

# **TAILORING NEWATER INSIGHTS TO EU POLICY PROCESSES**

NeWater synthesis product No 3

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

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## Preamble

Water managers and policy makers face many challenges. They have to satisfy various, often conflicting demands with limited resources, grapple with uncertainty, particularly that related to climate change, and often lack effective tools to address an array of complex water management issues. To help them overcome these challenges, the EU-funded NeWater project has developed the concept of Adaptive Integrated Water Resources Management (AWM). This approach assumes that sustainable management of water resources will only occur if we can increase our capacity to learn from experience and adapt to change and uncertainty.

AWM acknowledges the various types of uncertainty that we face: that there is (and will always be) a lack of knowledge on how the different parts of the water system interact, how the system works and how it will change with time. A central part of this management approach, therefore, is not only to seek new information (for example, with tools to support adaptive monitoring as well as tools to better assess future development). It is equally important to improve the capacity of the actors involved to process this information and draw meaningful conclusions from it: *“Adaptive management is learning to manage by managing to learn”*. As distinguished from other management approaches, AWM demands an assessment cycle that builds on the participation of all relevant actors during the management process. To be fully effective, the management process needs to be open for and encourage change in a way that is transparent and understandable to all actors. The capacity of stakeholders to protect their interests and to utilise a whole-system approach is a precondition for joint decision making in sustainable water resources management.

NeWater has dealt with a wide variety of issues and made valuable insights to support AWM in practice. These insights have emerged in large part from the experiences and results of the seven case study basins including the Rhine, Elbe, Guadiana and Tisza basins in Europe, the Amudarya in Central Asia, and the Orange and Nile basins in Africa.

Most of the project’s results have been published in reports or journal articles as well as on the project’s website. However, to provide guidance with this richness of results, the project consortium has identified twelve synthesis products addressing the most topical themes. These are (working titles):

1. [Management and Transition Framework](#)
2. [Uncertainty Guidelines](#)
3. [Tailoring NeWater Insights to EU Policy Processes](#)
4. [Climate Change Adaptation Book](#)
5. [Water Resources Scenarios for CS Regions](#)
6. [Cross-Comparison of Climate Change Adaptation Strategies across Regions](#)
7. [Process for Analysing Dynamic Vulnerability and Adaptive Capacity](#)
8. [Special Feature on Implementing Participatory Water Management](#)
9. [Guidebook on Adaptive Water Management](#)
10. [AWM Section in the WISE-RTD portal](#)
11. [Training and Guidance Material](#)
12. [Online Curriculum](#)

The present document contains the Synthesis Product No. 3. It tailors NeWater results along the current EU policy questions in water management.

## Acknowledgements

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

The authors wish to thank all interview partners from DG Environment and DG Research for generously offering their time and expert knowledge to identify the most relevant EU water policy questions for this NeWater synthesis product.

Claudia Pahl-Wostl  
Coordinator of NeWater  
May 2009

# Executive Summary

## Overview

NeWater aimed that the wealth of experience gained in the research and applications during the project will support a broader and more knowledgeable community of researchers, practitioners and policy makers. Thus, NeWater research has been tailored – from the beginning on – to the needs of water policy makers and practitioners. The present report is developed in the same spirit: in close co-operation between high-level EU water policy experts and the NeWater research community aiming to identify the current “burning policy” issues in order to map the NeWater results along them.

The report has been developed in two phases: The identification of current burning EU water policy questions and the mapping of NeWater results. In this process the identified questions have been clustered in the following three main topics:

- Water environment - Assessing status, trends and impacts
- Water governance issues
- Communication and dissemination of (scientific) knowledge

For each topic the relevant policy questions are described in detail linked to the appropriate results of NeWater.

## Background of the report and the reference framework for the policy questions

In order to provide a clear reference to the readership, chapter 2 is based on the main EU Directives and Initiatives considered in this process. The European Water Framework Directive (2000/60/EC; WFD) is central focal point of the section. The WFD is put in context with other policy sectors such as the Floods Directive (2007/60/EC) and the Groundwater Directive (2006/118/EC). Further climate change policy (Green & White Papers) and the EU Water Initiative (EUWI) were analyzed in terms of their adaptive capacity or the potential to improve it.

Summarizing it can be said that current water policy includes already some important elements to implement more adaptive management such as management cycles, intense monitoring requirements or participatory approaches. The challenge remains to make them effectively operational. For example, the emphasis on cooperative approaches including public and stakeholder participation needs to sharpened towards supporting learning processes which build the capacity of stakeholders to allow understanding other perspectives and better acknowledging the need of an integrated approach to water system management. Methods are required to ensure that the amount of necessary interactions and the political influence and resources at hand of the different actors does not lead to a minimal participatory approach preventing change towards more adaptive measures. Such measures build on informed decisions for which monitoring systems need not only to deliver reliable data on environmental changes and their impacts on water bodies and water dependent ecosystems but they need to be able to adapt to new information, technologies and scientific results improving the integrated approach in water resources management. Of huge concern in this context are the developments of climate change and the uncertainties linked to it. Not only further simulations and 77scenarios are necessary but also ways in approaching uncertainties acknowledging the lack of objective data interpretation and the importance of different perspectives from different stakeholders on the same problem (e.g. framing water scarcity as a demand or a supply problem). For example, the tremendous uncertainties in groundwater management especially regarding the impact of measures, or in climate change developments, need to be addressed explicitly, not necessarily reducing them but integrating them in a way which allows later adaptation of management strategies.

European water management also started to look more intensely beyond the territory of EU. The EUWI includes several elements that promote adaptive management solutions. The introduction of IWRM in all EUWI countries is an important first step towards adaptive water management. The installation of a monitoring group and the partnership approach provide a good basis for reaching AWM. However, the implementation of EUWI still faces several challenges: especially the (financial) commitment of EU Member States, but also that of the partner countries is a point for improvement.

## **The main policy questions identified and the NeWater contributions to answering them**

The NeWater project relies on two major pillars of research approaches:

- Methodological and conceptual development and integration of approaches to analyse management regimes and processes of change and transition
- Participatory action research in different case studies and problem oriented integration at the case level

Based on an analysis of the main Directives/initiatives and complemented by the results of interviews with European Commission representatives, the main policy questions to which NeWater can contribute were identified. Three overall categories of questions were established, while for each question an explanatory text has been developed which explains the background and rationale of the question.

The questions are listed below. Clicking on them allows you to immediately get to the contributions to these questions from NeWater (see **chapter 3**). An overview on the results can be found at the end of this summary.

### *A. Water environment - Assessing status, trends and impacts:*

[1. How can we better assess the impacts of climate change on water and deal with the uncertainty related to its impacts?](#)

[2. How can we improve water monitoring systems and assessment methodologies to better integrate uncertainties in water management?](#)

[3. How can we better assess the effectiveness of measures taken in terms of their impacts on the water environment?](#)

### *B. Water governance issues:*

[4. How to deal with uncertainty for decision-making?](#)

[5. How to better understand the role and improve the functioning of institutions for transboundary water management?](#)

[6. How to better implement and integrate public participation into decision making?](#)

### *C. Communication and dissemination of (scientific) knowledge:*

[7. How can water policy makers get better awareness of and access to scientific knowledge?](#)

[8. What are tools for identifying and making visible best practice solutions at the local level, which allow practitioners and decision makers to learn from another?](#)

[9. How can water managers and water policy makers improve their capacity on adaptive and integrated water resources management allowing the consideration of uncertain developments such as climate change?](#)

## **Further research questions identified - conclusions**

The explorative character of this study resulted in more issues than could be covered by NeWater. They are either covered (to a certain extent) through other EU-research projects or require additional research activities in the future (see chapter 4). A major cluster of such further research questions is

related to economic aspects of water management. The second group of questions refers to several different issues such as the need for case-based experiences on the impact of measures, support for international cooperation and knowledge transfer.

As a conclusion, while NeWater has aimed from the start to tailor its research as best as possible to the needs of the stakeholders, as a research project it can not deliver only on demand – especially since it aims for innovation and changes in the current system of water resources management. The document shows that important insights can be gained from NeWater vis-à-vis the key current EU water policy questions. These are especially linked to the development in governance issues towards adaptive management. Still, much more support will be gained with the further elaboration of the tools and methods of the NeWater such as the Management and Transition Framework in the future years by applying and evaluating the presented tools. The research that was started in NeWater needs to be continued to further contribute to changes towards Adaptive Integrated Water Resources Management.

**The following references from NeWater were used to answer the policy questions:**

**(Please note that over 200 deliverables (reports, tools, ...) were developed in NeWater. This list provides only a selection most targeted to the identified water policy questions.)**

*A. Water environment - Assessing status, trends and impacts:*

- [V. Krysanova, F. Hattermann: Towards adaptation to impact of Climate Change. \*\*NeWater Policy Brief\*\*. Updated March 2009. Available at <http://www.newater.info/index.php?pid=1022>](http://www.newater.info/index.php?pid=1022)
- [SP 4: F. Ludwig, P. Kabat, H. van Schaik and M. van der Valk \(Eds\): Climate Change Adaptation in the Water Sector. Earthscan 320 pages • 978-1-84407-652-9 • December 2008](#)
- [SP 5: H. ter Maat et al: Water Resources Scenarios for Case Study regions. NeWater Synthesis Product No 5. Full paper will be available in late 2009; see \[www.newater.uos.de\]\(http://www.newater.uos.de\) for details](#)
- [SP 6 Krysanova et al \(2009\): Cross Comparison of Climate Change Adaptation Strategies across regions. NeWater Synthesis Product No 6. available at \[www.newater.uos.de/\]\(http://www.newater.uos.de/\)](#)
- [SP 9: J. Mysiak, C.Pahl-Wost, C. Sullivan, J. Bromley, H. Henriksen, G.J. Lloyd: \(Eds.\): Guidebook for adaptive water resource management. Earthscan. Expected late 2009. Electronic version will also be available.](#)
- [AMIS - The Advanced Monitoring Information System –GIS based monitoring and information system prototype. Download <http://www.ufz.de/index.php?en=17262> .](#)
- [R. Giordano, M. Vurro: Review of existing monitoring systems. \*\*NeWater Deliverable 1.6.1\*\* available at \[www.newater.uos.de/\]\(http://www.newater.uos.de/\)](#)
- [Approaches to Adaptive Water Management in the Amudarya River Basin. Booklet with NeWater case study results. 2009. Available at \[www.newater.uos.de/\]\(http://www.newater.uos.de/\)](#)
- [Deliverable D 2.2.2: V. Krysanova, H. Buiteveld, D. Haase, P. Martinez Santos, K. Van Niekerk, K. Roest, M.Schlüter: Existing Practices and Lessons Learned in coping with climatic hazards \(floods and droughts\) at river basin scale. Report of the NeWater project, WP2.2, New Approaches to Adaptive Water Management under Uncertainty. 2006.](#)
- [Waterwise in D 1.4.1: Van Walsum, P.E.V., J.C.J.H. Aerts, J. Krywkow, A. van der Veen, H. der Nederlanden, M. Q. Bos, B.T. Ottow. Framework for integrated design of water and land management systems; towards robust water-space partnerships as a basis for adaptive water management. Deliverable 1.4.1 of NeWater project, Wageningen, 2005. Available at <http://www.newater.info/index.php?pid=1063>](#)

*B. Water governance issues:*

- **SP 2:** [M. Brugnach, P. van der Keur, J. Mysiak \(Eds\): Uncertainty in adaptive water management: concepts and guidelines. 2009.](#)
- **SP8:** [Y. von Korff et al \(Eds\): Special Feature on Implementing participatory water management: recent advances in theory, practice and evaluation. in Ecology & Society \(http://www.ecologyandsociety.org/ \).](#)
- **SP 11:** [NeWater Training Booklet. Available as CD and for download at www.newwater.uos.de](#)
- **SP12:** [Online Teaching Curriculum for AWM. Available at www.newatereducation.nl](#)
- **Deliverable D 1.7.3.c:** [N. Isendahl, C. Pahl-Wostl, A. Dewulf \(2008\): Options for improving dealing with uncertainties in water management practice. NeWater Deliverable 1.7.3c. Available at http://www.newwater.info/index.php?pid=1063](#)
- **Deliverable 1.3.1:** [T. Raadgever and E. Mostert \(2005\): Transboundary River Basin Management - State-of-the-art review on transboundary regimes and information management in the context of adaptive management. Deliverable 1.3.1 of the NeWater project. Available at http://www.newwater.info/index.php?pid=1063](#)
- **Deliverable 1.2.7/1.3.7b** [T. Raadgever \(2008\): Does collaboration enhance learning? The case of future flood management in the Rhine basin. Deliverable 1.2.7/1.3.7b of the NeWater project. Available at http://www.newwater.info/index.php?pid=1063](#)
- **Journal Article:** [Raadgever, G. T./ E. Mostert / N. Kranz / E. Interwies / J. G. Timmerman. Assessing management regimes in transboundary river basins: do they support adaptive management? Ecology and Society 13\(1\): 14. Available at: http://www.ecologyandsociety.org/vol13/iss1/art14/ES-2008-2385.pdf](#)

*C. Communication and dissemination of (scientific) knowledge:*

- All public NeWater products (reports, tools, ...) are available on the project webpage: [www.newwater.info](#) or [www.newwater.uos.de](#) .
- **NeWater Brochure:** [Adaptive Integrated Water Resources Management \(AWM\): Explicitely addressing today's challenges! For a printed copy, send email to contact\[at\]newwater.info. Online versions are available at www.newwater.uos.de .](#)
- **Policy Briefs** [address AWM & Uncertainty, Climate Change and Poverty & Gender Issues.](#)
- **SP 8:** [Y. von Korff et al \(Eds\): Special Feature on Implementing participatory water management: recent advances in theory, practice and evaluation. in Ecology & Society \(http://www.ecologyandsociety.org/ \).](#)
- **SP 9:** [J. Mysiak, C. Pahl-Wostl, C. Sullivan, J. Bromley, H. Henriksen, G. J. Lloyd: \(Eds.\): Guidebook for adaptive water resource management. Earthscan. Expected late 2009. Electronic version will also be available.](#)
- **SP 10:** [AWM section in the WISE-RTD portal \(http://wise-rtd.info/ \).](#)
- **SP 11:** [NeWater Training Booklet. Available as CD and for download at www.newwater.uos.de](#)
- **SP 12:** [Online Teaching Curriculum for AWM. Available at www.newatereducation.nl](#)
- **Water Management Plan (in Dutch):** [Watergebiedsplan Tussen Kromme Rijn en Amsterdam-Rijnkanaal. Authors: Renier Koenraadt, Anja Menkveld, Mirjam Stark en Arjen Koomen. Version februari 2008](#)
- [Links from IWRM to AWM can be found in GWP Toolbox \(www.gwptoolbox.org \)](#)



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# **1 Aims and development of this report**

## **1.1 Aim and target group**

The overall aim of this product is to "merge" the present burning EU water policy questions (esp. those linked to adaptive water resources management and climate change) with key insights from the NeWater project. With this, NeWater wants to support integration of new insights into practical water policy and water management. To support national and international policy makers in their decision for further funding programmes, elements of research are identified that are expected to become of relevance in the middle- and long term.

A review of 67 international scientific cooperation projects related to IWRM to evaluate their relevance for policy makers and to comment on the level and quality of communication of the research results was commissioned by the EC and undertaken by an independent panel of experts from around the world (Gyawali et al. 2006<sup>1</sup>). The review has shown that while the projects achieved considerable scientific and conceptual results, more importance needs to be given to effective communication of research results and to constructive engagement with stakeholders from all levels, including political decision makers.

In line with these insights, the NeWater-project from its very start had a strong focus on linking research insights to the European water policy background.

The product at hand is based on a demand driven perspective. It asks what the most burning policy questions/issues are and which specific NeWater contributions meet them to find first answers?

The main target group of this product is the European policy level, i.e. water policy officers at the European Commission (e.g. DG ENV, DG RTD.). EU water policy aims to give as much guidance and support as possible to the water managers and decision makers at basin level, e.g. through the Common Implementation Strategy (CIS). The EU policy level is the ideal interface for exchange and consultation between research, policy making, management planning and finally the implementation of RBMPs.

## **1.2 Process of developing this report**

This report has been developed in two phases: The identification of the policy questions and the mapping of the NeWater results.

The identification of the policy questions has been based on the analysis of central water policy documents (see next section) and expert interviews with key persons from the European Commission (seven officers from DG Environment and DG Research, see Annex).

The guiding question for the interviews was: "Where do you expect contributions from research in the natural and social science on the current main challenges in your field of European water policy implementation?"

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<sup>1</sup> Gyawali, D., J.A. Allan, P. Antunes, A. Dudeen, P. Laureano, C.L. Fernandez, P.M. Scheel Monteiro, H.K. Nguyen, P. Novacek, C. Pahl-Wostl 2006. Directing the flow – A new approach to integrated water resources management. EU-INCO water research from FP4 to FP6 (1994-2006) – A critical review. EUR 22017 – Luxembourg: Office for Official Publications of the European Communities.



Based on the policy questions identified, a collaborative process within the project consortium has been set up to map the central NeWater results of relevance to these questions.

## **2 Main EU Directives/Initiatives considered and links to adaptive water management**

As a background of the identification of the policy questions, a focus was put on content and implementation challenges of the most challenging Directives and Initiatives in the context of European water policy, with the WFD being the central and integrative piece of legislation. A special focus has been put on cross-cutting Directives/Initiatives linked to WFD implementation.

The main Directives/Initiatives considered are first shortly introduced below, while also their link to the concept of adaptive integrated water management is briefly discussed. Adaptive Integrated Water Resources Management (AWM) is a management approach that takes the complex socio-ecological nature of river basin environments into account in policy development and implementation. AWM addresses the inherent uncertainties associated with management and complexity by increasing and sustaining the capacity to learn while managing. Learning is sustained by an iterative process of testing and improving methods of analysis and management policies and practices. This process also responds to insights gained from monitoring outcomes. Management strategies should be robust and perform well under a range of potential but initially uncertain future developments. This implies e.g. an increased use of scenario planning.

Successful governance in river basin management depends on adaptive institutions (q.v. Pahl-Wostl, 2002: 396<sup>2</sup>) that are able to cope with complexity and uncertainty and to face new challenges such as climate change. Main elements of institutional adaptation are the adequate access and distribution of information, collaboration in terms of public participation and sectoral integration, flexibility and openness for experimentation. Participatory methods such as group model building and role playing games can support social learning in actor groups (Pahl-Wostl and Hare, 2004<sup>3</sup>; Maurel et al., 2007<sup>4</sup>). Such learning environments are perceived to be crucial for the adaptive governance of socio-ecological systems (Folke et al, 2005<sup>5</sup>; Pahl-Wostl 2007<sup>6</sup>).

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<sup>2</sup> Pahl-Wostl, C. 2002. Towards sustainability in the water sector: The importance of human actors and processes of social learning. *Aquatic Sciences* 64: 394-411.

<sup>3</sup> Pahl-Wostl, C. and Hare, M. 2004. *Processes of Social Learning in Integrated Resources Management*. *Journal of Applied and Community Psychology*. 14, 193-206.

<sup>4</sup> Maurel P, Craps M, Cernesson F, Raymond R, Valkering P, Ferrand N, 2007. *Concepts and methods for analysing the role of IC-tools in SL processes for River Basin Management*. *Environmental Modelling and Software*. 22, 630-639.

<sup>5</sup> Folke, C., T. Hahn, P. Olsson, and J. Norberg, 2005. Adaptive Governance of Social-Ecological Systems. *Annu. Rev. Environ. Resour.* 30, 8.1-8.33.

<sup>6</sup> Pahl-Wostl, C. 2007. Transition towards adaptive management of water facing climate and global change. *Water Resources Management*. 21(1), 49-62.



## 2.1 Water Framework Directive

In December 2000 the EU Water Framework Directive<sup>7</sup>, a legal framework for the protection and restoration of clean waters across the European Union entered into force. It substituted a patchwork legislation in the field of water management deriving from the early 1970s. It aims at streamlining EU legislation<sup>8</sup> and refers to international declarations and Conventions<sup>9</sup>. The Directive provides common principles, approaches and requirements for water management in the European Union by leaving extensive choices for Member States' individual approaches.

The main challenges linked to the WFD implementation are:

- Water management is a cross-sectoral issue and is related to many other policies, such as agriculture, industry and transport. The challenge here is to streamline the different EU policies in order to avoid contradictions and/or double efforts. Coordinated planning and a mutual understanding of the different sectors need to be improved based on a clarification of the interlinkages of the different sectors;
- The achievement of the “good ecological status” is very much dependent on the right understanding of the concept and a correct intercalibration among Member States;
- The improvement of co-operation among actors is still an important factor not only in regard to the involvement of stakeholders but also concerning interactions between different authorities;
- Climate change constitutes a great challenge for water management because of its potentially large impacts, its unpredictability and the related uncertainties (see section 2.3 below on this issue).

### Adaptive Management and the Water Framework Directive

The WFD contains several elements that encourage a move towards more adaptive water management. At the same time, it takes into consideration the actual situation in the basins and allows various options to slow the transition towards AWM a bit down.

For example, the catchment approach of the WFD requires involvement and cooperation of stakeholders throughout the river basin. Such participation processes can be designed to further contribute to the adaptiveness of RBM under the WFD since many adaptation strategies and measures rely on action by stakeholders like farmers or energy production companies (hydropower). Cooperation should support also learning processes which build the capacity of stakeholders not only to ensure their interest. Capacity building is often also central to allow understanding other perspectives and better acknowledging the need of an integrated approach to water system management. However, the rather strict frame of deadlines and reporting obligations (which is considered necessary to motivate Member State to implement at all) limits the time which is available for building up trust and for establishing more cooperative and participatory ways of management. Methods are necessary to ensure that the amount of necessary interactions and the political influence and resources at hand of the different actors does not lead to a minimal approach and thus prevents change towards more adaptive measures.

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<sup>7</sup> Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

<sup>8</sup> e.g. the Bathing Water Directive, the Drinking Water Directive, the Nitrates Directive, the Urban Waste Water Directive, as well as the Habitat and the Birds Directive

<sup>9</sup> The 1992 Dublin Statement on Water and Sustainable Development, the 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the 1997 UN Convention on the Law of the Non-navigational Uses of International Watercourses



Another example are the WFD requirements for an enhanced monitoring system comprising surveillance, operational and investigative monitoring networks: They provide for a good management basis leading to quick and efficient information exchange within a basin and between different basins, a prerequisite for any adaptive management system. Still, the monitoring systems need not only to deliver reliable data on environmental changes and their impacts on water bodies and water dependent ecosystems but they need to be able to adapt to new information, technologies and scientific results improving the integrated approach in water resources management. Of huge concern in this context are the developments of climate change and the uncertainties linked to it. Not only further simulations and scenarios are necessary but also ways in approaching uncertainties acknowledging the lack of objective data interpretation and the importance of different perspectives from different stakeholders on the same problem (e.g. framing water scarcity as a demand or a supply problem).

Finally, the repetitive management cycle of the WFD allows for a continuous review of management decisions and adjustments of policy decisions if needed, of great importance for reaching a more adaptive management system. This has in addition to be featured in terms of not reaching one environmental objective as the ultimate goal but as a mean to consider water resources management as a process in which also the goal are not necessarily be fixed but need to be adapted if appropriate also.

## **2.2 Cross-cutting Directives/Initiatives linked to WFD-implementation**

An effective implementation of the Water Framework Directive that meets the targeted objectives is only possible if other related European directives or major water related initiatives are fully taken into consideration and vice-versa. This integration is partly already incorporated into the WFD e.g. by directly referring to older related directives. In addition, newer Directives such as the Floods Directive (see 2.2.1) have themselves created a strong link to the WFD within the legal framework.

While the legal interrelations of the directives and initiatives appear to be set out clear, the practice of implementing these inter-linkages causes additional challenges. Shared tasks and synergies, but also conflicting interests and hindrances have to be identified.

The following section describes the main elements of the Floods Directive, the Groundwater Directive and the communication of water scarcity and droughts. It depicts the main elements of the directives/initiatives, their relation to the WFD and their potential for fostering adaptive management solutions in the field of water policy.

### **2.2.1 Floods Directive**

In November 2007, the so called “Floods Directive”<sup>10</sup> entered into force with the purpose “*to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community*” (Art. 2) without defining general objectives such as the level of protection or measures. For the implementation of the Flood Directive strong emphasis is given to link it with already existing work, especially to connect it to the ongoing WFD implementation and readily available information on flood risk/ hazards. While the directive stresses that floods are “natural phenomena”, it also indicates that these are exacerbated by human activities (such as increasing human

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<sup>10</sup> Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks, OJ L 288, 6.11.2007, p. 27–34



settlements and economic assets in floodplains as well as the reduction of the natural water retention by land use). The Directive text itself stipulates that projected climate change should be taken into account in the assessment of future flood risk (Art. 4).

### **Adaptive Management and the Flood Directive**

Current activities related to the implementation of the Floods Directive focus on the development of appropriate reporting formats and identification of best practice for the development of flood hazards maps and flood risk maps - as mentioned with a focus on building up on existing information e.g. from the CIS process. The Directive also includes a review structure which requires revising the flood risk assessment, the maps and the plans every six years. Like in the WFD, this cyclical approach may contribute to adaptiveness of management allowing the consideration of new information and experience in updated plans. This is especially important since the provision of information to the public and stakeholders through the maps may also contribute to awareness raising on flood risk and improve the capacity to adapt plans according to flood risks. In order to strengthen the potential of the reviews, strong emphasis needs to be given to monitoring the implementation effects and integrating the monitoring results into the management plan revisions and especially the re-consideration of the flood risk management plan measures. In addition, the participatory approach - harmonized with the WFD's one - needs to be widened at least at the operational level in terms of active involvement of key stakeholders to ensure support of relevant stakeholders for the implementation of various measures. This would also allow the initiation of discussions on the means for flood protection: what kind of safety is demanded? Which different uses need to be integrated (e.g. moving settlements, changing land use)? What role is expected from state and/or insurance companies with regard to covering up (potential) flood damages?

With regard to these questions and as already pointed out in the context of the WFD (Section 2.1), stakeholder participation is also important in terms of broadening the learning processes. This would probably also help to build capacity on how to deal with uncertainties due to unknown or changing conditions resulting from climate change.

### **2.2.2 Groundwater Directive**

Implementing Article 17 (1) & (2) of the WFD, the Groundwater Directive<sup>11</sup> came into force in December 2006. It aims “to prevent and control groundwater pollution.” (Art.1). In this context a central challenge is to define so called 'threshold' values, for cases in which the Groundwater Quality Standards for nitrates and pesticides do not ensure the prevention of any damage to the chemical and/or the ecological status of the associated surface waters and/or the associated terrestrial ecosystem. An additional challenge is linked to the practical definition and understanding of “significant and sustained upward trends”. Currently, much effort is invested to give guidance for developing conceptual models/ understanding to better assess the status of groundwater bodies and the achievement of environmental objectives. A major concern is linked to the difficulty on how to handle uncertainty in the monitoring systems and how to assess the impacts of measures and the impacts of climate change.

### **Adaptive Management & the Groundwater Directive**

In general, the Groundwater Directive development process and the current first phase of implementation show the increased consideration of the significant uncertainty issues related to groundwater management; while they have been known for a long time, this current focus establishes stronger links to the concept of adaptive management that considers approaches

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<sup>11</sup> Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration, OJ L 372, 27.12.2006, p. 19–31



for dealing with uncertainty in an explicit way. Additionally, adaptive approaches for groundwater management are of special interest but also complexity due to the often long time lags between measures and their effects on the groundwater, thus making a cyclical, adaptive management approach more demanding. The approach to groundwater management urgently requires also more openness in terms of considering the regional and local context: in some areas such as the Guadiana quantity problems call for adapting the management more to reduce the pressure on the groundwater bodies. In other areas land-use practice need to differ from field to field considering the soils, the irrigation practice and the resulting impact on the nitrates' passage to groundwater.

Regarding monitoring, groundwater management includes already rather tailored monitoring systems for general surveillance or more targeted control. However, for approaching management in a more adaptive way, not *more* monitoring systems but better (i.e. more representative) monitoring systems and more integrative monitoring systems are necessary that are directly useful for decision making. Not necessarily more data are needed but a better approach towards data related to their usability. Adaptive management with its emphasis on integrating different approaches to data into one management system might be of support here.

### **2.2.3 Communication on water scarcity and droughts**

In 2003, a water scarcity initiative was established under the WFD CIS (Common Implementation Strategy) process. In July 2007 the Commission published a Communication on water scarcity and droughts<sup>12</sup> and updated it in December 2008<sup>13</sup>. The communication recognises water scarcity and drought as a major challenge that affects a large share of the European population and territory, and that will be exacerbated by climate change impacts. It presents policy options to address this challenge, placing the need to use water more efficiently and to develop more sophisticated demand management strategies at the centre of its deliberations. The described way forward both at national and EU level suggests a work program including the following management approaches: better water pricing policies; allocating water and water-related funding more efficiently; improving drought risk management; fostering the emergence of a water-saving culture in Europe; considering additional water supply infrastructure; improve knowledge and data collection. The Communication also introduces a so called water hierarchy stating that water saving and efficiency measures shall be implemented first before installing new supply infrastructure.

#### **Adaptive Management & water scarcity and droughts**

Generally, the effective and comprehensive implementation of the WFD is seen as the best way forward to address water scarcity and drought. In addition to adequate measures included in the Programme of Measures of the RBMPs, article 13 (5) of the WFD encourages Member States to draw up more detailed programmes and management plans to deal with particular aspects of water management. In a recent report<sup>14</sup>, an Expert Network on Water Scarcity and Droughts<sup>15</sup> recommends developing "Drought Management Plans" when

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<sup>12</sup> Communication from the Commission to the European Parliament and the Council: Addressing the challenge of water scarcity and droughts in the European Union. COM(2007) 414 final

<sup>13</sup> Report from the Commission to the Council and the European Parliament - Follow up Report to the Communication on water scarcity and droughts in the European Union COM(2007) 414 final [SEC(2008) 3069]

<sup>14</sup> Water Scarcity and Droughts Expert Network: Drought Management Plan Report – Including Agricultural, Drought Indicators and Climate Change Aspects. November 2007

<sup>15</sup> In 2006, the Water Directors endorsed the mandate of an Expert Network on Water Scarcity and Droughts for the period 2007-2009



and where needed and provides guidance on the drafting process. As part of the RBMPs, drought management plans and measures will be subject to the same cyclic review process every six years giving the opportunity to adapt to changes of socio-economic and environmental conditions, thus establishing a link to adaptive management.

In any case, the anticipated measures make stakeholder involvement mandatory because they target towards controlling users' behaviour. Experience shows that command & control approaches lead often in first hand to an implementation deficit if support from stakeholder is not sought beforehand.

In addition, drought management requires adaptive capacity since the development of droughts are also strongly depending on "external" factors, such as climate change.

Climate change will in many cases intensify the pressure on water resources in areas already facing water stress. The policy options outlined in the Communication can be considered as important tools for climate change adaptation. The Commission presented a follow-up report on progress towards the set goals in 2008. It concludes that improvements on several issues of the work program laid out in 2007 have been reached, however it sees the urgent need to continue and reinforce this progress. This means, that measures and management plans addressing droughts need to be considered as developing and adapting.

The Commission's provision from 2009 onwards of an annual European assessment on water scarcity and droughts that will feed into the strategy for water scarcity and droughts planned for 2012 is thus only a first step.

#### **2.2.4 WFD and agriculture**

The successful implementation of the WFD depends strongly on agricultural land use, which is mainly influenced by the Common Agricultural Policy (CAP). Acknowledging this, the Water Directors agreed in June 2004 to take action in the field of agriculture and water management, establishing an EU Strategic Steering Group (SSG) on WFD and Agriculture<sup>16</sup>.

##### **Adaptive management and the WFD & agriculture initiative**

With the new groundwater requirements, the water – agricultural link has become more present over the last years and practical approaches on how to fulfil the different demands and objectives are needed and sought for. This concerns meeting the environmental objectives of the WFD, ensuring food supply and the energy supply required to mitigate the impacts of climate change, ensuring adaptation of agriculture to climate change including increasing water scarcity and droughts. In this context of multiple challenges, the need for management to become more adaptive and flexible is made obvious. Especially against the background of scarcity issues, more adaptive management can be achieved by decision-makers being more conscious about the management choices they have. Participation of stakeholders, especially farmers, is a key and new approaches are needed in order to allow the integration of local knowledge in the discussions mainly dominated so far by scientific results (models, climate change predictions etc). Management could also move towards a more adaptive model by better monitoring of the evolution of scarcity and droughts especially on regional and river basin level. This would also support an improved capacity to adapt/adjust land use strategies to climate developments.

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<sup>16</sup> Common Implementation Strategy for the WFD "Work Programme 2005/2006". Final mandate for an activity on "Links between Water Framework Directive and Agriculture". 7 December 2004



### **2.3 WFD & Climate Change/Green paper on adaptation to climate change**

In June 2007 the European Commission initiated the process of building a framework for policy action on adaptation at EU level with the Green Paper on adapting to climate change in Europe of June 2007<sup>17</sup>. It is the first comprehensive review of the discussion on adaptation in Europe, and sets the scene for adaptation efforts in the EU. The Green Paper examines climate change impacts in Europe and the case for action and policy responses. It stresses that early adaptation will bring economic benefits. With respect to water policy, the Green paper emphasises the importance of applying economic instruments and the user pays principle across all sectors, and to create incentives to reduce water consumption and the efficiency of water use. For flood protection, soft non-structural measures based on sustainable land-use and spatial planning should be given priority, although structural flood defences will continue to play an important role. In April 2009 the European Commission issued the White Paper on Adaptation<sup>18</sup>. Amongst others, it points out the need to create a Clearing House Mechanism by 2011. It is intended to exchange information on climate change risks, impacts and best practices between governments, agencies, and organisations working on adaptation policies.

In addition, a specific WFD CIS activity on Climate Change and Water started in 2007, focusing on the identification of adaptation measures at different scales and providing input to the science community.

#### **Adaptive Management, WFD & Climate Change and the Green Paper on Adaptation to Climate Change**

Managing adaptation to climate change is at the very heart of the Green and White Paper on adaptation. For example, the Green Paper outlines four strategy pillars for its actions. Of those, especially the need to reduce uncertainty through integrated climate research (pillar III) and the involvement of European society, business and public sector in the preparation of coordinated and comprehensive adaptation strategies (pillar IV) address adaptive management.

In the context of adaptive management, it should be especially stressed that the potential to reduce uncertainty through integrated climate research is rather constraint due to the challenges of modelling complex systems such as climate change developments, even if considering refined data. Therefore much strong focus should be given in establishing robust management strategies which e.g. deal with uncertainty through explicitly addressing different frames and perception on the challenges of climate change and integrate no-regret-measures.

Climate change is not explicitly included in the text of the WFD. However, water management under the WFD will have to deal with the challenges posed by climate change (e.g. increased flooding, water scarcity, and water quality problems). The CIS – Group on Climate Change and Water addresses these explicitly. Core activities of the WFD like analysing pressures and impacts, setting objective, designing monitoring programmes and the programmes of measures are designed for cyclic review in order to be able to take account of altered conditions due to climate change.

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<sup>17</sup> Adapting to climate change in Europe – options for EU action. Green Paper. COM(2007) 354 final

<sup>18</sup> White paper - Adapting to climate change : towards a European framework for action {SEC(2009) 386} {SEC(2009) 387} {SEC(2009) 388} /\* COM/2009/0147 final \*



## 2.4 European Water Initiative (EUWI)

The EU launched the European Water Initiative (EUWI) at the 2002 World Summit for Sustainable Development in Johannesburg (WSSD)<sup>19</sup>. Its objective is to help attain the water-related Millennium Development Goals (MDG's) including to halve the proportion of the world population that lacks access to secure and sufficient water sources and to adequate sanitation by 2015. In addition, by 2005, integrated water resource management (IWRM) and efficiency plans should be developed in all countries.

In this context, the EUWI objectives put a strong focus on stakeholder participation and cooperation through promoting multi-stakeholder dialogue and river basin approaches in national and transboundary waters. The EUWI also aims to identify additional financial resources and mechanisms to ensure sustainable financing.

The role of EUWI is more seen as a political instrument and not as a part of the official development assistance (ODA). The initiative follows a partnership approach and aims to create synergies within activities of the EU, the Member States and the partners in other regions. In this regard, the Multi Stakeholder Forum (MSF) assumes the double role of consultation with expert opinion and a wider stakeholder view on the one hand and that of a platform to ensure information dissemination and creation of transparency in policy processes on the other hand. Regional Working Groups are in charge of the implementation of the regional components of EUWI (Sub-Saharan Africa, EECCA, Mediterranean and Latin America). Their task is also to tailor the EUWI strategies to the specific needs of the regions. Finally, the cross-cutting Working Groups address in a co-ordinated manner (e.g. involving various partners) and in close co-ordination with the regional/thematic components, specific cross-cutting issues essential to the development of the EUWI – Finance, Research and Monitoring.

The major challenge of EUWI is to meet the Millennium Development Goals. It does not only consist of difficulties to guarantee the financial resources needed but also to assure co-ordination of the activities, to minimise bureaucratic hindrances and to create ownership of the parties involved.<sup>20</sup>

### Adaptive Management and EUWI

The EUWI includes several elements that promote adaptive management solutions. The introduction of IWRM in all EUWI countries is an important first step towards adaptive water management. With the installation of a monitoring group, which ensures a continuous review of EUWI activities, the instrument remains flexible to react to the evaluation of taken decisions, up-coming issues and challenges, a quality that is an overall prerequisite of adaptive management. In addition the partnership approach provides for a platform for exchange of knowledge and experiences. As a result practitioners of EUWI countries have access to a broad set of best practices and tools and many opportunities to seek for advice and to obtain needed training. Thus partners to EUWI are supported in the effort to find the best management solution even under conditions of extreme uncertainty. While these elements provide a good basis for reaching adaptive water resource management the implementation of EUWI still faces several challenges: especially the (financial) commitment of EU Member States, but also that of the partner countries is a point for improvement.

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<sup>19</sup> EU water initiative - Water for life, download at [http://www.euwi.net/download\\_monitoring.php?id=399](http://www.euwi.net/download_monitoring.php?id=399)

<sup>20</sup> EUWI: ANNUAL REPORT 2008, Based on 2007/2008 data, download at [http://euwi.jrc.it/download\\_monitoring.php?id=1515](http://euwi.jrc.it/download_monitoring.php?id=1515)

### 3 Policy questions to which NeWater can contribute

This chapter presents the main questions of EU water policy identified to which NeWater can contribute significantly. Further issues of central policy relevance can be found in chapter 4 of this report.

The Directives/initiatives presented above were a starting point for the identification of the policy questions and were complemented by the results of the interviews with the European Commission representatives. The final overview of these questions has been re-structured in a way that avoids repetition. It brings these questions closer to the NeWater outcomes. Three overall categories were established, while for each question an explanatory text has been developed which explains the background, rationale and more detailed aspects of the question.

#### 3.1 Water environment - Assessing status, trends and impacts

Scientific knowledge on the interaction between different parts of the water system, on pressures and impacts and on the effectiveness of measures is a key issue for water management and decision-making. For instance, strong demands are expressed by water policy makers for knowledge on the impact of climate change and related uncertainties, including a good understanding of the hydrological and ecological context related to vulnerability, uncertainty etc.. Much natural science research has been carried out to reveal the interactions of different parts of the water systems, including the impact of (changes in) anthropogenic pressures. However, for transferring these insights into water policy and management measures often many barriers appear. Often, there is a lack of tailor-made research questions for management purposes. Already only slightly different perspectives on the management problems impact on the applicability and even more on the transferability of scientific results. In addition, the uncertainty linked to them due to (lack of) data reduces trust into the research insights.

The main policy questions identified in this context and the contributions from NeWater are:

Question 1: How can we better assess the impacts of climate change on water and deal with the uncertainty related to its impacts?

Question 2: How can we improve water monitoring systems and assessment methodologies to better integrate uncertainties in water management?

Question 3: How can we better assess the effectiveness of measures taken in terms of their impacts on the water environment?

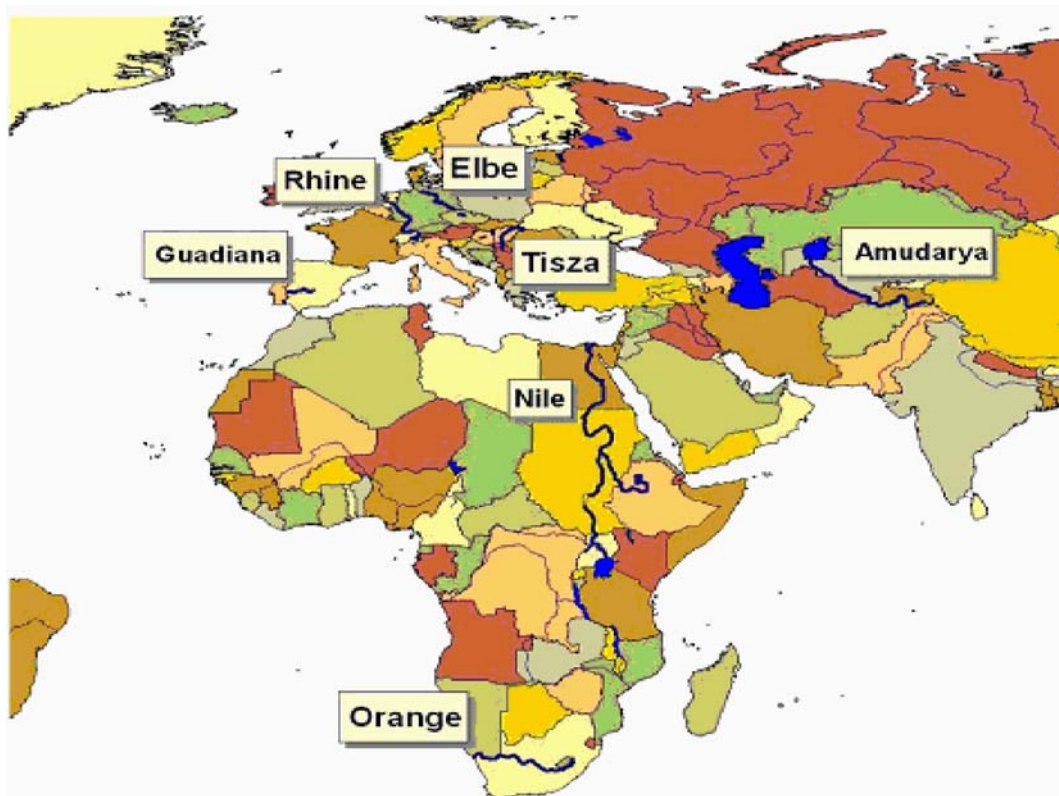
##### 3.1.1 Question 1: How can we better assess the impacts of climate change on water and deal with the uncertainty related to its impacts?

In general, large-scale direct impacts of climate change on water resources in Europe are quite well understood. What is still lacking for decision makers is specific knowledge on the extent to which climate change will impact flood frequency, periods of water scarcity and droughts as well as water quality at the regional and river basin level to local level. Gaps also exist on the specific impacts of climate change on all water dependent economic sectors like agriculture, hydropower, tourism, navigation or water supply and sanitation. One approach to cover this gap would be to get inputs from research on “**scaling down**” large scale scenarios and forecasts, while dealing with the remaining uncertainty of scenario

**outputs.** Except for downscaling, scenarios and development of scenarios on climate change needs to be fostered, including more refined data with a higher resolution (e.g. regional/local scale allowing identification of specific impacts on land-use). In addition to this need for information, management approaches have to be provided which open up water policy for necessary adaptations due to knowledge gaps or upcoming new and changing information (see also section 3.2).

On **scarcity & droughts as well as for flood forecasting/risk assessment**, one approach to **deal with the uncertainty** is to actually improve the results of simulation and/or scenario models to better assess the expected development under climate change. More research is needed on impacts and evolution of scarcity and droughts on a more regional and river basin level (downscaling forecasts). Water managers may feel the urge to wait for ever more precise and accurate model results before taking action. However, existing knowledge on future scarcity and droughts, although maybe linked to a considerable margin of uncertainty, is already sufficient to take action. Especially so called no-regret or win-win measures can be already implemented. They deliver beneficial effects regardless of the specific realisation of climate change in the future. An example would be to implement water saving measures in drought risk areas. With regard to floods, we need to find ways for integrating climate change impacts in preliminary flood risk assessment including results on scaling down

**Figure 1: Seven case study basins in which diverse processes at different scales were studied**



impacts in a meaningful way. This is why the vulnerability of water resources to climate change impacts is becoming a major concern for people and policy-makers at different levels.

## Contributions from NeWater to assessing climate change and its uncertainties

NeWater conducted seven case studies (see Figure 2) in river basins throughout Europe (Rhine, Elbe, Guadiana, Tisza), Central Asia (Amudarya), and Africa (Orange, Nile) taking a close look at the prevailing water management and testing new instruments and approaches proposed by the NeWater project. The impacts of increased floods and droughts were evaluated and management options evaluated. The case studies provide both, a set of detailed data (scenarios) on water resources development up to 2050 and adaptive management options for floods and droughts taking the socio-economic and political situation in the case study regions into account. A summary of these insights can be found in the NeWater Guidebook on Adaptive Water Management (SP 9) in the chapters 2-3 or in the case study summaries in the chapters 6 to 12.

### Overview on central and synthesizing products for assessing climate change and its uncertainties:

- [V. Krysanova, F. Hattermann: Towards adaptation to impact of Climate Change. NeWater Policy Brief. Updated March 2009. available at \[www.newater.uos.de/\]\(http://www.newater.uos.de/\)](#)
- [SP 4: . Ludwig, P. Kabat, H. van Schaik and M. van der Valk \(Eds\): Climate Change Adaptation in the Water Sector. Earthscan 320 pages • 978-1-84407-652-9 • December 2008](#)
- [SP 5: H. ter Maat et al: Water Resources Scenarios for Case Study regions. NeWater Synthesis Product No 5. Full paper will be available in late 2009; see \[www.newater.uos.de\]\(http://www.newater.uos.de\) for details](#)
- [SP 6: Krysanova et al \(2009\): Cross Comparison of Climate Change Adaptation Strategies across regions. NeWater Synthesis Product No 6. available at \[www.newater.uos.de/\]\(http://www.newater.uos.de/\)](#)
- [SP 9: J. Mysiak, C. Pahl-Wost, C. Sullivan, J. Bromley, H. Henriksen, G. J. Lloyd: \(Eds.\): Guidebook for adaptive water resource management. Earthscan. Expected late 2009. Electronic version will also be available.](#)

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Efforts are needed to improve information on expected climate change and its impacts, to increase public awareness and to facilitate the development of adaptation strategies. The **NeWater Policy Brief “Towards Adaptation to impacts of Climate Change”** (March 2009) includes an overview of climate change in Europe based on data of observations and model projections. It also outlines major impacts and possible adaptation options in water management, agriculture, tourism, energy provision and human health taking into consideration how the current EU policy framework could serve to strengthen adaptation and preparedness to climate change.

To get a deeper impression on the impact of the different management strategies concerning climate change, NeWater (SP 6) carried out a **cross-comparison of climate change adaptation** strategies considering six large river basins as case study areas. Three of the basins, namely the Elbe, Guadiana, and Rhine, are located in Europe, the Nile Equatorial Lakes (NEL) region (or the upper Nile basin) and the Orange are in Africa, and the Amudarya is in Central Asia. The evaluation was based mainly on the perspectives of policy makers and water management experts in the river basins, and also involved recent national reports.

The book “Climate Change and Adaptation in the Water Sector” (SP 4) includes not only an introduction on **climate variability** or using and **specifying climate scenarios** from a conceptual perspective but also contains specific case studies. These are drawn from a wide range of contrasting countries, including Australia, Thailand, The Netherlands, Germany, Philippines, South Africa, and Yemen.

Further, special emphasis on is given in the publication ‘Water Resources Scenarios for Case Study regions’ (SP 5) has gathered the **scenario information developed for each case study**. It provides estimations of future water stress based on socio-economic and climate

changes at global, continental and river basin scale. Water stress situations between NeWater case study areas can be compared. Output from regional climate models (RCM) will be made available at resolutions suitable for water resource management in the river basins (10x10 or 50x50 km<sup>2</sup>).

### 3.1.2 Question 2: How can we improve water monitoring systems and assessment methodologies to better integrate uncertainties in water management?

In general, for many water management issues, not more monitoring systems or more data are needed. Instead the existing systems have to be improved to arrive at more integrative and representative monitoring systems which e.g. respond to the local needs and integrate local knowledge. For example the information from status monitoring systems (surface and groundwater) needs to be put in better relation to emission monitoring systems (e.g. industrial or waste water discharges, agricultural fertiliser and pesticide application) in order to reduce uncertainties and to enhance understanding of the effect of measures. Climate change (i.e. meteorological and hydrological monitoring to filter out climate change signals) should be also integrated to adapt the monitoring system and to better interpret the results. To achieve all this, communication and exchange between monitoring systems, sectors (water, agriculture, industry, water services), and decision makers (EU, national, regional level) needs to improve. This includes also the integration of local knowledge.

Concerning the specific issue of water scarcity, monitoring needs to be adapted to deliver information on the evolution of scarcity & droughts (possible deterioration or improvement), giving feedback on how scarcity could further develop especially on regional and river basin level.

### Contributions from NeWater to improving monitoring systems for better integrating uncertainties in management

In the Amudarya and the Tisza case studies the scarcity of monitoring data is an important issue. In order to tackle this problem two different approaches have been developed and applied: (1) integrations of local knowledge, and (2) a modelling approach based on parsimonious models.

In the **Amudarya** case study the developed monitoring methodology addresses two different topics: (1) **soil salinity assessment and monitoring**, and (2) **wetland ecosystem monitoring**. In both cases local knowledge is used to amplify the existing environmental database (see **Amudarya results' brochure**).

**For integrating local knowledge** a structured questionnaire was

designed to annually collect the knowledge of local farmers by agronomists. A GIS-based advanced monitoring and information system (AMIS) was developed that is able to integrate and structure local and expert knowledge in order to assess soil salinization at the field scale. Monitoring data about wetland ecosystem conditions can be considered as not existent in the

#### Overview on central and synthesizing products for assessing improving monitoring towards adaptive management:

- [AMIS -The Advanced Monitoring Information System –GIS based monitoring and information system prototype. Download http://www.ufz.de/index.php?en=17262 .](http://www.ufz.de/index.php?en=17262)
  - [Raffaele Giordano, Michele Vurro: Review of existing monitoring systems. NeWater Deliverable 1.6.1 available at www.newater.uos.de/](http://www.newater.uos.de/)
  - [Approaches to Adaptive Water Management in the Amudarya River Basin. Booklet with NeWater case study results. 2009. Available at www.newater.uos.de/](http://www.newater.uos.de/)
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Amudarya delta region. The combination of GIS and relational database provides broad functionalities to administer and analyze environmental data with a spatial reference. AMIS supports environmental monitoring in data scarcity situations by facilitating the integration of different sources of information, such as qualitative and quantitative data. Due to the modular structure, the system can be easily tailored to specific requirements by implementing new algorithms or models.

The situation in the **Tisza case study in the Ukraine** is different. The focus related to monitoring is here on **flood risk management and forecasting**. Basic hydrological and climate data are being observed and collected by different authorities. Data exchange between different authorities and organizations is sometimes rather awkward. But generally, the current system used to administer relevant data for water management is well developed. Deficiencies were discovered in the usage of data in hydrological modelling for flood risk management and forecasting. Complex models, requiring a lot of and not always available input parameters are being applied for this purpose. But the data currently available are not adequate to apply complex hydrologic models. Hence, in order to harmonize modelling and data situation, the current approach should be adapted towards the application of simple and parsimonious models. A modelling approach based on simple conceptual rainfall-runoff models, using only available data, and the development of a rainfall-runoff database to support flood risk management was proposed here.

### 3.1.3 Question 3: How can we better assess the effectiveness of measures taken in terms of their impacts on the water environment?

In the context of the WFD, but also especially in the interface field of water and agricultural policy, there is lack of clear data on the linkages between agricultural pressures, the measures taken and the effectiveness of the measures for the water environment (esp. effects on groundwater). In this context, more information is needed on the effectiveness of agri-environmental measures as well as more knowledge about the time period between implementing measures and having first results on the field. In addition, in the field of flood protection, some knowledge already exists on the link of ecological quality and flood measures, but it is not used and made operational so far. Finally, when discussing measures on the context of scarcity and droughts, the wider effects of desalination need to be researched further.

#### Contributions from NeWater to assess the impacts of measures on the water environment

NeWater developed or enhanced a set of tools and instruments for adaptive water management. With regard to better judge the effectiveness of proposed or implemented measures two tools can be pointed out: The Adaptive Monitoring Design Support System (AMDSS) and Waterwise - a tool to link economy, hydrology and ecology with stakeholders' interests.

#### Overview on central and synthesizing products for assessing impacts of measures on the water environment:

- [Waterwise in D 1.4.1: Van Walsum et al.: Framework for integrated design of water and land management systems: towards robust water-space partnerships as a basis for adaptive water management. Deliverable 1.4.1 of NeWater project, Wageningen, 2005.](#)
- [AMDSS & Waterwise in SP 9: J. Mysiak, et al: \(Eds.\): Guidebook for adaptive water resource management. Earthscan. Expected late 2009.](#)
- [SP 6. V. Krysanova et al \(2009\): Cross Comparison of Climate Change Adaptation Strategies across regions. NeWater Synthesis Product No 6. available at \[www.newater.uos.de/\]\(http://www.newater.uos.de/\)](#)
- [D 2.2.1: V. Krysanova et al \(2006\): Existing practices and lessons learned in coping with climatic hazards \(floods and droughts\) at river basin scale. Assessment of Current Climatic Risks in the Rhine Catchment. Deliverable 2.2.1 of the NeWater Project. Postdam.](#)

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The **Adaptive Monitoring Design Support System (AMDSS)** aims at bringing information management and decision making closer together. Adaptive management has to handle uncertainties about future pressures on river basins. The monitoring systems have to incorporate this uncertainty by a reiterative evaluation of monitoring objectives, design, and performance. By this, monitoring systems provide both negative and positive feedback to information management and decision making process triggering a continued learning process. The main enhancement AMDSS concerns the integration of monitoring system within the learning process which characterizes the Adaptive Management.

The **‘Waterwise’ tool** is an interface linking hydrological relations/ models with economic and ecological relations describing in a spatial and time perspective **effects of land use on water quality, on agriculture, on nature**. Scenarios can be constructed and tested for their environmental and economic impact. For example, it may be considered to reforest an extensively used pasture. The model indicates that nitrogen load and the peak flow will reduce due to the buffering capacity of the forest area. However, income of farmers will also drop. The model helps e.g. to locate the reforestation areas at positions where reduction of nitrogen is still considerable, but income loss of farmers is averted. This way, policy makers and stakeholders can base their decisions on an overall judgment. Water serves as one of the guiding principles, but is not necessarily the dominant one.

**Both tools will be part of the NeWater Synthesis Product 9** “Guidebook on Adaptive Water Management”. There they are described in more detail and illustrated with examples from Case Studies. The guidebook will presumably be published by end of 2009. Detailed information on WATERWISE can also be found in Deliverable 1.4.1 .

With a special focus on climate change, NeWater studied response strategies to climatic hazards in the NeWater case studies (D2.2.1). The document describes current approaches and identifies success stories as well as general lessons learned. Furthermore, NeWater conducted a **cross-comparison exercise of climate change adaptation strategies and measures** across large regions in Europe, Asia and Africa drawing on NeWater case studies. It encompasses amongst others an overview on:

- existing and planned adaptation measures to climate change;
- missing measures and barriers for adaptation in the surveyed regions; and
- the implementation status of adaptation measures in the regions.

Such a cross-comparison exercise was not done before, and will be beneficial for water managers and policy makers at all levels in the case study river basins and beyond for learning from good examples, mistakes and problem solutions. Planning adaptation measures on a broader experience basis will help to better evaluate their foreseen impact. The results of the cross-comparison exercise will be made available in NeWater Synthesis Product 6.

### 3.2 Water governance issues

Faced with the increasing awareness of uncertainty and non-controllable developments, water management acknowledges next to technical measures the importance of water governance issues. Stakeholder participation and collaboration among different regions or nations and also at global level are much more present on the international agenda now. For example, the first section of the World Water Development Report<sup>21</sup> “Changing Contexts” is dedicated to our common responsibility for water resources and its correct governance.

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<sup>21</sup> The 2nd UN World Water Development Report: 'Water, a shared responsibility', Published : March 2006, download at <http://unesdoc.unesco.org/images/0014/001454/145405E.pdf>

Water management practice is in need to better understand how governance could be improved and even more important how improved governance could contribute to more insights on water governance could be made more operational. It has been often overseen that water governance can significantly increase or decrease uncertainty in water management.

Four main policy questions were identified to which NeWater can contribute:

Question 4: How to deal with uncertainty in decision-making?

Question 5: How to better understand the role and improve the functioning of institutions for transboundary water management?

Questions 6: How to better implement and integrate public participation into decision making?

### 3.2.1 Question 4: How to deal with uncertainty in decision-making?

Water managers and decision-makers often expect from research clear results, helping them to decide on different options. Uncertainty is in general not welcomed but, although expected to be made transparent, at the time considered a flaw of scientific results which has to be removed.

Today, uncertainties are increasingly perceived as barely reducible but at least partly inherent to the complex socio-ecological system. This is e.g. due to the accelerating pace and greater dimension of changes (e.g. climatic and demographic changes), which are likely to continue to increase in future.

While there is the need to better understand and reduce as far as possible the various uncertainties linked to trends and pressures affecting the water environment (see chapter above) and esp. climate change, uncertainties will always remain. Decision making and the related planning processes needs to find approaches for “living with uncertainties” and taking adaptive decisions that fully considers existing information, even if not complete or fully clear.

#### Contributions from NeWater to dealing with uncertainty in decision-making:

However odd it sounds, from the perspective of Adaptive Integrated Water Management uncertainty is a valuable piece of information when it comes to choosing what to do. The

concept of AWM highlights the importance of acknowledging uncertainties and of finding constructive ways in which to cope with them in water management practice. AWM can handle

#### Overview on central and synthesizing products for dealing with uncertainty in decision making:

- [SP 2: M. Brugnach, P. van der Keur, J. Mysiak \(Eds\): Uncertainty in adaptive water management: concepts and guidelines. 2009.](#)
- [Deliverable D 1.7.3.c: N. Isendahl, C. Pahl-Wostl, A. Dewulf \(2008\): Options for improving dealing with uncertainties in water management practice. NeWater Deliverable 1.7.3c.](#) Available at <http://www.newater.info/index.php?pid=1063>

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uncertainty e.g. by creating flexible solutions that are able to adapt to unknown, unexpected or changing conditions. To this end, the type of solutions sought are those which can work in a range of future conditions, and at the same time be successively adjusted and corrected as new knowledge is gained. Decisions are informed in addition to scientific assessment by a range of legitimate opinions, expectations, values and beliefs of those affected. This is achieved by giving guidance on supporting processes of social learning and change that adaptive management entails.

To this end, AWM deals with uncertainty by creating – through learning and adaptation – the capacity to respond flexibly and effectively to changing and unknown conditions. In the NeWater project, research into uncertainty was strongly linked to water management practice. Research focused on awareness raising and emphasized the importance of considering the multiple and valid ways of addressing a problem that can emerge when the opinions of different stakeholders are taken into consideration. Many stakeholders in the case studies took up the opportunity to improve their knowledge on coping with uncertainty. The Table 1 shows an excerpt of the cross-checking list jointly elaborated with the stakeholders on how uncertainty can be approached. The NeWater Uncertainty Guideline gives a more comprehensive overview of the challenges and options available for coping with uncertainties.

**Table 1 Extract from: Isendahl, N., Pahl-Wostl, C., Dewulf, A. (2008): Options for improving dealing with uncertainties in water management practice. NeWater Deliverable 1.7.3c**

<b>Framing parameters (selection)</b>	<b>Options for improving how to deal with uncertainties</b>
Uncertainty due to multiple knowledge perspectives	<ul style="list-style-type: none"> <li>• Supporting communication between the different parties.</li> </ul>
Urgency	<ul style="list-style-type: none"> <li>• Prioritising uncertainty situations</li> <li>• Designing a deadline to draw a line and enforce an adaptable decision despite a perceived lack of knowledge and certainty</li> <li>• Jointly establishing an agenda/list with stepwise tasks and goals and a timeline for all actors involved</li> </ul>
Positioning	<ul style="list-style-type: none"> <li>• Acknowledging uncertainties as a fact of life and chances involved.</li> <li>• Contemplating what exactly bothers you in the situation</li> <li>• Finding other people who frame the uncertainty more positively</li> </ul>
Trustworthiness towards other actors	<ul style="list-style-type: none"> <li>• Ensuring the involvement of all relevant actors</li> <li>• Engaging in dialogue with other actors to discuss differences in framing</li> <li>• Clarifying each other's ideas, stakes and expectations</li> <li>• Supporting transparent (and early) communication of uncertainties</li> </ul>

In AWM, uncertainty is taken as an incentive for cooperation instead of acting as barrier to cooperation and social learning, and negatively affect actors' commitment adaptive management suggest, a more effective way to deal with uncertainty is to create the capacity, through learning and adaptation, to respond flexibly and effectively to unknown conditions.

### 3.2.2 Question 5: How to better understand the role and improve the functioning of institutions for transboundary water management?

The awareness is increasing that transboundary institutions have a crucial role to play for river basin management in various directives/initiatives (e.g. WFD, floods directive, EUWI). Some but not sufficient knowledge is available on the potential set-up, changes, challenges and options for transboundary institutions and their decisions making, esp. in the context of the socio-economic/institutional/political situation in every river basin being very specific. Therefore, the research results/products in this field (including decision-making tools) need to be “robust” enough, giving knowledge that is broadly appreciable and not only “local specific”. Such results need at the same to be “adaptable” to a variety of local, specific river basins at hand.

Beyond a strict transboundary (border-to-border) level, there are also long distance interrelations between actions and climate change impacts – for example, changes that take place in the south of Europe can also influence the Alps. There are data and scientific projects on such issues, but so far no legal framework in place to deal with such interlinkages, so scientific knowledge on how to best integrate this in decision making and institutional set-up s is needed.

#### **Contributions from NeWater to understanding the role of and improving the functioning of institutions for transboundary water management**

Catering to the fact that all basins investigated in NeWater are transboundary river basins, the first phase of the project comprised a comprehensive assessment of institutional structures in all basins considered by the NeWater project, thus aiming for a broad assessment across a larger number of basins.

Based on these analyses, which were guided by an agreed framework, main institutional features were identified. Following a normative approach as well as the review of these analyses, a framework for assessing the adaptive capacity of transboundary water management regimes vis-à-vis global environmental change was developed (reference to article). The article highlights the following regime elements as fundamental for transboundary management:

- Actor networks, which are integrated across sectors as well as administrative levels and allow for broad stakeholder participation,
- Legal framework, which support adaptive management,

#### **Overview on central and synthesizing products for understanding the role of and improving the functioning of institutions for transboundary water management:**

- [Tom Raadgever \(2008\): Does collaboration enhance learning? The case of future flood management in the Rhine basin. Deliverable 1.2.7/1.3.7b of the NeWater project. Available at http://www.newater.info/index.php?pid=1063](http://www.newater.info/index.php?pid=1063)
- [Tom Raadgever and Erik Mostert \(2005\): Transboundary River Basin Management - State-of-the-art review on transboundary regimes and information management in the context of adaptive management. Deliverable 1.3.1 of the NeWater project. Available at http://www.newater.info/index.php?pid=1063](http://www.newater.info/index.php?pid=1063)
- [Raadgever, G. T.et al: Assessing management regimes in transboundary river basins: do they support adaptive management? Ecology and Society 13\(1\): 14. Available at: http://www.ecologyandsociety.org/vol13/iss1/art14/ES-2008-2385.pdf](http://www.ecologyandsociety.org/vol13/iss1/art14/ES-2008-2385.pdf)

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- Policies, providing for long-term planning as well as flexibility in terms of measures, but also the actual implementation of policy options,
- Information management system at the transboundary scale, which supports the joint production of information, while providing for the explicit consideration of uncertainties and the broad communication and fair use of information.
- Financing mechanism, which rely on a equitable share of funding as well as efficient cost-recovery mechanisms.

This framework was applied to three river basins (Rhine, Amudarya and Orange) in order to test its applicability to the specific situations in the basins. The assessment showed that the framework provides for a good tool in conducting a first assessment of the adaptive capacity of transboundary basins, while also pointing to the necessity of conducting further in-depth studies, regarding relevant regime elements in the specific basins.

More in-depth work on transboundary regimes has focused on three distinct issue areas with regards to the institutional set-up in transboundary river basins: the role of information management for transboundary river basin organisations (Amudarya and Orange), the role of stakeholder participation and learning (Rhine and Orange), as well as the role of donor coordination (Amudarya and Orange).

Findings highlight and support other research that common information management is crucial in establishing a basis of trust among the riparian countries. At the same time many river basins are stricken by the challenges that come with the set-up of common information management system. Research findings recommend a common step-wise approach towards building information management systems, which need to be supported by policy frameworks as well as political will in the riparian countries. Funding such information management efforts can and should be the basis for donor funding to transboundary river basin institutions, while at the same time ensuring the sustainability of these efforts.

In terms of facilitating learning in transboundary setting, different messages emanate from the research. In terms of facilitating learning among and with different stakeholder groups, a sub-basin approach appear to be mandated in order to reduce complexity in these interaction. Also, accounting for the different power positions of the stakeholders becomes even more crucial when approaching this from a transboundary perspective.

Finally, work with regards to the uptake of global scenarios on global environmental change at the level of transboundary river basin commission has indicated that transboundary institutions only slowly begin to take on responsibility in this regard, with national governments playing a much more decisive role. Fostering the capacity of transboundary institutions in this regard should guide the policy discourse in future.

### **3.2.3 Questions 6: How to better implement and integrate public participation into decision making?**

Based on the increased awareness on the advantages and necessities regarding public participation both of the stakeholders and the general public as well as the specific requirements in a number of directives (Aarhus convention, WFD, floods directive), there is the need to improve and better integrate public participation into decision making.

Implementing public participation often faces barriers:

- Many water managers feel that they are lacking time for – usually time-intensive – participation processes, especially as they have to meet many other specific WFD requirements which keep them busy.

- Many water managers also experience a doubt of their own skills when it comes to designing and implementing participation processes.
- The interaction with other (higher) authorities and sectors often impede the implementation of public participation. Water managers are not always responsible for final decision making but one or more higher-up authorities. Support is necessary from these authorities to motivate the initiation of participatory activities.

While significant research has already been conducted on the issue (e.g. through the HarmoniCOP-project), additional knowledge and experience from research is needed regarding on thinking, planning and acting with the civil society in water management, esp. in the transboundary dimension.

### **Contributions from NeWater to better implement and integrate public participation into decision making**

A guiding principle in NeWater was co-developing and co-applying knowledge and tools with stakeholders and scientists. Already by providing such a role model, NeWater research supported participatory water management and capacity building. Stakeholders took up the opportunity to use NeWater as a platform for experimental learning in trans-disciplinary processes, and for building trust between researchers, water managers and other stakeholders.

### **Overview on central and synthesizing products to better implement and integrate public participation into decision making:**

- [SP8: York von Korff et al \(Eds\): Special Feature on Implementing participatory water management: recent advances in theory, practice and evaluation. in Ecology & Society \(http://www.ecologyandsociety.org/ \)](http://www.ecologyandsociety.org/).
- [SP 11: NeWater Training Booklet. Available as CD and for download at www.newater.uos.de](http://www.newater.uos.de)
- [SP12: Online Teaching Curriculum for AWM. Available at www.newatereducation.nl](http://www.newatereducation.nl)  
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Some examples: In the Kromme Rhine, NeWater partners *advised* the local water board on how to design and implement a participation process. They also facilitated workshops and evaluated the process that then led to the adoption of a water management plan. In the Dhünn and the Guadiana NeWater partners *initiated* and *managed* participation processes that served as test runs for WFD decision making and that for the Dhünn led the water authority to conduct an experiment on water quality. In three other basins NeWater researchers – experimenting with simulations and co-constructed models - helped elicit tacit knowledge on criteria for decision making on flood prevention (Tisza), facilitated the joint representations of the economic situation and water management (Amudarya), or on legislative settings (Orange).

A special feature in the journal Ecology and Society will explore these experiences in depth.

### **3.3 Communication and dissemination of (scientific) knowledge**

Water decision makers work in an expert environment of pressure due to tight timelines and high complexity. The European Concerted Action Harmoni-CA has put much effort into highlighting the different perspectives of water decision makers and researchers on scientific results. It was stressed that water decision makers e.g. consider many resources of information of which research is only one. If its results are clearly and tailored

communicated, and relate to the ongoing tasks of the decision makers, they are appreciated. Water managers then seek support from the researchers who developed these results.

The pressures decision makers are facing often leads to a practice for policy development considering at the most the more prominent (research) inputs and lacks time and resources for a more comprehensive review on existing research. Also, water policy makers often do not need the complete backgrounds/details to scientific results but e.g. need to know about the practical impacts of measures in specific (types of) basins. In terms of task division, water decision makers need researchers to consider the policy questions and provide proper answers.

In addition, the resulting lack of awareness from the policy side on existing research results acts as a major barrier towards applying scientific results. This refers not only to the lack of tailored communication and presentation from the researchers but also to the possibility to actually get trained on scientific concepts and practice.

Three questions in this context are most prominent:

Questions 7: How can water policy makers get better awareness of and access to scientific knowledge?

Questions 8: What are tools for identifying and making visible best practice solutions at the local level, which allow practitioners and decision makers to learn from another?

NeWater has generated many insights on practices and claims that AWM is best suited for situations where uncertainty cannot be minimised in the short term or where the implementation of policies cannot be delayed until more and better knowledge is available. The Guidebook on AWM presents many of these experiences. Based on them the following 5 lessons learned (see figure below) have been identified, here introduced with the five selected metaphors: **Lighthouse**, **Explorer**, **Academician**, **Researcher** and **Nurture**.

Question 9: How can water managers and water policy makers improve their capacity on adaptive and integrated water resources management allowing the consideration of uncertain developments such as climate change?

### **3.3.1 Questions 7: How can water policy makers get better awareness of and access to scientific knowledge?**

With the ongoing information overflow on research results or other water management relevant information, the barrier to getting attention for specific scientific information raises strongly. Water managers need to rely more and more strongly on peers or other trusted persons to assess the quality of presented research or insights and also to know relevant background details. In addition and as a first step to new approaches, water managers also search “non-human” sources such as journals, conferences or the internet for information.

Raising awareness of and improving access to scientific knowledge has thus to follow two approaches. Information has to be accessible through the sources they commonly use (specific internet platforms such as CIRCA, WISE, water policy conferences) and a network of “ambassadors” who work at the interface of policy and science has to promote information and act as access point to background information or other experts.

## **Contributions from NeWater to raising awareness on and access to scientific knowledge of water policy makers**

With its strong participatory case study approach, NeWater has strengthened the policy-science interface through a network of researchers, water managers and other stakeholders.

Information material was directly delivered to the basins coming from the researchers. Efforts were made to

address water managers in their own language. For example, in the case of the Amudarya basin, a summary booklet with case study results was developed and made available in English, Russian and Usbek.

Next to the more than 200 deliverables and publications which came out of NeWater. To facilitate the access to the different aspects of NeWater, a special synthesis process was initiated which presents NeWater results target to different reader groups (water policy makers, water managers and researchers) in twelve comprehensive products. For example, the Guidebook on Adaptive Water Management provides a comprehensive reader on conceptual aspects and includes many experiences and examples from all case studies.

Quick readers will find the NeWater Policy Briefs addressing on 4-6 pages central issues in AWM namely AWM & Uncertainty, Climate Change and Poverty & Gender. Further, the NeWater results flyer and a 15-pages brochure provide special access to NeWater insights starting from the case studies and the synthesis products. The flyer is already translated into 13 languages. The brochure is currently translated to at least all languages spoken in the basin and are distributed both through the partners but also at major policy events such as the 2<sup>nd</sup> European Water Conference (Brussels, April 2009) or the 5<sup>th</sup> World Water Forum in Istanbul (March 2009).

For those, searching independently for information, the NeWater website provides information on all deliverables. In addition, a special section in the WISE-RTD was developed where both water managers and scientists find the means for targeted search on information about AWM and getting at the same time some introduction to the concept. A special section explains the concept of Adaptive Integrated Water Management and invites water managers to a keyword based search to get support for making water management more adaptive. You can find the portal at <http://wise-rtd.info/>. Linking up with the community of IWRM, NeWater cooperated with the Global Water Partnership and presents selected results and case studies on the GWP Toolbox ([www.gwptoolbox.org](http://www.gwptoolbox.org)).

### **Overview on central and synthesizing products to raising awareness on and access to scientific knowledge of water policy makers:**

- All public NeWater products (reports, tools, ...) are available on the project webpage: [www.newater.info](http://www.newater.info) or [www.newater.uos.de](http://www.newater.uos.de).
- [NeWater Brochure: Adaptive Integrated Water Resources Management \(AWM\): Explicitly addressing today's challenges! For a printed copy, send email to \[contact\\[at\\]newater.info\]\(mailto:contact\[at\]newater.info\). Online versions are available at \[www.newater.uos.de\]\(http://www.newater.uos.de\).](#)
- [Policy Briefs address AWM & Uncertainty, Climate Change and Poverty & Gender Issues.](#)
- [12 Synthesis Products have been developed \(see also Preamble of this report\) or webpage \[www.newater.uos.de\]\(http://www.newater.uos.de\).](#)
- [SP 10: AWM section in the WISE-RTD portal \(<http://wise-rtd.info/>\).](#)
- [Links from IWRM to AWM can be found in GWP Toolbox \(\[www.gwptoolbox.org\]\(http://www.gwptoolbox.org\)\)](#)

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### 3.3.2 Questions 8: What are tools for identifying and making visible best practice solutions at the local level, which allow practitioners and decision makers to learn from another?

At the current state of WFD implementation, water policy makers and managers are most interested to learn about the impact of measures and about best practices. Exchange of information is needed between the different stakeholders in the river basin management planning process to agree on the measures and practices. Research can provide platforms for exchange but also give the opportunity to learn about different measures, practices and experiences from other basin.

#### Contributions from NeWater to identifying and making visible best practice solutions at the local level, which allow practitioners and decision makers to learn from another

Most of the NeWater case studies included local level activities in different sub-basins. In general, these stakeholder processes proved strong in learning from other perspectives and also in developing an understanding for the different impacts of different options. For example, in the Kromme Rijn basin (subbasin of Rhine river basin) the study took up the implementation process of the European WFD. The Water Management Plan (WMP) for the Kromme Rijn will be used by the Waterschap Hoogheemraadschap De Stichtse Rijnlanden as a reference and the basis for a handbook for WMPs in other areas.

Reflections and recommendations for best practices on stakeholder participation processes are at the core of special feature on public participation (SP8), providing examples not only from different case study sub basins but also comparing approaches in different countries, e.g. Bulgaria and Austria.

NeWater has generated many insights on practices and claims that AWM is best suited for situations where uncertainty cannot be minimised in the short term or where the implementation of policies cannot be delayed until more and better knowledge is available. The Guidebook on AWM presents many of these experiences. Based on them the following 5 lessons learned (see figure below) have been identified, here introduced with the five selected metaphors: Lighthouse, Explorer, Academician, Researcher and Nurture.

#### Overview on central and synthesizing products to identifying and making visible best practice solutions at the local level:






- [SP8: York von Korff et al \(Eds\): Special Feature on Implementing participatory water management: recent advances in theory, practice and evaluation. in Ecology & Society \(http://www.ecologyandsociety.org/ \)](http://www.ecologyandsociety.org/).
- [SP9: Jaroslav Mysiak, Claudia Pahl-Wost, Caroline Sullivan, John Bromley, Hans Jørgen Henriksen, Gareth James Lloyd: \(Eds.\): Guidebook for adaptive water resource management. Earthscan. Expected late 2009. Electronic version will also be available.](#)
- [Water Management Plan \(in Dutch\): Watergebiedsplan Tussen Kromme Rijn en Amsterdam-Rijnkanaal. Authors: Renier Koenraadt, Anja Menkveld, Mirjam Stark en Arjen Koomen. Version February 2008](#)  
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### 3.3.3 Question 9: How can water managers and water policy makers improve their capacity on adaptive and integrated water resources management allowing the consideration of uncertain developments such as climate change?

With the prominent discussion on climate change, there is a general awareness that one cannot expect to be in full control of the processes' impacting on the water systems. Water policy makers face the expectations from the public and stakeholders to develop reasonable, reliable and sustainable policies which allow other interests groups to act upon. At the same time water policy makers realize that they cannot provide one answer but there will be always new or changing information coming up, asking for revisions of current policies. Water policy makers and managers look thus increasingly for possibilities to build their capacity on how to bridge these different demands.

Specific approaches, tools and materials are needed for capacity-building in an efficient and effectual way in order to improve water management capacities, in Europe and beyond.

**Figure 2: Lessons Learnt from NeWater Guidebook on Adaptive Water Management (SP 9)**

Build capacity	Commit to uncertainty	Think twice before deciding	Dare experiments	Plan for adaption
				
Based leadership	System analysis	Toolbox	Level of focus in pilots	Supported leadership en route
Effective leadership and sustained financial support are crucial. Horizontal and vertical coordination and harmonization are essential to facilitate change.	Integrated and forward-looking approaches need to take into account new realities and challenges. Short and long term scenario analysis can inform policy and specify learning goals. Commitment to uncertainty results in robust policies	Diverse tools are needed to explore vulnerability and resilience, encourage systemic learning and create opportunities for adaptive water management.	Experiments can be put in place at different institutional levels. Successful small-scale pilot studies can help to instigate new management approaches. Integrated performance and compliance assessment require apposite monitoring.	Stakeholder engagement, education and the creation of bottom-up user associations are crucial steps to attaining adaptive surface and groundwater management.
Lighthouse	Explorer	Apparatus	Researcher	Nurture
L	E	A	R	N

## **Contributions from NeWater to improve their capacity on adaptive and integrated water resources management allowing the consideration of uncertain developments such as climate change**

Already the case study approach can be considered a very strong contribution to building capacity of water managers and water policy makers on AWM. In addition to this, NeWater makes its knowledge available beyond the duration of the project through providing guidance material on AWM in general (SP9) and more specifically on uncertainty (SP 2).

In addition, NeWater created an online curriculum (SP 12) for teaching at universities. Its focus is on climate change, AWM concepts and tools as well as transition management. Further, NeWater conducted workshops in the case study basins in order to educate trainers who can pass on their gained knowledge and skills to practitioners. Focus was on AWM concepts and supporting tools. The training materials have been synthesized in SP 11.

### **Overview on central and synthesizing products to build capacity on adaptive and integrated water resources management:**

- **SP 11:** [NeWater Training Booklet. Available as CD and for download at www.newater.uos.de](http://www.newater.uos.de)
- **SP 12:** [Online Teaching Curriculum for AWM. Available at www.newatereducation.nl](http://www.newatereducation.nl)
- **SP 9:** [J.Mysiak, et al \(Eds.\): Guidebook for adaptive water resource management. Earthscan. Expected late 2009. Electronic version will also be available.](#)

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## **4 Further research questions identified**

Although NeWater has addressed plenty of today's challenges in water management, some issues on the current water policy agenda in Europe could not be addressed. During the interviews and the analysis of the documents, additional issues were identified.

We list these issues in order to facilitate work on them in further research projects. What is obvious is that most requests from European water policy makers relate to experience-based knowledge and asks for a very strong interaction with actual water management practice. This again confirms the basic NeWater approach to take the concept of participatory research serious as a concept and to actively involve the envisaged beneficiaries of the scientific results. NeWater's action research processes responded strongly to the issues that were addressed by the involved stakeholders and also considered the timing of the official water management processes in the case study regions.

### **Water managers are interested in more research contributions on the following issues:**

- Case studies applying measures discussed in the *context of policy processes*. It is important to stress that water managers follow a focused approach in order to understand management impacts on their basins. Thus, especially more comparative studies and simulations are necessary on the different measures, especially at regional and at basin scale. Water managers have in general a rather strong linkage to a specific region and are very cautious in applying results from a different region in their context.
- More examples and experiences on how to improve international and interbasin co-operation and knowledge transfer (main hindrances for long-term co-operation, how to create stronger partnerships, tools for adapting knowledge to other local and regional preconditions);

- Management instruments that are able to describe and explain complex management systems that explicitly take into account complexity (the prototype of the NeWater MTF is a first step here);
- More examples and experiences on improvement of monitoring systems in general terms;
- How can the integration of water and other environmental concerns in other policies better take place? What is the current state of the art on this? In order to implement an integrated approach to water management, a variety of policy fields and sectors need to be considered and integrated in a realistic way. This relates both to strategic considerations for the set-up and implementation of policy aims (e.g. for agricultural policy, energy policy, navigation, land use etc.). Integration is necessary in order to have them at least not contradicting each other, but also in the practical set-up of planning processes (e.g. interministerial working groups covering different policy fields). Overall, additional input from science on such governance issues is looked for.
- Methodologies for better assessments of the interaction between the different hydrological parts of the water system. For a good management of water resources, the links between groundwater and surface water need to be well understood. Knowledge can be improved on the interaction between specific groundwater bodies and surface water bodies. This knowledge is important to assess their influence on flood and drought events and especially demanded at regional and basin scale level.

In addition, a major cluster of such further research questions is related to **economic aspects of water management**:

- In the context of WFD-implementation, there is a lack of methods to deal with inherent uncertainties e.g. of climate change in the economic assessment. Broad ranging set of values on benefits of water management aspects are needed, while there is still the need for methodological development to reach this aim. A further issue is how we can deal with economic evaluation on a more global level;
- Scientific insights related to financing of the EUWI activities: what approaches (e.g. public-private partnerships) could improve the financing situation, how do they need to be set up in order to produce the desired outcomes;
- Regarding floods, there is need for better quantifying the economic results of re-opening floodplains (which might be a low-cost measure), including the consideration of (quantitative) economic value of grasslands (wetlands). In addition, methodologies are needed that address the distribution of cost and benefits of floods measures and the cost-benefit assessment of flood risk management plans especially in an international context. Current practices do not necessarily address indirect costs and effects of floods;
- Regarding climate change, region specific costs of inaction is a major

#### **Follow-up activities utilizing NeWater:**

Many of the activities, especially in the case study basins, are continued or fed into national or regional projects or further research activities. Examples include:

- **Twin2Go** (Coordinating Twinning Partnerships towards more Adaptive Governance in River Basins)
- **PSI-connect** (Policy Science Interactions: Connecting Science and Policy through Innovative Knowledge Brokering)
- **SCENES**-Project on Water Scenarios for Europe and Neighbouring States (Tisza basin)
- **G3C**-Network on Global Climate Change Collaborative
- **Climate Water** (Bridging the Gap between Adaptation Strategies of Climate Change Impacts and European Water Policies)
- Determination of **Resource Quality Objectives** and Service of the South African Water Act (Orange basin)
- **HIGHNOON** (Prioritization of Adaptation Options in Water Management)

knowledge gap, especially linked to the effects on the water environment and sectors relying on water. Reliable figures should be more widely available here as input to decision making process;

## **5 Conclusions**

Water management calls for two kinds of support from research. First, delivering facts and information are necessary to better understand current changes or developments and to assess the social, economic and ecological impacts of measures. Second, experiences and support to exchange, to learn from other and similar basins are of high interest to water managers and water policy makers. This is not only because of the growing awareness with regard to interactions between the different regions and states but also shows the increasing awareness on the complexity of the social-ecological systems which requires a much more pro-active approach towards uncertainty and knowledge gaps.

NeWater listened to these requests and played a two-fold role at the policy-science interface: it stimulated capacity building and learning among water managers directly involved in participatory management processes. In addition, NeWater provided information on the socio-ecological water system.

NeWater invited water managers to engage in research processes to enrich the practical relevance of research and provided “a safe space“ allowing for (experimental) changes in the approach to governing and managing the water system. Feedback by the stakeholders involved shows that this approach in particular results in the adaptation of perspectives and learning. However, the processes triggered by NeWater can only be a start. The time horizons of research projects are relatively short compared to the long-term implementation of river basin management. Many of the research activities will be taken up or intensified in follow-up projects (see textbox) or case study-specific activities at the local level.

## **6 Annex: List of Interviewees**

In July & August 2008, the following persons were asked: “Where do you expect contributions from research in the natural and social science on the current main challenges in your field of European water policy implementation?”:

Helmut Blöch, DG Environment, D2. Protection of Water & Marine Environment

Maria Brättemark, DG Environment, D2. Protection of Water & Marine Environment

Stephanie Croguennec, DG Environment, D2. Protection of Water & Marine Environment

Christos Frangakis, DG Research

Marieke van Nood, DG Environment, D2. Protection of Water & Marine Environment

Philippe Quevauviller, DG Environment, D2. Protection of Water & Marine Environment

Jorge Rodriguez-Romero, DG Environment, D2. Protection of Water & Marine Environment