an often-described phenomenon. The citizens' jury method compensates for overrepresentation by selecting participants. This approach could be applied more often to get a more mixed audience.

The need for a well-structured process is demonstrated by the experience in the River Dialogue project. The figure above, based on measurements by the Dutch team- suggest that domination of the process by a small set of participants is a real danger.

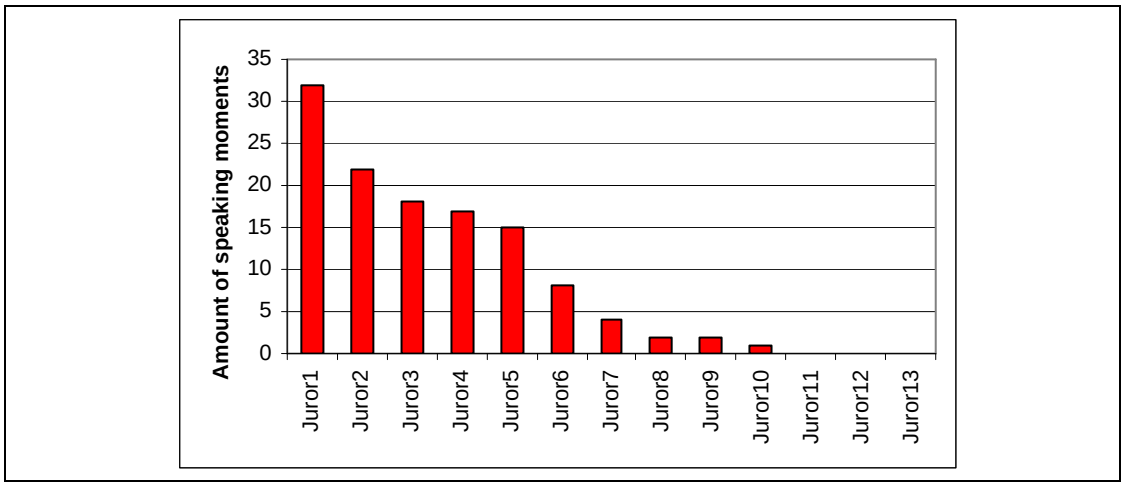

Figure. The amount of speaking moments per Juror in the Dutch Jury during the formulation of recommendations for the policy makers (plenary session)

One measure to try and prevent one or a limited number of jurors to dominate the process, the jury was split up in smaller groups during certain parts of the process (devising questions for witnesses, talking about conclusions). The idea behind this is that the more silent people feel more comfortable in a smaller group and speak out more. Measurements in the case of the Dutch jury (Huitema et al, 2004) suggest that this is correct, but that the effect is not remarkable.

The cost effectiveness of the citizens' jury tends to be an issue of concern. The costs are considerable (50,000 Euros and up) and it is often argued that citizens' juries should therefore be used mainly in situations with a high level of complexity and controversiaility.

8.7 Focus on focus groups

Because the citizens' jury method is relatively expensive, we also present a much cheaper method, the focus group. A focus group can be described as an informal discussion among selected individuals about a specific topic. There are many variations on the basic method, but in general, a focus group involves one or more group discussions, in which participants focus collectively upon a topic selected by the initiator, usually presented to them as a small set of questions. The method can be used to generate a rich understanding of participants' experiences and beliefs with regard to a specific topic. The focus group is guided by a moderator who is a well-trained professional who works from a predetermined set of discussion topics.

Looking at representativeness, we found that focus groups need not necessarily be representative for a wider social collective. Especially when organizing focus groups consisting of people that meet each other regularly, it is possible that there is less diversity of opinions (to achieve diversity, one would need to have various focus groups). This can be overcome by organizing multiple focus groups. In the case of the River Dialogue project, we organized around ten focus groups in Sweden, Estonia and the Netherlands.

Looking at resources, we observe that focus groups are not a very resource intensive method. Focus groups require little commitment from participants in the sense that they can generally be held in locations near them and that the average duration is only 1.5 to 2 hours. No preparations need to be made by the participants. In the River Dialogue project this implied a

relatively high willingness to participate. The figure below shows that the willingness to participate of those approached by phone varies from 24 to 100 percent.

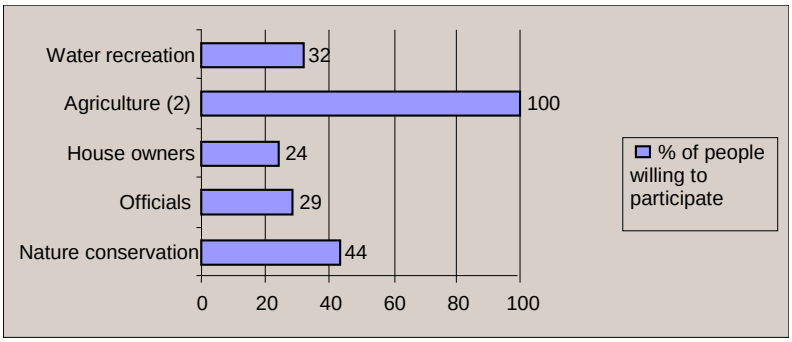

Figure. The willingness to participate in focus groups on water management held in the Netherlands.

A ringing 79 Percent of the participants would be willing to participate again if they were asked to. The participants gave several reasons for this. The main reason was that the focus groups gave them the opportunity to express their opinion about a topic of their concern. Some argued that the focus groups would be more interesting if the groups were heterogeneously composed, or if the groups received more concrete information input. Only one participant indicated that he would not participate again.

In terms of independence, focus groups score relatively high. There is little external input of information and therefore the participants mainly learn from each other. Our analyses show that 24 percent of the participants gained a lot of new insights from the focus groups (Score 1 and 2), whereas 53 percent of the participants gained hardly any or no new insights at all (Score 4 and 5). The generation of new insights was lowest in the two agricultural groups and in the group with public officials, whereas the house owners, the fishermen and both the citizens groups gained relatively many new insights.

Score Groups		1	2	3	4	5
		Many new insights				No new insights at all
Fishermen	(n=6)	33	0	33	17	17
House owners	(n=5)	20	20	40	0	20
Citizens Friesland	(n=8)	0	50	13	37	0
Citizens Almere	(n=7)	0	29	29	29	13
Nature conservation	(n=4)	0	25	25	25	25
Water recreation	(n=5)	0	20	0	0	80
Public officials	(n=7)	0	14	0	58	28
Farmers Friesland	(n=8)	0	12.5	50	25	12.5
Farmers Noord Holland	(n=6)	0	0	17	50	33
Total average	(n=56)	5	19	23	27	26

Figure. The learning effects of focus groups according to participants in the Netherlands

From the outcomes of the Dutch focus groups it does appear that focus groups are helpful in getting an idea of how people construct problems. The question however is how valuable

such insights really are. This depends crucially on the situation wherein a water manager finds himself. If there is little experience with participatory policy making, or when many new policies are in the process of being prepared, getting to know problem constructions of certain groups may be useful information. Perhaps overlooked problems come to the surface, priorities may have to be adjusted, or valuable insights for the communication process on policy are learned.

8.8 Conclusions

This policy brief pointed at advantages and disadvantages of public participation in water management from a functional perspective. This implies that we have focused on goals that water managers may have and indicated how certain participatory methods may help them achieve these goals. We would like to add that public participation can often also be justified on the basis of normative considerations (the desire to work in a democratic manner) and on the basis of legal considerations (public participation is often part of the legal requirements).

There is a rich variety of methods, various of which have been discussed here. These methods have profiles that make them suitable for specific situations. If the goal is simply to understand what the public thinks, focus groups and opinion polls may suffice, if the goal is to reach agreement on certain standards, negotiated rule making may be applicable, if the goal is to publicly discuss a complicated project the citizens' jury may be prescribed. We propose that water managers, if engaging with the public, start using a wider variety of methods than they currently do. The traditional method of public involvement, the hearing, has downsides that have been mentioned often. Negotiated rule making, opinion surveys, focus groups and citizens' juries would be welcome additions, be it all in different circumstances.

The discussion in this brief suggests that challenges in terms of representativeness are real and that participation methods must be run in a highly structured manner to avoid domination by a limited set of participants. It seems that even across different country settings, it is hard to involve people, especially young people in public participation processes. European knowledge on public participation in water is currently rapidly proceeding with the results of the Newater and HarmoniCOP projects coming out (see Raadgever and Mostert, 2005; Ridder, Mostert and Wolters, 2006). These projects point at the fact that successful public participation, regardless of the method used, requires that the organizer adheres to four principles:

1. Openness, meaning that the water manager and other parties involved abstain from the possibility of taking unilateral decisions.
2. Protection of core values, the core values of participants must not be under threat.
3. Speed, deadlines should be clear and realistic.
4. Substance, agreements that are reached must be technically feasible or disproportionally expensive.

Finally, we do wish to reiterate the fact that the institutional, cultural and physical conditions under which participation takes place may differ strongly within Europe, between Europe and other developed nations and finally between Europe and the developing countries. Lessons learned within Europe may be even more valid under less favorable conditions for public participation. We would welcome an exchange of insights with practitioners and scholars from other parts of the world.

8.9 Insights and recommendations for policy makers

Key recommendations:

- Water managers can choose a rich variety of public participation methods to engage the public. These methods have several profiles that have been represented here
- Little used but potentially attractive methods for public participation in water management next to hearings are public opinion surveys, negotiated rule making, focus groups and citizens' juries.
- In public participation the representativeness of people taking part needs to be actively monitored and corrected if not in order A structured decision process is necessary to prevent individuals from dominating public discussions.

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9 Annex VI: Transboundary regimes and the role of information; IWRM in the North - Policy brief - Tuesday 18 March 11:00 - 13:00

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9.1 Summary

The EU Water Framework Directive is an important driver for water policy development and water management in the EU Member States. In the coming years, River Basin Management Plans must be developed by the Member States to describe the actual and planned management of the River Basin, in cooperation between all Member States that share a River Basin. This puts specific requirements on the institutional arrangements as well as on the way information is handled and disseminated on top of the national water management arrangements. The national level must be supplemented with a transboundary component that not only complicates management in terms of adding interfaces, but also adds a new level of complexity in terms of differences in legal, cultural, historical, and institutional settings. This policy brief will provide insights and recommendations on how to cope with water management in a transboundary setting, based on recent EU research on this topic. While many insights are based on the WFD implementation, the knowledge obtained is also of relevance for other, non-European international River Basins (among others in the context of the EU Water Initiative).

9.2 Background

The EU Water Framework Directive (WFD) to a large extent determines the water policy development and water management in the EU Member States. Water policy in the European Union in the period until 2009 will be dominated by the developing of River Basin Management Plans (RBMP). These RBMPs contain the environmental objectives for the River Basin as well as the measures as controls taken or identified to reach these objectives. Article 13 of the WFD and the accompanying Annex VII describe what the RBMP should contain, how it should be produced and how often it should be reviewed. The article among others prescribes that for an international River Basin District (RBD) the riparian Member States must coordinate with the aim of producing a single international River Basin Management Plan.

A recent study showed that 30% of the prospective RBD's are international. Area wise, the international RBDs constitute 66% of the total area of prospective RBDs (see figure). This underpins the importance of transboundary cooperation between riparian countries in collective management of a river basin. It implies that national issues concerning the RBD can no longer be dealt with on a national basis but should be negotiated with other countries.

This policy brief touches various issues that have to be dealt with in transboundary cooperation and describes the role of international institutional regimes and the role of information in transboundary settings. Regimes use and produce, are based on and result in information. By combining these two aspects of institutional regimes and information, a more complete view emerges on transboundary water management. From this perspective it is important in transboundary settings to analyse the ways formal and informal actors cooperate in transboundary regimes, how policies are developed and implemented, the existing and developing legal framework, the financial basis and the use and production of information within transboundary regimes. A specific focus needs to be the analysis of information input to decision-making processes in international water management and its interactive relationship with the actors in the process (actors use information for their objectives but are also influenced by incoming information). The analysis below is based on a review of EU research in the field of Integrated Water Resources Management (IWRM) done in the framework of the NeWater project. A review of existing transboundary water management structures and practices in transboundary water basins in Europe demonstrated that organisational and institutional aspects of implementing EU water policy (political, research, administration etc) need to be developed. Problems of communication and information exchange between different levels of governance as well as across borders present major difficulties for water policy implementation.

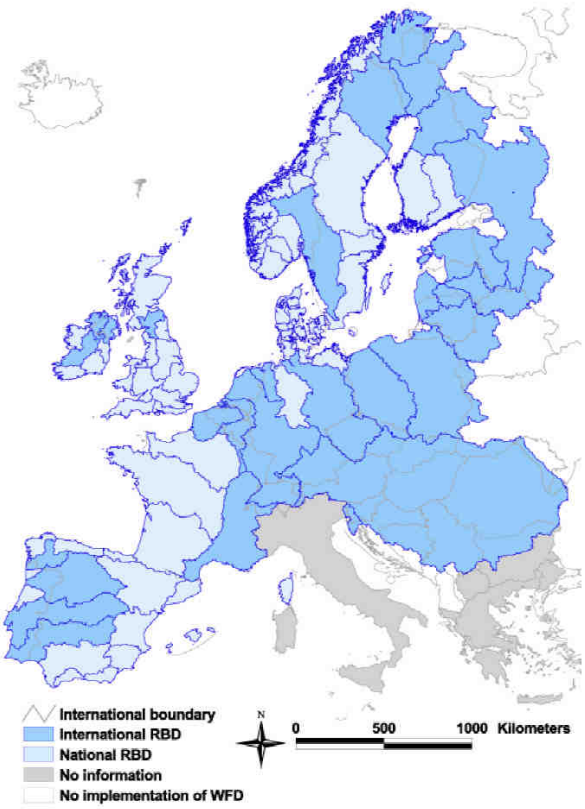

Figure: Prospective river basin districts (Nilsson and others 2004).

9.3 The role of international institutions/regimes in transboundary settings

International regimes can be defined as the ensemble of institutions around an international issue, such as the management of an international river basin. Depending on different cultures, governance, socio-economic settings, languages etc., different regimes exist. The synthesis of European research should provide an overview of what “institutional designs” can be labelled integrated in terms of able to apply IWRM, thereby investigating the power play between countries and diplomacy/negotiations, the role of informal agreements, the role of international conventions (ratified or not), etc.

Water management in a transboundary context is much more complex than water management within one country. There are different countries with their distinct political and economic interests, different histories and cultures to manage the transboundary waters. Management of transboundary water is therefore inherently political, and political will from

the governments of all riparian countries is a prerequisite for a successful initiation and continuation of any transboundary cooperation. This political commitment to international cooperation by the transboundary states is however weak.

Transboundary aspects seem to be seriously underestimated in WFD implementation so far. The requirements in the WFD text concerning transboundary RBDs are 'softly' defined while the ambitions of holistic management and administration according to river basins are high. In the face of the large number of transboundary RBDs there is a need for more formal arrangements and procedures between the riparian governments as well as between the governments and the stakeholders to implement the WFD. This should include responsibilities and procedures of work.

It is highly important and recommended by the WFD to involve multiple stakeholder groups in the development and implementation of EU and national water policies with the aim of developing a social learning process. This may not always be feasible because sometimes only few organised stakeholder groups exist that are in some way involved in the planning and implementation of water policies. Many local stakeholders are not sufficiently aware of regional water management issues and therefore are not able to become involved. This may be combined with the fact that experts often produce a highly technical body of information that becomes incomprehensible to non-experts. Next to that, transboundary water commissions are largely expert/technical in nature. The socio-economic connotations of water management decisions may as a consequence be underestimated. One consequence of the expert/technical of commissions can be a lack of attention to the involvement of stakeholders.

The implementation of water protection measures requires considerable financial resources, usually much higher than available in transboundary water basins. In this context the environmental objectives of water management plans should be coordinated with the economic development priorities of the border regions.

9.4 The role of (static-dynamic) information in transboundary settings

Information plays an important role in decision-making, ranging from use of information as a source of power to use of information to postpone decisions to applying information as a basis for cooperation. This synthesis of European research provides insight into the role of information in transboundary regimes. This relates to the question if data/information (incl. socio-economic information) is exchanged across borders and communicated to the public. Underlying questions are: Who collects and produces information? Who interprets information? Who uses information (if any)? How is information used in decision-making processes? What were drivers for (un) successful examples (e.g. budget, flood/drought etc.)? Next to this, the review searches for the use of information on new developments and scenarios. Main questions are: What happens with projections and planning (exchange of information on plans (“we are planning a dam”) and expectations (“we expect our agriculture to increase by XY%”) between countries, does it match)? Is there exchange on planning and what is expected to happen? How does it fit? What are drivers for “good/bad” examples?

Environmental data is rarely used in the decision-making process unless it shows a direct and clear connection between the impact of the physico-chemical and biological conditions to changes in the economic and social situation in a given transboundary water region. Information for decision making, especially the analysis of the problem, needs to fall within the scope of expectations of the decision makers. For a transboundary water management situation this implies that, to be effective, an existing problem should be described from the viewpoints of the countries involved. Furthermore, the information should also allow for different solutions in the different countries.

A very wide spectrum of information is required to support decision-making and to evaluate the effects of water resources management decisions. Information production lags behind these information needs in water management. Although IWRM was introduced more than a decade ago, information about transboundary water basins still focuses mostly on hydrological and ecological components of water bodies and largely ignores the importance of socio-economic data and processes. Among the reasons that hinder production of improved information are;

1. Strong boundaries between different disciplines that are not easily overcome;
2. The variety of information needs are underestimated and the knowledge and perception of goals of information dissemination prior to producing the information is insufficient;
3. Differences in institutional behaviour between representatives of different organizations involved in the cooperation hinder the collaboration between these institutions.

To improve transboundary cooperation it is necessary to initiate actions such as common monitoring programs, the construction of common databases, common tools for hydrological and ecological predictions, as well as efficient information dissemination and exchange systems.

Innovative approaches and technologies to disseminate water management information (e.g., semantic webs, citizen juries) are found to be valuable in transboundary water basins as a means of increasing awareness. Knowledge management technological solutions should be used to provide interested parties with comprehensive information and news on environmental and regional development issues in the basin. In developing this usable knowledge it highly advisable to bring down the complexity of the information by breaking down the problem domain into sub-domains. The discourse, including the various arguments and facts should be made as open and as easy as possible with the goal of reaching actual decisions rather than accumulating opinions.

9.5 Insights and recommendations for policy makers

- It is essential to address differences in water management competences between countries. Next to that, the political processes of transboundary cooperation must be taken into account.
- There is a need for better cooperation and coordination across borders. To achieve this, at least formal arrangements and detailed procedures for transboundary cooperation must be established between riparian countries.
- There are weak requirements for transboundary river basin districts in the WFD.
- Stakeholders and the public participation are the keys to the successful implementation of water policies. Transboundary Water Commissions need to involve stakeholders.
- The use of environmental combined with socio-economic information is crucial for transboundary water management and decision-making.
- There is a need to develop innovative approaches and technologies to disseminate water management information to the wider public in a form that it becomes understandable for this audience.

9.6 References

Further reading:

Gooch, G.D. and Stålnacke, P. (eds.), 2006. Integrated transboundary water management in theory and practice: Experiences from the new EU Eastern borders IWA Publishing, London, UK. ISBN: 1843390841. (in press)

Nilsson, S., Langaas, S. and Hannerz, F., 2004. International River Basin Districts under the EU Water Framework Directive: Identification and Planned Cooperation. European Water Management Online No. 2004/02. http://www.ewaonline.de/journal/online.htm

Timmerman, J.G. and Langaas, S. (eds.), 2004. Environmental information in European transboundary water management. IWA publishing, London, UK. ISBN: 1843390388.

Projects included in the review:

MANTRA-East, Integrated strategies for the management of transboundary waters on the eastern European fringe - the pilot study of Lake Peipsi and its drainage basin www.mantraeast.org

TRANSCAT, Integrated water management of transboundary catchments www.transcat-project.net

TRANSMAP, Transboundary networks of marine protected areas for integrated conservation and sustainable development: biophysical, socio-economic and governance assessment in East Africa www.transmap.fc.ul.pt

TRABOREMA, Concepts for integrated transboundary water management and sustainable socio-economic development in the cross border region of Albania, Former Yugoslav Republic of Macedonia (FYROM) and Greece www.traborema.net

HARMONICOP, Harmonising collaborative planning www.harmonicop.info

10 Annex VII: Local Action reporting FT 5.15 - Broadening perspectives in the face of increasing risks (FT 5.15)

Convener

European Commission DG Research; Scientific Officer: Dr Panagiotis Balabanis.

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Chairperson:

Prof. Dr. Wim Cofino, Head of the Centre for Water and Climate, Wageningen University and Research Centre.

Crosscutting perspectives:

Institutional Development and Political Processes, Capacity-building and Social Learning, Application of Science, Technology and Knowledge.

10.1 Title of the local action 1

New Approaches to Adaptive Water Management under Uncertainty (NeWater) – the Amudarya Basin Case Study (LA 1796)

Chairs: Umid Abdullaev (uzgip@buzton.com), Maja Schlüter (mschlute@princeton.edu)

10.2 Synopsis

Water resources in the Amudarya river basin sustain an intensive agricultural sector, livelihoods of the local population in its oases and a variety of ecosystems that provide valuable services. Water availability is extremely highly variable demanding for a flexible and highly adapted water management that can cope with droughts and floods. More than 90% of the water resources in the river basin are used in irrigated agriculture.

In recent years river basin management has been challenged by major changes in the political and socio-economic environment and increasing uncertainty in water availability. All river basin countries have engaged in reforms to adapt to the new realities. However, given the complexity of the water management system in the Amudarya river basin, highly integrated approaches are needed to make it more adaptive and ready to cope with uncertainty and unexpected change in the future.

This NeWater case study aims to identify potentials and barriers to making water management more adaptive and ready to cope with current and future challenges. It brings together practitioners, stakeholders and scientists to compare, debate and synthesize new development pathways for the Amudarya basin. Activities are taking place through the year 2008 at different scales from the transboundary, to the regional and local levels. There will be active stakeholder participation through a wide consultation process, dialogues, and focus group discussions. The available past and on going multi level projects and studies will be mainstreamed to enable an environment for implementation of adaptive IWRM principles and reliability.

10.3 Key Activities

The project aims to identify future development pathways and provide guidance and tools that will allow current water management to adapt to new realities and future challenges. Future pathways will focus on:

- Water allocation (quality & quantity) between different users, options for diversification of water uses
- Inter-sector cooperation and partnerships to enhance livelihoods and the provision of ecosystem services.
- Impacts of water management on most vulnerable groups
- Information management on the local and transboundary scale, potential of new monitoring approaches (e.g. participative monitoring, technical advancements)
- Adaptive governance
- Capacity-building and social learning

10.4 Lessons learned

- A thorough understanding of the characteristics of the current regime, including its actors, adaptive capacity, environment, cultural and socio-economic settings is a basis to identify barriers and potentials for transition to more adaptive regimes.
- The development of future pathways and options for change should be based on the knowledge of the current regime and the experience gained in past projects, taking the socio-economic, cultural and political realities in the river basin into account.
- The discrepancies between introduced reform policies and their implementation on the ground are not always well understood
- There is a need for consistent policies to address root causes
- Institutional coordination and harmonization at national, oblast and local levels is essential to facilitate changes
- There is a need to develop the institutional and research capacity to formulate and implement integrated approaches, and to overcome constraints;
- Development of stakeholder participation and partnership through (I) community organizing; (ii) sustainable livelihood approaches; (iii) relationship-building; (iv) participatory research; and (v) training and capacity building.

10.5 Key Messages

- Need for integrated approaches that take new realities and challenges in the river basin into account, considering technical as well as social aspects
- Solutions to current problems in the river basin will to a large extent have to come from the social side (rather than technical solutions)
- Stakeholders at different scales (governmental, regional, farmers' representatives, etc.) should be involved into a process to develop a joint vision to address current and future challenges and methods to address them, e.g. diversification of water uses for sustainable livelihoods

- Approaches that can cope with uncertainty instead of trying to eliminate it are urgently needed
- Successful small scale pilot studies can help overcome resistance to change and increase adoption of new approaches
- It is believed that a transition from centralized management to more involvement of actors at different levels will enhance the adaptive capacity of the system; forms of public participation in a specific context have to be jointly developed

10.6 Title of the local action 2

Hydrologic Sustainability of Hillside Developments (LA 0845)

Chairs: Jorge Maza (mazaja@nysnet.com.ar), Raquel Zabala (rzabal@minplan.gov.ar)

10.7 Synopsis

The unfavourable effects of conventional hillside developments in Greater Mendoza (Mendoza, Argentina) on storm runoff in downstream urban areas have been observed, since flows are 91% higher than those produced by the watershed in the undisturbed state.

The study has also made it possible to determine that non-conventional urban development substantially improves hydrologic conditions as the above percentage decreases to 16%.

10.8 Key Activities

The hydrologic response to the above conditions was that the runoff from a 5-year recurrence interval storm was the same as the runoff from the natural watershed.

Digitized cartography, aerial photography, satellite imaging, geographic information system, a digital terrain model and hydrologic simulation mathematical models were used for this project.

The study includes hydrologic sustainability guidelines for hillside development in Greater Mendoza.

10.9 Lessons learned

This action can be of great interest for other locations where growth through hillside areas without any regulation or no land use planning has been identified.

The problem discussion and its solution methodology can be used in approaching similar cases.

The study is available for State and Local authorities to be used as the basis for a future land use regulation in the Great Mendoza hillside area.

10.10 Key Messages

After an in-depth bibliographic review of hillside development regulations and codes, this non-conventional urban development was revised so as to conform to the following guidelines:

- Road lay-out according to land contour
- Number of lots or houses inversely proportional to the natural slope
- Household storm sewers that drain into the same lot for infiltration

- Application of a hillside fragility index based on infiltration parameters, natural slope of the land and distance to streams.
- Strategic location of impounding reservoirs in excavations

10.11 Title of the local action 3

Guadiana Basin Case Study (LA 1781)

Chairs: Pedro Martínez-Santos (pemartin@geo.ucm.es) and Araceli Olmedo

10.12 Synopsis

The semiarid Upper Guadiana basin (Central Spain) spans 16,000km2 and is home to about 500,000 people. Over the last thirty years, rapid change and adaptation have been key to water resources management in the basin. While irrigation-based social and economic welfare has traditionally acted as the main driver behind the area's prosperity, it has also been a catalyst for unwanted environmental effects and complex legal reforms. These divergences are currently at the heart of widely voiced water conflicts, both at the inter and intra-basin scale, and call for further adaptation in the dawn of the Water Framework Directive.

Groundwater is by far the most valuable water resource in the Upper Guadiana basin. Today, groundwater irrigation is the main water consumer in the area, accounting for 95% of the total uses (200,000ha), while remaining a significant economic sector together with its associated industries. Intensive groundwater development for agriculture began in the 1970s, mostly through the initiative of individual farmers. Since then, groundwater irrigation has brought significant social and economic benefits to the region, mainly due to the ready availability of the resource on demand and to the resilience of aquifers against drought.

However, groundwater development mostly took place in an uncontrolled fashion, while water authorities traditionally focused on building and managing surface water infrastructures. Largely as a result, groundwater-dependent ecosystems such as RAMSAR-listed Las Tablas de Daimiel National Park were seriously affected. The environmental effects of intensive pumping were aggravated by European subsidies, which favored irrigation of water-intensive crops in the 1980s and 1990s. In the recent past, government initiatives to restore and maintain aquifers and wetlands have traditionally met stiff opposition, mostly from farmer collectives. These generally advocate the reallocation of existing water transfers as the ultimate solution to the area's problems.

10.13 Key Activities

To debate water management futures as an alternative to the present situation of relatively uncontrolled groundwater irrigation, water shortage and conflict prone water transfers.

Adaptive water management focuses on: wide public participation and education in:

- Operational day to day water distribution and groundwater management (e.g. combined with short & medium term meteorological, hydro geological and agro-economic forecasts);
- Economic diversification;
- Transparency in data;
- Legal and institutional arrangements.

Indicator of Success: reduced vulnerability to climate change and water shortage and improved basin wide economic & ecological performance

10.14 Lessons learned

This action provides an excellent example of conflict over the benefits of groundwater-based irrigation and the environmental value of groundwater-dependent wetland ecosystems.

The Guadiana experience shows command and control approaches to be unsuitable for groundwater management. Bottom-up user associations within an adaptive management regime may prove a viable alternative in the future. However, after years of social conflict, the transition to adaptive management must necessarily be gradual.

10.15 Key Messages

Over the last decades, agriculture in arid and semi-arid countries has experienced a true "silent revolution" of intensive groundwater use. Millions of independent farmers worldwide have chosen to become increasingly dependent on the reliability of groundwater resources, and as a result their countries have reaped abundant social and economic benefits. The Upper Guadiana basin, Spain, provides an excellent example of this reality.

- However, this "silent revolution" has been carried out with scarce control on the part of governmental water agencies, and thus a series of unwanted effects have developed in certain places. While these by no means justify the pervasive "hydromyths" and obsolete paradigms that voice the frailty of groundwater, appropriate management of groundwater resources remains a worldwide challenge.
- Stakeholder education and the creation of bottom-up user associations appear crucial steps in attaining adaptive groundwater management, since command and control approaches have generally proven unsuitable.

10.16 Title of the local action 4

Drainage of the area of the metropolis of Mexico City and the risk of flooding (LA 0367)

Chairs: Gustavo Paz Soldan (gsp150205@yahoo.com.mx) and Concepción Olavarietta (olav@prodigy.net.mx)

10.17 Synopsis

Mexico-City is one of the most densely populated and extended metropolises of the world. From the foundation of the Gran Tenochtitlan in 1325 much energy has been put in infrastructure for drinking water, industrial use and for drainage to avoid flooding.

Mexico City suffers from an integrated water problem: during centuries the soil settled because of the overexploitation of the groundwater, the subsidence of the soil created a lowering of the topography and problems of drainage. With the extension of the town the scale of drainage system enlarged and became more complex; the system functioned less. Funds for reconstruction of the drainage system had to compete with other priorities; so investments were delayed and maintenance neglected.

Rehabilitation and extension of the drainage system is essential; depression cannot be drained anymore; the capacity is insufficient under high rainfall conditions; temporary and local flooding cause economic loss. On top of that one has to fear high rainfall and increased floods because climatic change. The risk of inundation is increasing every decade. Technical solutions alone are not sufficient as also social, political economical and financial aspects influence the implementation.

10.18 Key Activities

To test appropriate integral solutions for drinking water, industrial use and drainage to avoid flooding and reduce the risks of failure of the drainage system.

Technical appropriate design and implementation of works; solutions that are acceptable at district, state and national level; dealing with influential parties that may pose a risk; essential changes with important reach which can compete with political priorities; programme for motivation of the people who lost confidence in the government for full cooperation with the programme.

10.19 Lessons learned

Complex problems like the drainage of a metropolis like Mexico need:

- Good analysis of the effect of the actors in the process
- Proper participation of the parties involved
- Considering the investments needed and the social and economic cost in case of no action and the carrying capacity of a metropolis as Mexico.

10.20 Key Messages

- To improve awareness and create support for the process one has to make clear that beyond the economic costs and benefits also the improvement of social security and human live is at stake.

10.21 Title of the local action 5

Poverty alleviation and ecological integrity

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10.22 Synopsis

The Orange is the largest watershed in Africa south of the Zambezi. More than half of the catchment area is located in South Africa, with the remainder lying in Lesotho, Botswana and Namibia. The Orange basin is characterized by extremely variable rainfalls, ranging from 2000 mm per year at the source to 50 mm per year and thus extremely arid climatic conditions neat its mouth, and high evaporation of 2.000 to 2.500 mm. The Orange does not have extensive floodplains or a significant delta. Only in the downstream area there are low-lying areas with fertile land that is suitable for irrigation. Irrigation dominates water use with 54 %, in contrast to 10 % that goes towards environmental demands and 2 % provided to urban and industrial use. The remaining 34 % is accounted for by evaporation and run-off to the ocean through rivers and canals.

The central aim of this case study of the NeWater project is to build preparedness for uncertainty in future water resources supply and demand. Capacity building in the use of scenarios, tools and incentives will assist in developing this preparedness. Furthermore, the generation of scenarios in association with project partners may help develop greater common skills, understanding and teamwork between the four countries in the Basin. The Orange Senqu River Commission (ORASECOM) is the four-country water management and allocation institution, which has agreed to participate in this project.

10.23 Key Activities

To produce accessible water futures that illustrate the connectivity between water users and managers in the Orange, the potential consequences of various uncertainties, and the associated management options.

Here solutions focus on: different modes of trans-boundary cooperation, links between poverty and water, the role of the donor community and management of the Lesotho Highlands for water production.

Indicator of Success: poverty alleviation goals, variation of water system services and benefits, maintaining ecological integrity, cooperation between countries in basin scale management.