Convention of the Protection and Use of
Transboundary Watercourses and International Lakes
Task Force on Water and Climate
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Draft Collection of lessons learned and good practices on climate change adaptation in transboundary basins

Draft of the publication as of 7 October 2014

Summary and proposed action by the Task Force

At its sixth session (Rome, 28–30 November 2012), the Meeting of the Parties to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes entrusted the Task Force on Water and Climate, in cooperation with the Working Group on Integrated Water Resources Management, with the preparation of a collection of lessons learned and good practices on climate change adaptation in transboundary basins (ECE/MP.WAT/37, para. 51 (d)). This publication is prepared in cooperation with the International Network of Basin Organizations (INBO) and many other partners for launch at the seventh World Water Forum to be held in the Republic of Korea in April 2015.

The present document includes the very first draft of the publication, prepared by a drafting group, which still requires considerable revision. The content and scope were discussed at the first meeting of the drafting group (Geneva, 9–10 December 2013) and the second meeting of the global network of basins working on climate change adaptation (Geneva, 13–14 February 2014) as well as at the ninth meeting of the Working Group on Integrated Water Resources Management (Geneva, 25-26 June 2014).

The Task Force is invited to:

(a) Review the draft of the publication contained in this document and provide comments on the content, structure and good practices included;

(b) Suggest possible additional good practices for the preparation of the publication;

(c) Entrust the Drafting group, in cooperation with the Bureau, to further develop and finalize the publication in the period November 2014 to March 2015 for its launch in early 2015 at the Seventh World Water Forum.

FOREWORD- to be added

SUMMARY/ MAIN MESSAGES – will be added

ACKNOWLEDGEMENTS - LIST OF AUTHORS – will be added

TABLE OF ABBREVIATIONS – will be added

TABLE OF FIGURES; TABLES and BOXES – will be added

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1. Introduction

1.1 Background and objectives of the document

1. According to the fifth IPCC Assessment Report, impacts of climate change on natural and human systems are observed on all continents and across the oceans. Most climate change impacts are transmitted through the water cycle. Extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will very likely become more intense and more frequent by the end of this century, as global mean surface temperature increases. At the same time, droughts and low flows are expected to increase.

2. More and more basins are experiencing increased flow variability which might be due to climate change. Transboundary and national basins around the world are therefore starting to address these changes by developing climate change impact assessments, vulnerability assessments and adaptation strategies. However, they are faced with numerous challenges: uncertainty of climate change impacts, especially at the basin level, national and local adaptation activities which are often not coordinated, lack of capacities, lack of knowledge on climate change impacts and possible adaptation measures, lack of and resources etc.

3. As 60% of rivers and numerous aquifers in the world cross national boundaries, transboundary cooperation in adaptation is necessary to prevent negative impacts of unilateral activities and to support the coordination of adaptation measures at the river-basin or aquifer level and joint development of more cost-effective solutions. It is also essential to make sure they offer benefits to all riparian Parties, for example by sharing the costs and benefits of adaptation measures or by reducing uncertainty through the exchange of information.

4. Transboundary cooperation can broaden our knowledge base and enlarge the range of measures available for prevention, preparedness and recovery. The need for cooperation in climate change adaptation can even be an incentive for cooperation in transboundary basins. International legal frameworks such as the UNECE Convention on the Protection and Use of Tranbsboundary Watercourses and International Lakes (Water Convention) and the UN Watercourses Convention help countries to jointly adapt to climate change.

5. For this reason, the Parties to the UNECE Water Convention decided at their sixth session (Rome, 28-30 November 2012) to develop a collection of good practices and lessons learnt on water and adaptation to climate change in transboundary basins. The Task Force on Water and Climate was entrusted with the elaboration of the publication in cooperation with the International Network for Basin Organizations (INBO) and many other partners. The development of the collection of lessons learnt and good practices was also an outcome of the sixth World Water Forum (target 3.3.2) and it will be presented to the next World Water Forum in 2015 in the Republic of Korea.

6. The publication was produced in 2014-2015 by a drafting group composed of nominated experts from different countries and organizations working on water and climate change adaptation. Each chapter was prepared by a lead author in cooperation with numerous contributors.

7. The collection intends to demonstrate and illustrate important steps and lessons learned to take into account when developing a climate change adaptation strategy for water management in the basin or transboundary

context. It aims to compile, analyse, publish and disseminate lessons learned and good practices on water and adaptation to climate change in transboundary basins. It includes lessons learnt and good practices from the programme of pilot projects under the UNECE Convention on the Protection and Use of Tranbsboundary Watercourses and International Lakes implemented since 2010 in cooperation with partner organizations such as OSCE and UNDP in the framework of the Environment and Security Initiative. It also includes lessons and examples from numerous other organizations working on water and climate change in transboundary basins, such as the International Union for Conservation of Nature (IUCN), the Global Water Partnership and many others.

8. The collection serves as a complement to the Guidance on Water and Adaptation to Climate Change[1], developed by the Task Force on Water and Climate in 2007-2009 and adopted by the Meeting of the Parties to the Water Convention in 2009, as well as to the previous INBO handbooks[2].

9. The publication is not legally binding and does not supersede the legal obligations arising from the Convention.

1.2 Definitions

10. A **lesson learned** is a recommendation about a certain concept or approach that has proven to be beneficial or effective as derived from practical experience.

11. A **good practice** is a case situation in which certain concepts or approaches proved to be beneficial or effective and where adaptive capacity has been increased.

1.3 Target audience

12. The target audience of the collection of good practices and lessons learned includes all those working on adaptation to climate change in transboundary basins: joint bodies; river basin commissions and other institutions for transboundary cooperation; developers of adaptation strategies, especially in transboundary basins; decision makers; persons working on water and/or climate change in ministries; and other authorities.

1.4 Why transboundary cooperation is important in climate change adaptation

13. Water is a cross-cutting issue, which demands attention at all levels and across sectors. Water issues involve many stakeholders with conflicting and competing needs, and cross multiple physical, political and jurisdictional boundaries, as recognized at the United Nations Conference on Sustainable Development (Rio+20 Conference) held in 2012. Cooperation is necessary to address issues such as water allocation decisions, upstream and downstream impacts of water pollution and water

[1] United Nations publication, Sales No. 09.II.E.14. Available at: http://www.unece.org/env/water/publications/pub.html

[2] See http://www.riob.org/riob/publications-et-documents/article/manuel-de-la-gestion-integree-des

abstraction, infrastructure development, overexploitation and financing of water management. Water cooperation contributes to:[3]

(a) **Poverty reduction and equity**. More inclusive governance of water and cooperation between different users can help overcome inequity in access to water, which is essential for satisfying basic human needs and reaching the Millennium Development Goals;

(b) **Economic benefits**. Cooperation can lead to more efficient and sustainable use of water resources, e.g., through joint management plans creating mutual benefits and better living standards;

(c) **Preserving water resources and protecting the environment**. Cooperation facilitates the exchange of data and information and can help develop joint management strategies to preserve water resources and protect water-related ecosystems;

(d) **Promoting peace**. Cooperation on water can help overcome cultural, political and social tensions and build trust between communities, regions and States.

2. General arrangements: institutional arrangements and application of integrated water resources management principles

14. Most of our experiences on adaptation to climate change initiatives are very recent. However, a series of relevant water management policies and actions undertaken until now at national and transboundary basins have been carried out within pre-existing IWRM or related frameworks (e.g. EU WFD). Some of these provisions and measures are by today's terminology and classifications, typical climate change adaptation (CCA) responses. Among them, the provisions for addressing droughts and floods are perhaps the most common and effective measures of this category. Similarity and coherence between IWRM and CCA approaches are rather natural since increasing frequency and appearance of peaks and extreme events directly connected to climate variability and change are closely related to a series of pressures excreted on either the entire river basin or its parts, eventually belonging to different riparian countries, affecting, however, the whole system. Climate change more than any other stressor affects directly a larger area even beyond the river basin system and therefore it requires at least a basin wide approach if not the wider level of cooperation.

2.1 Demonstrate the importance and usefulness of basin-wide adaptation

15. The cooperation on IWRM at transboundary level was historically based on considerations of balancing upstream and downstream countries' or communities' priorities and needs in order to shift from water sharing into sharing the benefits of water. Climate adaptation measures, more than any other set of provisions, require cooperation in the same spirit and distribution of tasks in order to reduce and remediate climate change

[3] See *Water cooperation in action: approaches, tools and processes*, report of the International Annual UN-Water Zaragoza Conference 2012/2013, held from 8 to 10 January 2013 in Zaragoza, Spain. Available from http://www.zaragoza.es/ciudad/medioambiente/onu/en/detallePer_Onu?id=710.

challenges with fair sharing of both benefits and burdens. It is noteworthy that within a river basin, you might have "winners" and "losers" of adaptation since the adaptive capacities of various sectors and groups of a society differ, while the support they may obtain from public or private institutions may also vary significantly.

16. Integration of CCA strategies with those of IWRM will benefit from common processes and mechanisms of decision-making, financing and awareness raising/participation of stakeholders, resulting in economy of human and material resources and coherence. Damages and other impacts of climate change including humanitarian, political and security risks require responses that affect the entire management of the river basin. The River Basin Management (RBM) approach as an integral part of IWRM is widely recognized and well-understood by now, therefore, there is a growing consensus that CCA should be part of a wider effort to integrate all relevant frameworks and processes. This may reach even beyond traditional interpretation of IWRM to include integrated coastal zone management (ICZM) and employ the ecosystem approach (ECAP) in order to increase water security and reduce tensions.

17. Furthermore the gradual deepening of our knowledge related to climate change issues may allow for a gradual enhancement and further on development of IWRM/RBM concept and deeper understanding of the overall management of the transboundary river basin.

Box 2.1 Developing a strategy for climate change adaptation in the Danube basin

2.2 Ensure that each adaptation policy considers climate change as one of many anthropogenic pressures on water resources

18. The effects of climate change alone may be not so big, effects of other anthropogenic changes may be much higher, especially in the short term. Therefore, CC should not be considered stand-alone. Climate change is frequently considered as one more in a series of already known pressures which include population growth, migration, globalization of the economy, urbanization and "littoralisation" (increasing population densities and constructions across the most vulnerable to climate change coastlines) changing consumption as well as agricultural and industrial production patterns. However, climate change is in fact intensified by a combination of the aforementioned stressors, many of which interact with each other and therefore can lead towards various frequently unpredictable feedbacks. This means adaptation strategies should be coordinated with sectoral ones as well as with other water and sustainable development policies, and be integrated in an overall strategy with clear priorities and synergies. Scenarios can be helpful in assessing the possible effects of different pressures and in developing such strategies (more on scenarios is in chapter 6).

2.3 Involve decision makers in the adaptation process from the beginning to ensure that the process is connected with policymaking

19. Similarly, both groups should be involved from the beginning in the elaboration of any intervention/ project in order to ensure ownership and political support of the steps to be followed and the results to be achieved. This can be done through the creation of working groups or committees in which all the different stakeholders are represented.

20. The direct impact of climate change on the natural and man-made environment leads to opposing tendencies and may simultaneously trigger conflicts and/or induce cooperation between or even within countries. To avoid the former and enhance the latter it is crucial to involve both experts/scientists and policymakers in order to better understand the interaction between the hydroclimatic system on one hand and the socio economic system on the other.

Box 2.2: Memorandum of understanding on the Drin

Box 2.3: Jordan River

2.4 An institutional structure is essential to ensure cooperation between riparian countries in climate change adaptation

21. Coordination of CCA strategies, particularly within wider and more comprehensive frameworks, is obviously not an easy task and cannot be achieved without joint institutional structures such as coordination management body or a framework, even if in some cases or actions valuable elements of national adaptation policies could guide the transboundary institutions. Conflicts are usually less probable when well established and smoothly operating institutions exist even in cases where riparian countries have still unresolved political differences.

22. In fact, the best examples of CCA approaches and practices in transboundary river basins are observed in cases where:

    (a) well-established and functional cooperation mechanisms, management schemes and governance bodies are in place (see for instance the Rhine River or Danube River boxes). In this case CCA issues are added as natural extension of existing competences, either with a special mandate or implicitly as complementary to other policy areas;

    (b) relatively new and emerging cooperation schemes where provisions for joint operations in CCA area are either explicitly mentioned or implicitly included. Here climate change in most of the cases is recognized among the stressors; while in other cases the results of the pressures (for instance droughts or floods) are recognized as highly important areas of transboundary cooperation without, however, reference to the root causes of these pressures.

Box 2.4: Rhine

2.5 Incorporate the ecosystem approach into adaptation strategies

23. The ecosystem approach is a strategy for the integrated management of land, water and living resources that addresses the crucial link between climate change, biodiversity and sustainable water and other natural resources management. The ecosystem approach is based on adding value to the ecosystem services, and therefore it is considered as being affordable and cost-effective. Increasing ecosystems' resilience can be done by including the ecosystem as a "water user" through environmental flows. Healthy freshwater ecosystems often have high natural resilience and can resist extreme events. The implementation of the ecosystem approach may require revisiting the priorities and relative use of "hard" water infrastructures versus "soft" or "green" ones to manage water and regulate both quantity and quality of water resources, restore flow regimes and rebuild natural climate resilience. Ecosystem-based adaptation has positive

effects beyond the direct impact of adaptation, while improving both livelihoods and biodiversity. Ecosystem-based adaptation is particularly relevant in transboundary basins.

Box 2.5: Great Lakes Basin

Transboundary cooperation between the seven United States Great Lakes Basin states and Canada illustrates many of good practices in the Chapter. The five Great Lakes contain about 20% of the World's fresh water supply and are shared between Canada and the United States. The two nations have adopted binding legal instruments which recognize that nations have a duty to all inhabitants of the planet, present and future, to conserve a resource for the benefit of humankind and have adopted a precautionary, ecosystem approach to adapt to climate change.

Starting in the 1980s, both nations became concerned that transbasin diversions from the Lakes could have an adverse impact of the ecosystem and future water use options in the region. Between 2001 and 2005, the eight United States Great Lakes states negotiated an innovative interstate compact, The Great Lakes-St. Lawrence River Basin Compact (Compact) .The Compact makes it very difficult to divert water outside the Great Lakes Basin, which except in the state of Michigan does not correspond to the political boundaries of the states. Even small communities that straddle the divide between the Great Lakes and other drainages must meet a high conservation standard to gain access to water located only a few miles away.

Climate change was a factor in the negotiations because the Compact proponents faced a major challenge in justifying placing 20 percent of the world's fresh water supply off limits to non-Basin users. Proponents used a bi-national institution which administered a 1909 boundary waters treaty between the two countries to help make the case for a precautionary, ecosystem adaptation strategy. The International Joint Commission (IJC) can investigate issues through References requested by countries. In 1999, the two governments agreed to an IJC reference on Great Lakes diversions. The resulting 2000 report, Protection of the Waters of the Great Lakes: Final Report to the Governments of Canada and the United States (Report), invoked the precautionary principle to justify the anti-diversion regime and linked it to global climate change .

The Report concluded that the Lakes are "highly sensitive to climatic variability".

The Great Lakes provinces and states have chosen to adapt to climate change by trying to maintain the existing ecosystem. If projections of lower lake levels occur, the region is in a better position to adjust to them than if had encouraged transbasin diversions.

2.6 Apply transparency and openness throughout the process

24. When working together in a transboundary basin, transparency in methods used, transparency on uncertainties, on interests, etc., is needed to ensure the necessary mutual trust.

Box 2.6: Colorado River

One of the many challenges of adapting to climate change is reliable information about near term impacts in a particular basin. Any set of predictions will also be plagued with uncertainty and the need for further research. However, predictions made through a process that combines rigorous scientific review with a broad stakeholder involvement can help galvanize regional leaders to consider concrete adaptation steps. In 2009, the United States Congress authorized the federal Bureau of Reclamation to conduct a series of studies assessing the risks of climate change in the most stressed basins in the Western United States.

To take one example, Colorado River Basin Water Supply and Demand (2012), synthesized available model predictions and a wide range of demand and regional growth scenarios in the highly stressed Colorado River Basin. The existing national and international allocation law assumes that the average annual flow is 15 million acre feet; it further assumes that existing carryover storage can supply this amount in low water years. However, the Report warns basin leaders that under conservative future water supply projections, the basin could face a 3.2 million acre foot imbalance by 2060, while admitting that the imbalance could be greater or less.

A wide variety of stakeholders from environmental NGOs to state legislators have accepted the report as a legitimate blueprint for adaptation. The federal government and the states have not yet taken hard, painful adaptation steps, but the basin states have identified on the need for water conservation, supply reallocation, and water banking as the best options to live with a decreased water budget. This is important step toward adapting to a world with less water supply and has important lessons for all arid regions.

2.7 Ensure synergies and linkages between adaptation actions at different government levels (local, national, regional, transboundary) and different (economic) sectors

25. Numerous adaptation activities are already ongoing at the national level, with governments developing national adaptation strategies, adaptation plans, sectoral plans and numerous other policy documents. Most of them come as a response to international policies and frameworks introduced in the countries by individual government officials such as the national focal points of different conventions and agreements. Quite frequently the effectiveness of CCA policies is limited by the lack of expertise, knowledge and scientific evidence regarding climate risks and especially their sector specific economic implications in the national or regional context. Linking water and adaptation policies into sectoral ones by aligning respective policy objectives poses major challenges at all governance levels. Ideally, transboundary adaptation strategies should be linked to the national adaptation and sectoral strategies in order to ensure the implementation of any relevant measures and reduce the gap between policy on paper and their actual on-the–ground enforcement.

Box 2.7 : Multilevel decision making for IWRM and climate change / Example of Great Lakes

3. The legal framework

3.1 Information management and data sharing agreements between riparian countries are key to peaceful transboundary water cooperation.

- A well-performing information management and data sharing arrangement between riparian countries is key to the implementation of the general duty to cooperate.
- International law provides rules that govern the exchange of data and information regarding transboundary water resources.
- Research suggests a global trend towards incorporating data and information exchange as a key component of the growing normative framework for transboundary freshwater resources.
- Even in politically charged basins, information and data sharing projects can constitute an important way of building trust between riparians.
- Information and data sharing systems should not only be technology-focused, but also be based on capacity development and able to integrate multidisciplinary information.

Possible box: The SUMAR and DESERVE projects

3.2 What provisions should be included in water quality regulations to address climate change impacts on water quality?

- Assessing the what, how and when of these impacts.
- Establishing a serious and fluent system to share information between all stakeholders, to have a clear understanding of these impacts.
- Establishing effective emergency response measures to deal with situations caused by the impacts of climate change, such as droughts and floods
- Water quality problems on one side of a basin affect the other, a basin-wide authority can enable cross boundary solutions through management but the previous examples suggest that such authority would require sufficient powers to enforce its decisions.
- Water fit for purpose. Water quality regulations not only need to address local water conditions; acknowledgement of different water uses within the basin enable a more flexible way to manage water quality when facing natural constraints.
- Water quality issues can emerge due to emergency and catastrophic events as well as from the action of another riparian party. Sound and straightforward conflict resolution systems allow timely and effective measures when water quality is damaged.
- Integrated regulation. Declining water levels, deteriorating water quality, and increasing use of groundwater resources have raised concerns with regard to transboundary aquifers. There is a growing need to include these water sources in the current regulations.

Possible boxes: Agreements between the United States of America and Mexico, the Great Lakes Water Quality agreement and the 2012 Protocol, Agreement between Kazakhstan and China regarding water quality

3.3 Trust building and collaborative learning are essential prerequisites for successful negotiation and effective implementation of legal arrangements

- Managing complexity and distrust in relations between riparian countries demands a stepwise and context-specific approach that builds trust and facilitate shared understanding
- Build on what is working, largely relying on home-grown governance arrangements, and adjust accordingly
- Reach out to epistemic communities and bring together science, law and policy through collaborative learning initiatives and regional projects that enable co-production of knowledge and reflexive learning
- Technical cooperation might demonstrate practical benefits of better water management and sow the seed of trust among riparian countries
- Joint identification of opportunities between representatives of riparian countries and scenarios that portray alternative development options is instrumental for being able to capitalise on synergies and shared benefits, to address trade-offs and to reconcile different users preferences.

Possible box: The Central Asia Water Information System

3.4 Joint bodies play a key role in ensuring that climate change adaptation is planned for and developed in a cooperative manner, therewith harvesting the benefits of cooperation while avoiding or minimizing costs of unilateral action. Case study Mekong River Commission (MRC)

- The MRC as a joint body for institutionalized river basin management is crucial for fostering successful basin-wide adaptation to the consequences of global climate change and thus ensure the long-term sustainable development of the basin
- The 1995 Mekong Agreement and the subsequent MRC Procedures provide a sound legal basis for institutionalized cooperation and sustainable water resources governance in the LMB
- However, the legal framework remains insufficient with regards to specific provisions on basin-wide climate change adaptation and the mainstreaming of climate-relevant aspects into more general water resources development activities
- Acknowledging the importance of climate change for the LMB, its resources, its populations and its economies, the MRC increasingly works on climate change adaptation and has developed a number of activities and approaches to basin-wide adaptation
- However, MRC's mandate in basin-wide adaptation needs to be sharpened, especially with regards to the linkages between national and regional adaptation measures and the mainstreaming of climate-relevant aspects into water resources development more generally.

3.5 Cooperation in transboundary basins to manage in conjunctive use surface water and groundwater on adaptation to climate change. case study: U.S.-Mexico

26. A new international legal and institutional framework to manage in conjunctive use surface water and groundwater with specific regulation for fossil aquifers along the U.S. –Mexico border region is needed. The solution to manage groundwater is an effective international regulation able to allocate groundwater based on the principles of International Water Law and using the 1997 UN Watercourse Convention as umbrella treaty for the development of legislation. The international regulation must take into account the needs of each specific basin as a whole and unitary system, as well as the analysis of the social, environmental and economic conditions in each sub-region.

3.6 Conflict resolution in trans-boundary basins on adaptation to climate change: cooperation, fact-finding and the use of expert bodies.

27. The 1997 U.N. Watercourses Convention promotes private recourse and cooperation through negotiation, fact-finding and the use of expert bodies as effective mechanisms able to provide dispute resolution in trans-boundary basins on adaptation to climate change. Both the 1997 U.N. Watercourses Convention and the CFA follow similar procedures for the settlement of disputes. This would provide cooperation and the implementation of procedures to solve conflicts through fact-finding and the use of expert bodies in the whole Nile Basin.

3.7 Principles and rules of international law supporting an ecosystem approach to management of international watercourses and their relevance for climate adaptation in transboundary river basins

- An ecosystem approach is supported by existing instruments of international water law and is essential for climate adaptation in transboundary river basins; however further investigation is needed into how concepts such as ecosystem services or payments for ecosystems can or should be implemented at transboundary levels. Increased interaction between international environmental law directly and indirectly addressing inland aquatic ecosystems will help strengthen development and implementation of the ecosystem approach into legal frameworks for shared watercourses.
- The ecosystem approach is supported by international legal instruments directly and indirectly addressing transboundary waters.
- An ecosystem approach is essential for climate adaptation in transboundary river basins because it ‘increases resilience within the natural system’
- The soft law and technical guidance instruments developed under the UNECE water regime have assisted in interpretation and implementation of the ecosystem approach within the UNECE pan-region which will also assist development of the concept beyond the UNECE.
- International law currently includes features which do not fully support the implementation of the concept of Ecosystem Services and Payment for Ecosystem Services at the transboundary level. In the meantime, the

principles of precaution and equity and provisions for adaptability and flexibility need to be built into legal instruments which seek to implement ES or PES, especially while scientific knowledge around aquatic ecosystem functioning and interrelationships remains a process of ongoing discovery.

- From an international legal perspective, international law on protection of inland freshwater ecosystems is somewhat fragmented with guidelines developing in isolation under the different international environmental regimes. In order to strengthen current work on ecosystem based climate adaptation in transboundary river basins, more efforts need to be invested to forge greater normative and institutional interaction between law on water, climate, biodiversity and wetlands and international, regional, national and basin levels. Greater institutional synergies should also lead to more mutually supportive and joint efforts for implementation.

3.8 Legal frameworks need to ensure that the development and implementation of adaptation strategies, plans and measures comply with applicable norms on transparency, public participation and access to justice.

28. A detailed multi-level coordination mechanism, supported by a transboundary legal framework that translates legal requirements down to the national level has ensured that at least minimum levels of public participation are ensured in the design of strategies and measures to adapt to climate change. This has made it possible to incorporate different types of data and information from national and local level stakeholders that must be considered and coordinated across one of the largest basins in Europe.

4. Stakeholder involvement in the whole process

29. Frontiers frequently represent a “delimiter” not only of an ethnic but also a cultural and socio-economic nature. The public and stakeholders can be insufficiently aware of how to take part in transboundary decision-making. Mechanisms of public participation are not well developed in many countries and even less at transboundary level.

30. The prime role of public authorities of sovereign states in promoting transboundary cooperation, including on climate change adaptation aspects, is fully acknowledged. Furthermore, the importance of a systematic stakeholders’ engagement in the whole cooperation process is widely recognized.

31. Stakeholders include national and local authorities of riparian countries, established transboundary bodies and platforms, infrastructure management agencies (water, energy, land, transport, etc.), productive sector entities including associations and businesses (natural resource management, agribusiness, forestry, fisheries, construction, tourism, mining, health, risk and disaster management, etc.), civil society, media, academia, minority groups, and others.

32. Cross-cutting issues like gender and youth, employment, poverty and social equity should be fully integrated into considerations and deliberations. Among others, the questions related to the allocation of water rights and the potential/ anticipated impacts of climate change should be analysed and explained to the stakeholders.

33. There are multiple benefits deriving from stakeholders' engagement including:

(a) Fostering information exchange and communication channels with all involved parties towards a more thorough understanding of issues, potential solutions and alternative perspectives;

(b) Assisting the transparency, quality and effectiveness of decision-making processes by gaining better insight into potential equitable outcomes, solutions to conflicts and mutual benefits;

(c) Strengthening implementation, monitoring and adaptation-to-change capacities by increasing understanding, early warning, confidence and skills;

(d) Improving the sustainability of impacts by increasing functionality and acceptance amongst sectors and partners.

34. It should not be neglected that long-term stakeholders' engagement is a time and resources intensive investment. Regional institutions and organisations, including UNECE, GWP Regional and Country Water Partnerships and other partners, can play a facilitation role at transboundary level due to their capacities and neutrality. Among different options, they may assist building Transboundary Water Partnerships or Basin Water Councils that can deliver substantial inputs if well managed.

4.1 Involve decision makers in the adaptation process from the beginning to ensure that the process is connected with policy making

35. All levels of decision-makers have to engage from the early stages, including authorities at national, local and transboundary level. A high-level dialogue can boost the processes and pave the way for dialogue and negotiations at all appropriate operational levels. Influential politicians can serve as leaders and change makers towards enhanced collaboration. Involvement of members of parliament elected in the area of interest has a distinctive added value.

4.2 Ensure stakeholder participation in all steps of the development and implementation of adaptation strategies and measures

36. A step-by-step approach is necessary in all planning and implementation phases aiming to secure stakeholders by-in, ownership and engagement. This includes:

(a) *In the design phase*: set clear goals; contextualize key issues, synthesize existing knowledge, address gaps and acknowledge uncertainty through a situation analysis; identify the competent national and transboundary stakeholders including their roles, stakes, expectations and capacities through a stakeholders' survey and analysis. Among others, use existing consultation and decision-making structures, address the widest possible stakeholders audience and focus on the most willing and the most influential, screen where there is potential for participants to impact outcomes and where there is not.

(b) *In the engagement phase:* conduct open consultations as well as group discussions; adapt information to the different audiences; elaborate through a participative process options, including 'no/low-regret' choices, and feasible ways to achieve them; trigger mutual influence and foster trust

and respect. Among others, increase participants' motivation and, over time, promote changes in behaviour.

37. In the follow up and evaluation phase: maintain systematic input by establishing functioning platforms; plan evaluation from the outset addressing both the process and the outcome. Among others, establish baseline info and performance metrics against these.

38. The engagement of a neutral and/or an all-inclusive facilitator is important for bringing the diversity of players together.

Box 4.1: Climate Change Stakeholder Consultations in Bugesera Transboundary Basin shared by Rwanda and Burundi (GWP EAF)

Under WACDEP (Water, Climate and Development Programme of GWP and AMCOW), Rwanda and Burundi through the GWP **Country Water Partnerships** are supporting the implementation of a transboundary project in Bugesera Basin to improve water security and climate resilience in the areas. The Bugesera Basins vulnerable areas to climate change identified as a priority in both the Burundi and Rwanda NAPAs. The Bugesera Project comes to support the two countries' initiatives relating to CC resilience programmes (CC adaptation initiatives in Rwanda) and, availability of IWRM Plan in Burundi, among other things,

To kick start the WACDEP in Bugesera, Rwanda and Burundi Water Partnership organized national consultative meetings of stakeholders in the areas to discuss:

- the adaptation measures to improve the resilience of the local communities in Bugesera Sub Basin to the increasing threat of climate change and variability to water resources and their capacity to meet the these challenges;
- the equitable and sustainable use, as well as promote integrated management and development, of national and shared water resources in the region ;
- the modalities of implementing the proposed Bugesera project as well as strategic plan and roadmap for its implementation;
- how the project can be integrated with other existing projects in the local area to ensure its ownership and sustainability.

During the workshops, participants from public, private and CSO's have deliberately discussed on the project and came up with the following recommendations:

- Type of project and activities to be implemented on ground,
- Identification of key project stakeholders/beneficiaries: their roles, responsibilities and contribution in the course of the project implementation,
- Project's Implementation modalities: management, implementation approach, involvement of stakeholders, timeframe, etc…) at local level. Who will be responsible for the day-to-day management, monitoring and evaluation of the project activities, and duration of the project);
- Sustainability and ownership of activities by the local administration and communities;
- Recognition of the role of women and youth in the implementation of the project;
- Strategy for the mobilization of additional funds: funding mechanism;
- Consideration of the transboundary nature of the project and benefit sharing by the riparian communities (Rwanda and Burundi) and others.

4.3 Build transboundary teams among scientists, administrative authorities and experts to enable joint assessments

39. A joint group to harmonize the tools, methods, models and scenarios to be used is a good way to prepare a basin-wide vulnerability assessment and to advance adaptation in general. Such groups should include representatives of all riparian countries as well as different regions and sectors of basin-wide relevance. A proper exchange of information between the countries is imperative for this. A stakeholder analysis can help to identify persons to be involved.

Box 4.2: Rhine - Strategy for adaptation to climate change

4.4 Involve different stakeholders at different levels

40. Despite the fact that transboundary relations are often considered as high-level cooperation and therefore imply restricted involvement of local stakeholders, there is a clear need to match different levels and actors while developing and implementing CCA strategy on the basin level. This is caused by the fact that possible limitations due to the need to adapt are mainly falling on basin inhabitants and managed by local authorities – and in case of being "imposed" from top level, these limitations may cause protests and even rejection if not properly understood and accepted.

Box 4.3: Making space for water in the Bodrog River Basin, GWP Toolbox

Activities were carried out in the project by the consortium of the GWP facilitated partners from Hungary, Slovakia and Ukraine. Activities included technical assistance on development of strategic documents for the area (namely, the Strategy for mitigation of floods for the Bodrog River Basin), and concrete investments in pilot areas in each country of the Bodrog River Basin.

Project activities considered the maintenance and/or restoration of floodplains by creating a "space" for water during flood events, as well as measures to prevent and reduce damage to human health, the environment, cultural heritage and economic activities.

The involvement of municipalities, river basins organizations, NGOs, farmers, spatial and urban planning authorities was critical. Practical examples of floodplain restoration contributed also to improved habitats conditions. In addition, the project partners actively participated in the dissemination of project results providing information for possible replication actions on national levels and to other basins.

5. Information and data needed, including data exchange at the basin level

5.1 Ensure collection and sharing of the appropriate and necessary data, information and models from the entire basin and across the water cycle

41. The collection of the necessary data and information includes quantitative and qualitative local knowledge, paleoclimatic records, surface and groundwater monitoring records, projected information (e.g. from the Intergovernmental Panel on Climate Change (IPCC)), extreme event

records, water supply/demand/ usage estimates, data for building climate, socioeconomic and environmental scenarios and an elaboration of a knowledge base on expected future changes. Such data are not only needed on the national level, but also on the international level, even more so if they concern an international basin. To ensure data availability on the international level, sharing of data is imperative.

42. To enable sharing of data, a common, integrated, accessible database is most suitable. Exchange of comparable data is second best. Sharing of information and data can be done for specific data in the beginning which can be expanded over time as countries and/or other data holders may initially be reluctant to share data. The various data sets need to be harmonized for scale, data resolution and focus of the data, as well as be comparable in terms of measuring method and quality, so that data sets are interoperable.

43. The data included in the common database need to be processed for verification, ground truthing, accuracy and precision and degree of uncertainty. In situations where not all data are available, incomplete data, alternative sources (such as sometimes remote sensing/ satellite data) or expert opinions can be used instead (see Box 5.4).

44. In the Danube basin, work is underway to develop a common database; one of the measures as defined in the Danube Adaptation Strategy is 'to develop homogenous data production, digital mapping and a centralized database for data exchange and comparability among regions and countries' (Box 5.1).

Box 5.1: Information in the Danube Adaptation Strategy

Information is considered an important factor for cooperation in the Danube Adaptation Strategy. The Strategy states that flexible sustainable decision-making processes that can accept new information, and that can be modified on the basis of this information, are important elements in building and/or improving resilience. To achieve this, homogenous data production, digital mapping and a centralized database for data exchange and comparability among regions and countries is considered essential. The collection and storage of data will support education, capacity building, awareness raising, information exchange and knowledge transfer. It is considered essential in order to take the best available scientific information into account. This entails evaluation of the coverage of the data (e.g. meteorological, hydrological, water quality, soil moisture data, stake, damage cost data, etc.) and needs regular checking if existing relevant science and research information on climate change modelling and impacts in the river basin are taken into account. The data is not restricted to water issues only, but also includes other sectors which are directly related to water management (e.g. agriculture-water demands, water needs for energy production, etc.).

The centralized database must be developed in a way that it ensures communication and coordination on climate change adaptation issues between different levels of management within a river basin district (RBD). This will also support that climate change aspects are discussed between the relevant public administrations, in stakeholder meetings and discussions on how relevant water-related sectors can contribute to adaptation.

The information as collected should build on:

1. effective long-term monitoring (to enable climate change signals to be identified and reacted to in due course),

2. the assessment of the likely additional impact of climate change on existing and

future anthropogenic pressures and risks, and

3. the incorporation of this information into the design of measures (particularly for proposed measures with a long-term design life).

Establishment of the information collection and storage is also subject to regular revision and update.

5.2 Monitoring and observation systems should be capable of adapting to the changes in information needs that could develop in the future

45. Monitoring and observation systems are usually developed and designed for long-term operations. This often entails that the system is not expected to substantially change over time. The uncertainties connected with climate change, however, require flexibility of the monitoring and observation systems to be relevant and supportive in decision-making.

46. To achieve such flexibility, a basic requirement is to be able to provide timely identification and warning of emerging environmental problems and effective feedback on the adequacy of policies and programs. Next to that, monitoring and observation systems have to be able to provide information also in data poor areas, which demands integrating different sources of information. Moreover, a regular reviewing and revision of the systems is needed. Developing a flexible monitoring and observation system, as a result, necessitates proper and regular specification of information needs. Regular reviewing ensures that the monitoring and observation system can account for changes, both in the legal and institutional set-up (see Box 5.2), and in changes in hydrological and meteorological conditions. Information needs should be determined in close cooperation between decision makers and scientists (see 5.4) while close connection to the stakeholders should be ensured (see 4.x).

Box 5.2: The TransNational Monitoring Network

The TransNational Monitoring Network (TNMN) is an important tool under the Danube River Protection Convention (DRPC), whose Contracting Parties are committed to co-operate in the field of monitoring and assessment. Formally launched in 1996, it aims to provide a well-balanced overall view of pollution and long-term trends in water quality and pollution loads in the major rivers in the Danube River Basin. The TNMN was established to support the implementation of the Danube River Protection Convention in the field of monitoring and assessment and was formally launched by the ICPDR in 1996.

The main objective of the TNMN is to provide a structured and well-balanced overall view of pollution and long-term trends in water quality and pollution loads in the major rivers in the Danube River Basin. The TNMN utilises nationally assessed monitoring data and is based on the provisions of the DRPC, which requires:

- Harmonising monitoring and assessment methods, particularly concerning water quality in rivers;
- Developing co-ordinated or joint monitoring systems applying stationary or mobile measurement devices, and shared communications and data processing facilities; and
- Elaborating and implementing joint programmes for monitoring riverine conditions in the Danube catchment area, including flow rates, water quality, sediments and riverine ecosystems, as a basis for the assessment of transboundary impacts.

The TNMN monitoring network is based on national surface water monitoring networks and includes monitoring locations across the Danube and its main tributaries river. An interim water quality classification scheme has been specially developed to evaluate the data collected by the TNMN.

In 2006, the TNMN was revised to ensure full compliance with the provisions of the EU Water Framework Directive (WFD).

5.3 Evaluate thematic, spatial and temporal areas of data coverage and gaps

47. Accurate assessment of the situation in a basin and the potential impacts and vulnerabilities need to be based on a common understanding and, consequently, common information from the basin. A first step is to collect and exchange the available information. Comparison of the available data and information allows for identification of differences in temporal, spatial and thematic coverage. It also allows identification of gaps. In parallel, the joint information needs are specified.

48. The result is an overview of the information needs as well as the available data and information on the basin level including gaps in the available information (see Box 5.3). Such an overview allows for the development of a joint monitoring and observation system, exchange of knowledge and experience in information collection, and arrangements for filling of gaps.

5.4 Ensure transfer of knowledge from science to decision makers and the political sphere

49. The information resulting from monitoring and observation systems, usually summarised and interpreted to form knowledge, often does not

satisfy the decision maker's needs. The major reason for this is that there is little direct communication between decision makers and scientists. Decision makers from around the world are calling for more 'useful' information; information that is salient and context-sensitive, credible, and legitimate. Quality assurance programs together with regular evaluation studies ensure the credibility of the information. Legitimacy of the information is, among others, ensured by making the production process transparent. Salience is related to the question if information that is produced is actually used and to the question if information users have information needs that are not met.

50. To improve the salience of the information, better communication between information users and scientists is needed. Especially in a transboundary context, this may be challenging. The information and knowledge transfer can be realized through meetings composed of decision makers and scientists from the riparian countries. Such meetings should be used to discuss the decision makers' information needs and to discuss the results from the monitoring and observation systems in an aggregated way. The meetings will help scientists to better understand the knowledge and information needs of the decision makers and to make the translation from data and information to knowledge. The decision makers will gain from these meetings through an improved understanding of the information and knowledge and through assigning a higher value to the gained knowledge and information. Involving decision makers in such meetings requires that the meetings are thoroughly prepared, focusing on the problems and gaps encountered in identifying the information needs. Moreover the input expected from the decision makers must be clear beforehand and the meetings must be targeted and as little time-consuming as possible.

51. The monitoring and observation systems benefit from this exchange by providing better tailored information and improved support to the decision making process.

Box 5.3 Joint database in the Neman River Basin

The Neman River Basin is located on the territory of Belarus, Lithuania, the Russian Federation (Kaliningrad Oblast), Poland and Latvia (Figure 1). The total river length is 914 km and the basin area is 98,200 km2. In the average water year, Belarus and Lithuania together account for approx. 94% of the total Neman river runoff. The climate in the Neman River Basin is moderately continental. The Atlantic Ocean is the major factor affecting the climate.

Fig.xx Network of meteorological stations and hydrological regime stations

The main environmental problems in the Neman River Basin are due to the flow of pollutants to the water bodies from point and non-point sources of pollution.

In the Neman River Basin there is a network of 23 meteorological (8 in Belarus and 15 in Lithuania) and 25 hydrological stations (12 in Belarus and 13 in Lithuania) (Figure xx). Monthly data contain temperature, precipitation and runoff. Within the framework of the UNECE pilot project, exchange of data and common agreed climate scenarios between the countries took place and a common data base was used. An internet-based common information platform was developed and installed, containing meteorological, hydrological data and thematic maps with climate and runoff forecasts (http://www.cricuwr.by/neman/).

Box 5.4: Vulnerability assessment in the South Caucasus through improved data and expertise exchange

In preparation of the Second National Communications (SNC) to UNFCCC, Armenia, Azerbaijan and Georgia conducted robust vulnerability assessments and identified priority adaptation measures. However, the forecasts of the impacts of climate change significantly varied from country to country. Particularly, the outcomes of downscaling of the regional models for the three countries were not satisfactory in most of the cases, resulting in biases and uncertainties with climate change projections. Thus, there was a need to improve the regional climate scenario downscaling through establishing better data exchange and cooperation between the countries, to improve application of climate change impact assessment models, and to enhance cooperation among the countries to identify common climate change concerns, particularly related to water resources.

In the frames of the UNDP/ENVSEC "Regional Climate Change Impacts Study for the South Caucasus Region" project (2009-2011) leading national experts in the three countries undertook technical discussions, and data and information exchange, to decrease uncertainties in predicting potential climate change risks and develop concerted adaptation measures. Particularly, different datasets related to climatic risks, meteorology, hydrology, morphology, socio-economic aspects were exchanged between the countries, and included in a common database.

Exchange of data and expertise led to refinement and improvement of climate change vulnerability analysis (especially on socio-economic factors) and prioritization and development of adaptation measures. Particularly because of the improved data availability, the countries were able to undertake proper vulnerability assessments, as a result of which four GCMs were selected as the most appropriate for the South Caucasus region, given the results of their application on historical data. Using these four reliable models, projections of changes in precipitation and air temperature were prepared, which eliminated some of the contradictions, outlined in the SNCs. The exchange of information, data and expertise will also greatly help the countries when they work on their third national communications.

6. Vulnerability and Impact Assessments

6.1 Develop a common understanding about the concepts of vulnerability, opportunity, impacts, and uncertainty related to climate change

52. Vulnerability and impact assessments are tools designed to inform decisions, planning, and actions about observed and potential climate impacts. Effective assessments have a clear focus (what is being assessed?) and a clear audience (who will use the assessment?). However, the language around climate change can become a source of misunderstanding and potentially an obstacle to both assessment and implementation, particularly in a transboundary context with potentially conflicting interests and visions, as well as focus and audiences. A common language, targets, audiences, and set of references should be established early in the process of assessing impacts and vulnerability, preferably in writing, so that stakeholders and decision makers can build on an explicit, solid, and clear foundation.

53. There are many definitions for climate change vulnerability, but the IPCC's AR5 definition is probably the closest to a consensus standard, which includes two components: the sensitivity of an object or system of

interest to climate change relative to its response capacity, and that object's exposure to adverse impacts. Figure 6.1 shows that the risk of negative effects arises from the interaction of climate-related hazards, including hazardous events and trends (left), with the vulnerability and exposure of human and natural systems (right). Comprehensive assessments will span all of these variables in a way that should be actionable for end-users.

54. At least three other conditions should be determined near the outset of an assessment. (1) Should the sensitivity and exposure of governance and stakeholder institutions, regulatory frameworks, and relevant social systems be included in the assessment, or should the primary focus target climatic and biophysical impacts? For transboundary basins, the interaction between governance levels can have a significant influence on adaptation actions. (2) Should the process explore emerging potential opportunities that may derive as a result of realized or potential climate impacts in addition to negative impacts? High-latitude regions, for instance, may see an expansion of suitable agricultural zones. (3) Should the tolerance for end-user or stakeholder future uncertainty be a part of the assessment process? The uncertainty tolerance for the design of new water infrastructure, for instance, will be quite different than an examination of regulatory frameworks. Likewise, there may be significant gaps in uncertainty tolerance across relevant governance institutions in a transboundary basin.

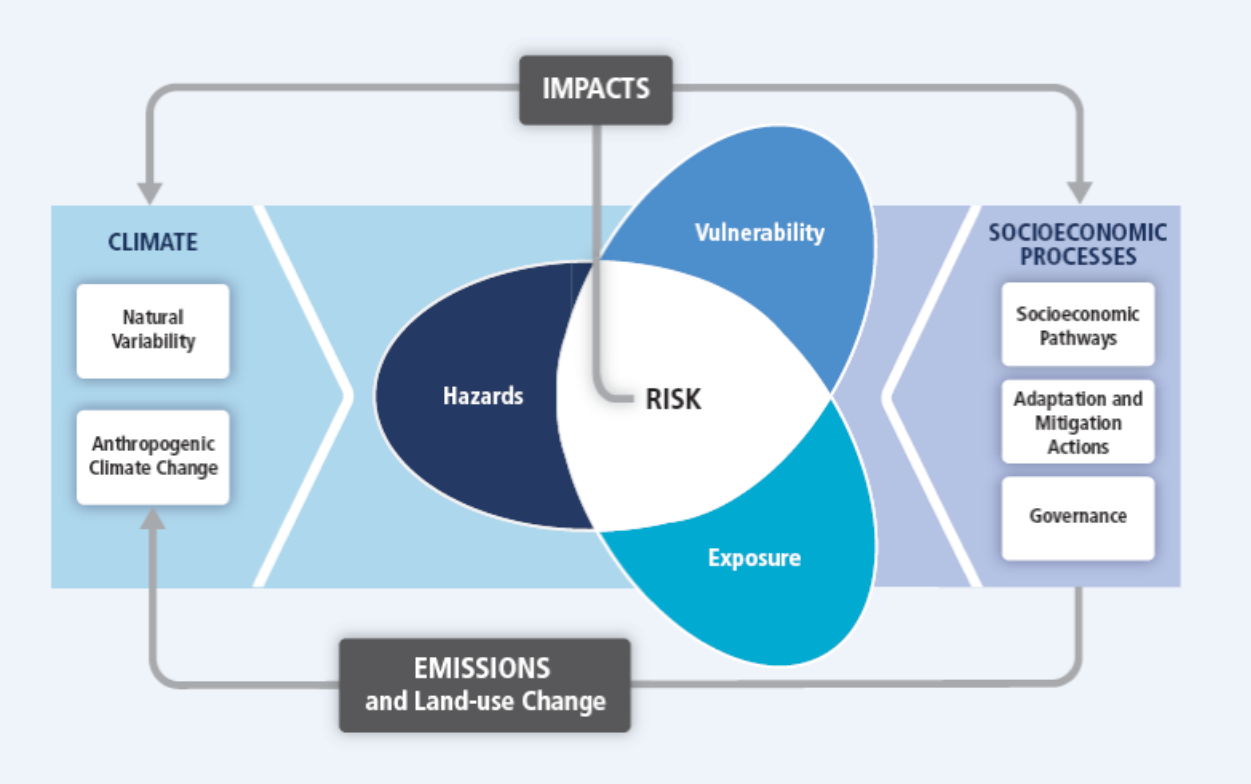

Fig. 6.1 WGII AR5 illustration of the core concepts (IPCC, 2014)

6.2 Consider the whole basin and all steps of the water cycle in the vulnerability assessment

55. The characteristics of water strongly suggest that vulnerability be assessed across the whole of the water cycle. Water is both a local and global management priority, climate change is impacting different spatial and

temporary aspects and steps in the water cycle unevenly. Therefore, focusing on a single aspect of the water cycle — particularly just "visible" and local surface water — may miss important impacts that are relevant for local stakeholders. Evaporation, precipitation, snowpack and glaciers, surface flows and runoff patterns, and groundwater storage and recharge processes can potentially be influenced by shifts in land-use patterns, climate change, and consumption patterns. Moreover, uncertainties (and the tolerance for uncertainties) differ between these steps of the water cycle.

6.3 Assess vulnerability at both the basin and sub-basin levels.

56. Climate change is global by its drivers; however, its consequences are hydrologically relevant at both basin and local scales by their manifestations. For transboundary basins, a whole-basin assessment is critical to capture biophysical trends holistically (see 6.1) and to test the efficacy of governance systems, while vulnerability assessment on a sub-basin — local — level is a means to identify hot spots that require first-priority adaptation efforts. This is the level where many adaptation measures are actually taken.

Box 6.1: Classification of the Moldavian part of the Dniester River basin by its vulnerability to climate change

6.4 Cooperation with neighbouring countries in scenario and model elaboration and data exchange is crucial

57. Data and scenario harmonization will not produce political collaboration alone, but they are vitally necessary for effective implementation. Consistency in how data is collected, packaged, modeled, and interpreted through the development of socio-economic, environmental, development, and climate scenarios is important for reaching a required coherence in the comprehensive assessments of impacts and vulnerability. Indeed, ensuring that all scenarios and models are credible and evidence based will support difficult tradeoffs between sectors and stakeholders by policymakers seeking defensible long-term and sustainable solutions.

6.5 Harmonize and integrate the use of climate, environmental and socioeconomic models and scenario development

58. Climate change presents novel challenges that have not been seen for centuries, even millennia, with impacts that are multifaceted and will often be indirect, and complex. Untangling impacts is challenging for anyone, but decision makers often face difficulties exploring interactions between climate change and other human and natural system responses, especially when quantitative data of one type are presented in spatial or temporal scales that are difficult to conceptually reconcile with other information. As a prerequisite for effective adaptation planning, climatic, socio-economic, and environmental scenarios and models should be harmonized at the same or very similar scales and resolutions. Interoperability is an important element in finding synergies that move between, for instance, eco-hydrological changes in fisheries or flood frequency and extant and economic impacts and responses. Ideally, models should span full-basin scales rather than political, administrative, or other types of non-hydrologic boundaries alone.

Box 6.2: Neman on data/model harmonization, data exchange at the basin level

6.6 Establish mechanisms for regularly updating the assessments, the scenarios of changes, and the implications for water resources in order to ensure flexible adaptation

59. Models are approximations of natural and human processes, often with deep uncertainties and many simplifications. While they are essential for estimating trends and projected impacts, they are also almost certainly only a broad description of reality. Most modelers and scenario builders are very aware that these models are tools designed to inform but not determine decisions. Decision makers are often confronted with difficult choices about when to act and how much to anticipate, and they have a strong desire to avoid reacting too soon (or too late) and spending too much (or too little). As such, models and scenarios can help demonstrate the operating space for decision makers — what kinds of decisions are irreversible, and commit them (or future decision makers) to particular pathways. Likewise, models and scenarios should be reconsidered on a regular, iterative basis, as new information from climatic and eco-hydrological monitoring becomes available, as well as economic and development strategy evolve over time. In many cases, decision makers have found that scheduling these reconsiderations and updates on a fixed schedule is a useful means of ensuring long-term flexibility.

Box 6.3: Fixed-term updating — EU Water Framework Directive, IUCN/GEF Pangani environmental flows project.

6.7 Combine the vulnerability assessment with concrete measures and actions on the ground that increase resilience

60. Vulnerability assessments should — ideally — be tools designed to directly inform decisions, planning, and actions. Involving stakeholders and decision makers in the preparation and development of a vulnerability assessment should ground the assessment process so that outcomes are useful and meaningful to end users. In many cases, the process of assessment is also an opportunity to build the capacity and reduce the sensitivity of stakeholders and decision makers around climate impacts and the expansion of the limits of climate adaptation as a practice. A powerful means of engaging decision makers is to collaborate on the scenario development process so that the assessment team and decision makers both construct a clear and common understanding of the tolerance for uncertainty for specific types of decisions. In many cases, the assessment team may decide to describe impacts in qualitative rather than quantitative terms, since numerical and statistical measures of uncertainty often provide a false sense of security about the level of confidence in projected trends.

61. The assessment team should also work closely with decision makers to outline a series of actions that take account of observed and projected trends. One useful strategy in developing such actions is to categorize them by the level of "decision commitment," long-term flexibility, or path dependency implied by these actions. For example, so-called low- or no-regret measures such as improved monitoring, cross-sectoral coordination approaches such as IWRM, and early warning networks for floods may have only indirect connections to climate vulnerability and adaptation and would constitute best practices under a stationary climate or a wide range of possible climate futures. In contrast, building or modifying new infrastructure, investing in new capacity, restoring ecological or

hydrological systems, modifying governance agreements may be associated with selecting a subset of projected climate futures at the expense of other possible futures.

6.8 Reconcile uncertainty and confidence in recommendations and strategy in the assessment results

62. Technical and scientific assessments often focus on uncertainty in projected impacts, particularly over timescales beyond more than a decade or around topics that are not covered well by models (such as shifts in climate variability or climate engines such as ENSO) or scenario development (such as shifts in energy or economic policy). In practice, decision makers are often confused by or unsure how to interpret uncertainty or calls for additional analysis; often, these terms may provoke frustration or no response at all. Practical decision making guidelines, qualitative descriptions, and a range of actions that are keyed to the level of confidence will help ensure uptake by decision makers in their processes.

63. In effect, decision makers often prefer to have issues framed by the level of confidence behind a recommendation and how potential impacts (and their decisions) may constrain their decision-making ability. For instance, many infrastructure investments represent commitments spanning decades or centuries — they are almost inherently "regretful" decisions. A traditional "safety margin" approach may not be sufficient with progressively stronger climate changes over an operational lifetime, potentially leading to the "stranding" of that infrastructure. The siting, design, operation, and integration of one piece of infrastructure with other aspects of the landscape may allow more flexible, robust, and reliable operations over longer timescales — lowering the amount of regret inherent in infrastructure. A hydropower facility, for instance, could be designed in a modular, extensible manner, so that its design could be altered as climatic and economic conditions change over time.

64. Gaps between available data and the needs of particular decision makers should be considered explicitly. For instance, evapotranspiration shifts are very difficult to monitor or project, but the tolerance for these uncertainties is relatively high. Precipitation patterns at sub-annual scales — such as seasonal or monthly patterns — are also harder to project, but the tolerance for uncertainty is much lower. Changes in the intensity, frequency, variability, reliability, and form of precipitation are very challenging to predict and model in a way that matches the needs of water managers and planners or the designers or operators of water infrastructure. Increased uncertainty therefore demands greater flexibility.

7. Developing and prioritizing adaptation measures

7.1 To deal with the uncertainties of the data and information about climate change, an adaptive approach towards implementing responses to realized and emerging impacts is needed

65. Climate adaptation is the process of making decisions that should optimize flexibility and robustness to multiple futures over climate-relevant timescales — usually decades to centuries. Climate adaptation normally stands in contrast to "stationary" approaches, which are more likely to assume that climatic and environmental conditions are relatively fixed.

Given that future climate conditions — and the impacts from those conditions — are very difficult to predict, addressing high levels of uncertainty is a critical component of climate adaptation decision making; indeed, climate adaptation is often shown as a circular or cyclical process. The future has arguably always been difficult to predict and win-win measures and conscious attention to decision "pathways" (and how choices now may limit or enhance decision making options in the future) are among the most appropriate approaches under such circumstances. If climate change presents a fundamentally new challenge for decision makers, it is because climate is a fundamental driver of so many environmental and economic processes, most of which have not previously accounted for small much less dramatic shifts in climatic conditions.

Box: illustrating climate adaptation as a cycle

7.2 River basin management planning, environmental impact assessment, and strategic environmental assessment can provide a necessary legal basis for climate change adaptation

66. Because of the newness of climate change adaptation as an emerging body of practice, obtaining an institutional, legal, or policy mandate to assess vulnerability and implement a new set of approaches like adaptation is often challenging — methodologies that focus on past or reference conditions as a fixed standard may not allow targets to reflect shifting norms, emerging conditions, or adjusting standards for new climatic realities, such as significant shifts in the overall water balance. A basin-wide perspective that integrates both land and water management decisions — such as a river basin management plan — is a powerful tool for setting governance priorities at a transboundary scale.

67. River basin management plans can reflect/ include? both passive and active, positive approaches to adaptation. For instance, some regions may be declared unsuitable for construction (passive) because of increased flood risk or hydrological sensitivity, prescribe an environmental provision (passive), define a water allocation hierarchy for scarcity and drought conditions (active), or ensure structural measures are integrated in the planning process such as safety barriers (active).

68. In addition, well-defined methodologies such as EIA and SEA can serve as an effective vehicle for identifying environmental stressors that are at least indirectly related to climate change such as overabstraction, unsustainable fisheries, climate-mismatched infrastructure, limited ecological connectivity, and water pollution and other quality issues, which clearly contribute to overall social, economic, and ecological resilience. These assessment mechanisms can create the necessary regulatory mandate for broader infrastructure, institutional, and economic shifts in behavior. In order to be most effective, both should be prepared early in project cycles, when projects (EIA) or programmes and plans (SEA) are at the initial stage of conceptualisation.

BOX 7.1: Adapting Policy to Climate Impacts: EU Water Framework Directive and Climate Adaptation, US ESA and Climate Adaptation

7.3 Develop a mix of structural and non-structural measures

69. Some of the most significant actions for implementing climate adaptation can involve so-called "soft" interventions that do not involve the construction or modification of infrastructure, such as reevaluating existing infrastructure operating regime for new or projected hydrological conditions, developing regulatory mechanisms that account for emerging trends in climate impacts, capacity building to ensure flexible decision making, and reforming land-use management or land tenure systems to prioritize sensitive hydrological zones. "Hard" interventions are often associated with more risk for regret since they more often represent a commitment to a particular set of climate futures, such as building new infrastructure that may be sensitive to additional or unpredicted shifts in climate. Soft interventions are often particularly useful for creating the enabling conditions for more effective and resilient management decisions. In a transboundary context, soft interventions may in many cases be the main instrument for joint collaboration. In most cases, a mixture of hard and soft interventions are necessary and warranted. However, transboundary governance will remain the key challenge regarding implementation in international river basins and aquifers: governance issues are becoming the most prominent factor in water management.

Box 7.2: "Additionality" in climate adaptation finance: Can you connect actions with impacts?

7.4 Prioritize adaptation measures

70. The process of prioritizing adaptation measures is often critical to effective implementation and typically should be made with a mixture of both technical and policy oriented decision makers. Common methods of prioritizing include cost-benefit assessments conducted based on a vulnerability assessment, and in conjunction with public interest and media attention, the degree of exposure and the relative sensitivity of targeted stakeholders, the potential "durability" or longevity/efficacy of the range of solutions, and the degree of flexibility vs the level of commitment to a particular path dependency. Engineers, scientists, and other specialist decision makers have a tendency to develop technically "optimal" adaptation measures, but policymakers are likely to use other standards that may seem technically sub-optimal, which often results in conflicts between technical and policy teams. In practice, high level decision makers will undergo a "satisficing" or arbitrage process balancing multiple prioritization methods. When possible, prioritization methods should be made explicit and through a transparent process. In that regard, public participation is mandatory not only to reveal the most appropriate measures but to contribute to project social acceptance also.

Box 7.3: the AGWA DSS

7.5 Involve other sectors and ministries in defining adaptation priorities

71. Climate adaptation — like water itself — is inherently multi-institutional, multi-sectoral, and interdisciplinary. Moreover, there are many decision

makers and institutions that may be unaware of their exposure or sensitivity to shifts in climate. Hydropower operators, for instance, may view themselves as relevant to climate change primarily through their generation of clean energy (i.e., climate mitigation and greenhouse gas emissions) rather than vulnerable to climate shifts or in need of developing climate adaptation responses. However, greater coordination by itself is not the same as climate adaptation. Involvement with many sectors may therefore require a process of education, recruitment, and persuasion (see Chapter 10). Adaptation actions are most likely to be successful if they are "owned" by a wide variety of actors. At the same time, because of the multi-disciplinary and multi-sectoral nature of climate change, there is a risk of no group or sector owning any responsibility. Leadership in fostering cooperation is a necessary catalyst to action. Regulatory approaches to coordination may be ultimately less effective — particularly in a transboundary setting — than less-forceful engagements such as capacity building and partnerships. Processes such as IWRM or institutions such as RBO can provide an overall framework and governance mechanism for linking sectors, institutions and interventions.

Box 7.4: Guidance from the ICPDR on building basin-wide adaptation efficacy

7.6 Assess the economic, environmental, and social costs and benefits of different adaptation options

72. Climate change doesn't fit easily into a single sectoral or institutional "box," and the actions necessary to respond to realized or emerging impacts may likewise have unintended consequences. The potential for sowing conflict may be greater in transboundary settings, where stakeholder engagement processes may normally be restricted within national boundaries. Flood risk reduction actions in one region, for instance, may increase flood risks in downstream countries, while national adaptation plans should span ministries and sectors that may be able to identify gaps and synergies. The risks for unintended consequences may be higher if significant differences in risk exist across political boundaries, such as variations in environmental, economic, and social or livelihood values. In the same way that vulnerability assessments are an important tool to visualize climate impacts, a broad preliminary assessment of adaptation options that includes the transboundary implications of those options for all stakeholders can reduce or eliminate the potential for future conflict. A formal transboundary consulting mechanism is mandatory in order to promote balanced and sustainable decisions for all riparian countries. Finally, it is important that all documents and plans be viewed as living documents, which include mechanisms to evaluate efficacy, to adjust course, and to incorporate new thinking and lessons. Environmental indicators based on a Pressure-Impact-Response methodology are very useful for such monitoring purposes.

7.7 Ensure linkages and integration with adaptation efforts at other management levels

73. Environmental issues such as effluent treatment, overfishing, invasive species, and demand management require effective resolution by coordinating actions across more than one governance level. Climate change is no different. Indeed, in a transboundary setting, coordination across governance level complements coordination at the same level across political boundaries — nation to nation, city to city, province to province

— as many regional lessons can be captured and implemented more easily. Most significant water allocation decisions may be best considered at the transboundary or basin-wide level — agriculture, energy, ecosystems, infrastructure. Indeed, sustainable water resources management may be claimed by upstream countries but downstream ones may have a different opinion regarding the meaning of "an equitable and reasonable manner," a designation that should take into account a set of relevant factors and circumstances, such as the ones listed in article 5 of the UN Watercourses Convention (United Nations, 1997). In that regard, a good governance approach is clearly mandatory but simple methodological tools could be very useful to address transboundary gaps on strategy, action, organization, or financing and to foster an institutional transition towards better international coordination.

8. Financial and economic matters[4]

8.1 Economic analysis can help to build the case for action and inform the selection of adaptation options

74. Economic analysis can contribute to an important part of the decision-making process for adaptation. These studies can quantify the expected costs and benefits (avoided damage) of adaptation to help build the case for action, especially when done on a basin wide level. However, in general, economic assessments of what it will cost to adapt to climate change for water systems remain sparse. Many existing studies typically focus on cost estimates and do not quantify benefits. Further, they tend to focus on "hard" interventions, such as building structural flood protection or storage, rather than "soft" solutions, such as policy shifts or behaviour change, like reducing water demand. These "soft" solutions are often less-costly interventions than structural alternatives, but they are often more difficult to quantify. Despite their limitations, economic assessments that help to demonstrate the cost of inaction (or not adapting) can contribute to building the case for action. An example from Armenia provides an illustration (Box 8.1).

Box 8.1 Assessing socio-economic costs of climate change to spur adaptation action

A major study to assess the socio-economic impacts of climate change in Armenia (if no proper adaptation measures are taken) helped to influence decision makers to take action on adaptation. The study documented a wide range of social and economic impacts such as an increased incidence of illness due to heat waves; water shortages and increases in electricity tariffs and food prices; and an increase in the incidence of dangerous landslides, mudflows and floods. The study estimated that losses from diminishing agricultural productivity could, on their own, exceed 8 percent of Armenian GDP by 2100.

Overall, the study highlighted that while the potential for economic growth in Armenia is large, the absence of significant measures to adapt to climate change could easily impede that growth.
Source: Stanton et al., 2009.

[4] This chapter draws significantly on the 2013 OECD publication *Water and Climate Change Adaptation: Policies to Navigate Uncharted Waters* and the OECD country profiles on Water and Climate Change Adaptation available for download at: www.oecd.org/env/resources/waterandclimatechangeadaptation.htm.

8.2 Adaptation costs should be mainstreamed into overall costs of water management

75. The cost of adapting to climate change will likely add to the already substantial financing gap for water systems. Greater variability and shifts in extremes are likely to pose a larger challenge for adapting water systems than shifts in averages. Adaptation costs for water could be substantial, especially for flood protection (see Box X). Many of the investments needed for adaptation could take place within normal investment replacement cycles. It is difficult and often not practical to attempt to split out the marginal additional costs related to adaptation from those due to a broader range of pressures on water systems resulting from a wide range of drivers.

Box 8.2 Illustrations of adaptation costs for water

A recent review of economic assessments of adaptation in Europe was undertaken in 2011. The review found relatively low to medium coverage for economic assessments of the water sector, compared to other sectors. However, several recent national level studies indicated potentially significant adaptation costs, in particular for flood protection. In the UK, a study estimated the total adaptation investment for a portfolio of responses to address flooding (coastal, river and intra-urban) over the next 80 years at between GBP 22 billion and GBP 75 billion (depending on the scenario) implying average annual costs of up to EUR 1 billion per annum. Similarly, in The Netherlands, a recent assessment of flood protection and flood risk management estimated the cost of implementing a comprehensive set of adaptation measures at EUR 1.2-1.6 billion per year up to 2050 and EUR 0.9-1.5 billion per year thereafter (up to 2100).

Source: ClimateCost, 2011.

8.3 Using economic instruments for water management can reduce baseline stress and provide flexibility to changing conditions

76. A range of policy instruments can be drawn on to promote effective and timely adaptation. These include regulatory instruments (standards, permits, regulations), economic instruments (charges, payments for ecosystem services, insurance schemes, markets), and information-based instruments (planning tools, voluntary agreements, awareness raising and information provision). Economic instruments, in particular, can be useful to improve incentives for managing risk and dealing with greater uncertainty. One innovative example of pooling risk can be found in the Caribbean (see Box 8.3).

Box 8.3: Pooling catastrophe risk of excessive rainfall events in the Caribbean

The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is a unique and innovative approach to pooling risk related to climate change. It is a regional catastrophe fund, providing coverage to Caribbean governments which is designed to limit the financial impact of disasters. It is the first and currently only multi-country parametric risk pool in the world. Risk pooling offers the advantage of diversifying risk, hence greatly reduces the cost of reinsurance, compared to the price each government would have paid individually (IPCC, 2012).

The CCRIF was established in response to the severe damage caused by Hurricane Ivan in 2004, which caused billions of dollars in losses across the Caribbean. For both Grenada and the Cayman Islands, the losses were close to 200% of GDP.

The Facility offers parametric insurance, which disburses funds based on the occurrence of a pre-defined level of hazard and impact, as opposed to indemnity-based insurance, which covers the policyholder against the loss of a specific asset. In May 2012, the CCRIF introduced a product for excessive rainfall. Several features of the offerings help to maintain governments' incentives to invest in risk reduction. Premiums are based on an analysis of actual risk and potential compensation does not cover all potential damages, thus maintaining the incentives to engage in loss-reducing measures.

77. In addition to insurance schemes, other economic instruments, when well-designed, can reduce inefficient water use and improve the flexibility of water allocation to respond to changing conditions. In the OECD's Survey of Water and Climate Change Adaptation (2013), several countries, along with the European Commission, identified economic instruments to cope with water quantity issues, including water pricing, abstraction charges, water-related taxes and water trading as part of their adaptation response. France recently developed an innovative tax to improve incentives for the management of urban rainwater (see Box 8.4).

Box 8.4 Incentives for managing urban rainwater: the "Rain Tax" in France

In France, a growing number of municipalities are confronted by the challenge of coping with increasing storm water runoff. This puts pressure on their current water treatment systems. First introduced by the Law on Water and Aquatic Ecosystems (LEMA), the new "Rain Tax" is designed to promote the sustainable management of rainwater, control pollution, and prevent the risk of floods. In addition, the tax provides addition revenue to contribute to the financing of urban rainwater management. Municipalities have the option of implementing the tax if they choose to do so.

The tax applies to land and road owners (both public and private) in urban areas. It is determined according to the impermeable land surface (imposed on surfaces of a minimum of 600 m2, with the maximum tariff of EUR 1/m2). However, a tax reduction of 20% to 100% can be offered if the land/road owner plans to create or improve its rainwater management system with the objective of limiting or stopping stormwater runoff.

The revenue of the tax is exclusively dedicated to the public management of urban rainwater. This includes the creation, operation, renewal and extension of infrastructure installation and maintenance.

8.4 Ecosystem-based approaches and green infrastructure can be a cost-effective alternative to "grey" infrastructure and be an effective strategy under uncertainty

78. Ecosystem-based approaches and green infrastructure such as restoring wetlands to reduce vulnerability to floods or improving catchment management to improve water quality can be cost-effective adaptation approaches. They can also be effective strategies to deal with uncertainty, as there are usually less capital-intensive and more easily adaptable than traditional, engineered alternatives. Several incentives can help to promote their uptake, such as tax incentives, land use planning and payments for ecosystem services. In Denmark, several cities are using such approaches to address heavy rainfall and increasing flood risk (Box 8.5).

Box 8.5 Ecosystem-based approaches and green infrastructure in Denmark

In Denmark, more intense rainfall events and rising sea levels in a changing climate have increased the urgency to provide flood protection for low-lying and densely populated areas. A recently restored wetland, Egå Engsø, is being used to channel water from heavy rainfall, hence provisioning flood protection near Aarhus, Denmark's second largest city, as well as reducing nitrogen leaching from surrounding agriculture. Further preventive measures are also being considered. A new wetland, Hede Enge, has been proposed to reduce risk from extreme rainfall events, which are projected to become more frequent and severe with climate change. The cost of the proposed project is estimated at approximately DKK 25 million, most of which would compensate affected landowners for expropriation of land.

Source: Danish Climate Change Adaptation portal, 2012.

8.5 Ensure adequate financing for adaptation through a mix of public and private funds. Funding should aim to maximise net benefits (or minimise expected losses).

79. Financing for adaptation has yet to be adequately addressed in many countries. For those countries that have specified financing approaches to support their adaptation plans, several approaches haven been taken. A few countries have dedicated funding for general climate change adaptation, some of which is apportioned to water issues. Other countries are mainstreaming adaptation into existing budgetary arrangements. Water-related adaptation may also figure in specific water programmes and projects. Finally, certain countries are tapping into international funding mechanisms for adaptation. Box 8.6 provides an illustration. In many cases labelling funding that contributes to adaptation objectives as "adaptation financing" is not necessary or practical, given the difficulties with attribution.

Box 8.6 Australian Water for the Future Programme

The Australian Government is investing AUD 14 billion over 12 years to facilitate climate change adaptation and as a response to increasing water scarcity. Specific measures include:

- Sustainable Rural Water Use and Infrastructure Programme: AUD 5.8 billion has been committed to increase water use efficiency in rural Australia.
- Restoring the Balance in the Murray-Darling Basin Programme: AUD 3.1 billion has been committed to facilitate water buy backs to protect and restore the environmental health of the Murray-Darling Basin.
- Urban water programmes to secure and diversify urban water supplies: over AUD 250 million has been committed to fund practical projects that reduce water losses in cities and towns. Over AUD 680 million has been allocated to investment in desalination plants, water recycling schemes, stormwater harvesting and reuse projects.
- Improving Water Information Programme: AUD 450 million over ten years has been provided to the Bureau of Meteorology to revolutionise the way water information is measured, accounted for, reported, forecast and analysed.

Source: OECD (2013), "Country Profile on Water and Climate Change Adaptation", www.oecd.org/env/resources/waterandclimatechangeadaptation.htm.

80. While experience with financing adaptation for water is still preliminary in most countries, several countries are exploring **innovative financing mechanism**s. A few examples are summarised in Box 8.7.

Box 8.7 Exploring innovative financing mechanisms

Several countries are exploring innovative approaches to financing adaptation for water system. Illustrations include:

- **Denmark**: preparing new legislation to increase the possibilities for Danish water and sewer companies to finance more intelligent and socio-economically optimal climate change adaptation measures. For example, the proposal could make it possible for sewer companies to co-finance new measures on roads and in waterways, to keep rainwater out of the sewer system.
- **Germany**: examining the possibility of including aspects of climate adaptation in Federal funding programmes and joint funding instruments financed by the Federal Government, the *Länder*, and the EU.
- **Mexico**: since 2006, Mexico has been selling catastrophe bonds ("cat bonds") as an innovative form of risk financing. If a disaster occurs during a bond's lifetime, the government uses the money borrowed to pay for repairs. If no disaster occurs, the government pays the money back with interest.

Source: OECD (2013), "Country Profiles on Water and Climate Change Adaptation", www.oecd.org/env/resources/waterandclimatechangeadaptation.htm.

8.6 In transboundary basins, it can be more beneficial to locate adaptation measures in a particular jurisdiction, and then jointly share the costs, rather than trying to distribute adaptation measures across jurisdictions evenly.

81. There are a number of adaptation projects and programmes ongoing in transboundary basins. In Europe, the Danube Strategy is a macro-regional strategy for transnational territorial co-operation in the Danube region. Adaptation is a cross-cutting topic relevant for several of the thematic priorities. For the Baltic Sea, the BaltCICA project uses climate change scenarios to discuss and develop adaptation measures with relevant planning authorities and stakeholders. The project also assesses costs and benefits of adaptation. Project results contribute to supporting transnational approaches in the Baltic Sea Region. *[Insert an example from UNECE on transboundary cost-benefit sharing in a box to illustrate the key message above]*.

9. Evaluation of adaptation strategies *(not available yet)*

9.1 Implement concrete (low or no-regret) adaptation measures while continuing to monitor, evaluate and further develop the strategy

10. Capacity development

10.1 Identify the need for capacity development and develop a capacity development plan accordingly.

82. Capacity development may be needed to ensure proper understanding of both the process and the content in developing an adaptation strategy. Capacities are needed on the water areas, like hydrology and meteorology, but also in non-water areas, like planning, uncertainty management, forecasting, scenario development, etc. If such capacities are not present, a

capacity development plan is needed. Such a plan includes an inventory on the available capacities as well as on the capacities that are lacking.

83. Generally, capacities that are needed include:

(a) **Understanding climate change.** To know and understand climate change and its impacts on water resources is a clear need in the process towards adaptation. The scientific aspects are especially important as it allows to get a solid argument to convince decision makers on a fundamental subject. To acquire this knowledge, the reference to numerous publications and the work of the IPCC is a way to go. This should allow a clear view of possible local climate change impacts or at basin level thanks to the IPCC data and to develop scenarios across the basin.

(b) **Understanding uncertainty.** It is particularly important to understand the "uncertainty" of the climate change dimension, both to be able to integrate the Adaptation plan preparation work and to be able to argue with decision makers for action, since uncertainties are often an obstacle to decision making. Similarly, understanding the vulnerabilities to climate change, the impacts of climate change and the complexity across all sectors (e.g. a temperature increass induces a new energy requirement for cooling, this can lead to construction of a hydroelectric power plant with a dam which can impact downstream water resource) will be useful for the plan development. Capacity development should also allow to know the impacts of climate change on the water and all the elements that will influence water (agriculture, population growth, energy, ...).

(c) **Understanding adaptation and mitigation.** In understanding climate change it is also important to understand the differences between adaptation and mitigation, and to maximize possible synergies between the two aspects.

Box on training offered by ???

10.2 Ensure knowledge and know-how about the development of scenarios, identifying vulnerabilities, and likely impacts.

Box on different tools of modelling

(a) **Capacity to develop scenarios.** The climate change adaptation plan and its actions and measures are closely linked to the quality of scenarios of climate change in the region and the basin or sub-basin. Establishing these scenarios requires specific capabilities (methodologies, use of modeling tools, ...). The scenario development must take into account both the data provided by the IPCC with capacity to downscale it and those from the basin (local data, the regional basin or sub basin, riparian countries data), including those related to economic and social changes induced by climate change that may impact water resources (for instance, population increasing or migration for example, or economic development that creates more water needs and also more discharge).

(b) **Capacity to manage uncertainties related to climate change**, to take them into account in the Basin strategy in term of adaptation and in measurements. Capacity to use an approach to favor “no regrets / low regrets" actions and investments ions " that does not compromise the future in case of any major changes in the very long term. Investments without regret / low regrets are different by the fact that they offer benefits whatever the climate scenario. That will reinforce confidence in the long-term and the sustainability of the decisions. No regret investments allows to take action now, despite the great range of uncertainty regarding climate change. The

water management is used to deal with the variability and the uncertainty, however, with the climate change, this variability and uncertainty are much more important, and they should be treated, not just in short term and medium term as in basin management plans but also on the very long term.

(c) **Capacity to integrate data from the climate change into the basin management plan** (incorporating the Adaptation to climate change Plan in the Basin Management Plan). In particular, the BMP usually covers 5-10 years, while the adaptation plan will propose measures to CT or MT but also very long-term (or 30 to 40 years).

(d) **Capacity to work in interdisciplinary teams.** Access to an interdisciplinary team with multiple skills is required. The work requires skills ranging: networking, accessing a wide range of information sources (both institutional and private), data analysis (economic and environmental), presentation of risk to decision makers. We must not only build capacity but identify various appropriate experts who can provide critical expertise in order to build a resilience of water system in medium term

10.3 Use education to raise awareness on the need for adaptation.

84. There is a need to raise awareness of the public at large about the need for adaptation. This may be attained by providing two or three good, local examples, using different tools (movies, games …). A special target group are young people that can relatively easily be reached through their teachers. Young people are an efficient entrance for developing awareness of their family.

10.4 Exchange knowledge and experience between stakeholders on the adaptation activities to learn and build capacities.

85. Exchange of knowledge and experiences between the different stakeholders that are connected to the adaptation strategy is a good way of raising capacity, as through the exchange, stakeholders receive new knowledge and insights. Moreover, their insights will be attuned to the interests of other stakeholders. Organising exchange of information and knowledge between stakeholders is therefore an important route for capacity development.

86. On another level, basin organizations are aware of the substance which exist already around the world and can learn from each other. Networks of basin organisations consequently play a role in capacity development.

11. Communication and dissemination

11.1 Clearly define the communication objectives in advance

87. Communication may be intended to various aims: to raise awareness about problems and solutions; to inform partners about progress made, personal initiatives and results; to involve all stakeholders in the decision-making process; to encourage external support or to fundraise. Each specific goal requires careful planning about the most appropriate means of communication, timing, scale and location of dissemination, lack of which might lead to a failure. Certainly, this design exercise cannot be properly done if there is no clear view on what to communicate, to whom and,

above all, to what aim. This is especially true in wide and complex contexts, as transboundary basins are.

11.2 Develop a Communication Plan since the beginning of the project

88. Preparing a communication plan is always necessary, but the wider your scope, the more carefully it should be designed. In transboundary water management a poorly planned communication could result in the side-lining of certain areas of the basin, stakeholders, audiences or aspects of the project. Therefore, in such a context a comprehensive communication plan should present the following characteristics:

    (a) It should be shared and agreed by all the countries, trying to encompass and reconcile their interests and needs;

    (b) It should be included in the project general strategy among the basic activities and tools;

    (c) It should be developed since the beginning of the project and cover all its phases (not only the implementation, but also the activities preceding and subsequent to it), following a step-by-step approach. For this reason, although a communication strategy represents a long-term plan, it requires the creation of short- and medium-term schemes and programmes. Briefer time frames allow precise and detailed choices for each phase, location and recipient, as well as an overall view and full control over the entire process.

89. A good communication plan shows its positive effects immediately, because it fosters the exchange of knowledge and information and strengthens the communication capacities of all parties.

11.3 Ensure awareness of the importance of acting at a basin-wide scale

90. Unfortunately, in transboundary basins most adaptation efforts are still focused on and developed at the national level. Hence, the first urgent step to be undertaken through communication is to raise awareness on the importance of a basin-wide adaptation plan. Emphasis should be put on the benefits of a comprehensive transboundary strategy, for instance by giving good practice examples from other basins where this has proven successful. Concrete discussions about the adaptation measures and how to implement them practically should be started and fostered all over the basin, but also outside its borders at the regional and international level.

Box 11.1

Communication strategy of ICPDR

11.4 Communication about adaptation to climate change should not be limited to the large basin level, but should also be adapted to the local or small sub-basin scale

91. Traditionally, information about climate change has been disseminated according to a top-down approach, its sources usually being international organisations, like IPCC, or national governments. Nevertheless, the subsequent development of the socio-economic scenarios and the assessment of the vulnerabilities at the basin scale require a strong

involvement of the local actors, especially at the sub-basin and riparian country levels.

92. This entails, first of all, the beginning of extensive communication with the stakeholders with the objective to inform them about: the overall policy goals, including those specifically targeted at the natural environment; scenarios; impacts and vulnerabilities; adaptation options, including issues like compensation for property loss; participatory opportunities and their weaknesses; and policy limitations.

93. Secondly, after raising awareness and educating the local actors, communication should aim to their involvement in all steps of the adaptation project (see point 5).

Box 8.2
Example of stakeholder participation for climate change adaptation in basin of Adour Garonne, France…

The Adour Garonne basin is situated in the south west of France. In order to anticipate the stakes and the impacts of the global changes (included climate change), the Adour-Garonne Basin Agency has developed a participatory approach called "Garonne 2050".

It started with a study ….
Then the elaboration of the three scenarios has been developed in several workshops, working groups and conferences with all categories of stakeholders. - Let the nature to act and accept diminution of flows
- Conserve the current nature and compensation to the climate change effect
- Limit the vulnerabilities by acting partially on the low flow.
….

11.5 Especially in transboundary basins, proper communication is crucial to ensure stakeholder participation and ownership of adaptation measures

94. Stakeholders' participation in the preparation and adoption of the adaptation measures is essential to get real ownership of these interventions by those who will coexist with them daily (see Chapter 4). In view of the fact that climate change is a complex subject, containing great uncertainties (which favour reluctance to act), such involvement can be primarily achieved through appropriate dissemination of information. In particular, the feeling of inclusion is raised by an extensive deployment of communication both in its temporal and spatial dimensions, i.e. during all phases of the project and in the whole interested area.

11.6 In transboundary contexts, internal communication between project partners is as essential as external outreach

95. Adaptation strategies in transboundary basins generally involve not only the riparian countries, but also an international team. A good communication plan should account for an inclusive internal communication, which comprises both kinds of actors: although mainly focusing on the steps planned and undertaken by the different countries, the exchange of information should point to the final goal of developing supranational activities in cooperation with the international players.

96. Here are some suggestions to create a working internal communication machine among partners:

(a) Create a coordination mechanism to assure that the information provided is not conflicting, late, or overlapping (for instance establishing a system of sequential transmission points following a priority order for receivers; creating different lists of recipients for each subject, level of urgency, area; identifying an inventory of verified sources of information; etc.);

(b) Clearly define roles and responsibilities to guarantee a faster and better exchange of information among project coordinators and from them to local stakeholders. The organizational structure so created will facilitate the overall implementation of the project, since it will apply to other phases and activities, supporting the strengthening of a network of relations among partners;

(c) Establish a standard format for information exchange to simplify transmission, understanding and response. Simple expedients, like the use of settled graphic forms, a shared glossary, agreed-upon location references and denominations, could prove to be very useful in this sense. Likewise, to avoid mistakes in translation, a language common to all the riparian countries should be chosen.

97. Last but not least, each news and information by countries should be accompanied by detailed and clear explanations, to avoid misunderstandings.

11.7 Tailor messages on your audience

98. Generally speaking, for information to be received as expected, the sender should draft the message looking at it from the point of view of the recipients. These latter are a complex and varied group of individuals imbued with knowledge, beliefs, and opinions that filter and shape the interpretation of facts. As a consequence, adapting the information to the target audience is crucial, not only to make it intelligible, but also to raise interest.

99. While, usually, the tailoring exercise entails forging language, selecting content and supporting it with the appropriate media according to the understanding capacities, needs and preferences of the public, in the case of transboundary river basins a further effort is required. In consideration of the fact that a transboundary approach aims to develop a basin-wide adaptation plan, special attention should be paid to the following aspects:

(a) Messages should be differentiated more depending on the actual living conditions of the population (directly vs. indirectly affected communities, rural vs. urban population) than on national criteria. Hence, instead of having communication sub-plans by country, it would be worth having dissemination materials and initiatives by type of public;

(b) The choice of language is as important as delicate: although it would be advisable to select a unique idiom for the whole basin to convey a message of unity and uniformity, intelligibility by the target audience remains overriding;

(c) While tailoring communication on the addressees, the overall coherence of the message has to be guaranteed at a basin level.

11.8 Build a common repository of the information to be communicated

100. A lot of information exists nowadays about climate change and water. One of the first steps of the communication strategy should consist of the creation of a reference knowledge base of the existing documentation both at the global and regional/basin scale. A range of different kinds of information is essential for proper communication: firstly, data on the hydrological as well as meteorological situation; secondly, scenarios and forecasts, including explanations of the models used to elaborate them; and thirdly, descriptions of ongoing projects and their results. The collection and selection of information would be better managed by a single entity acting at a basin level. Once such a repository is produced and shared among partners, preparation of messages for dissemination can commence. Certainly, to reach this objective, the removal of political and technical barriers to the exchange of information and data is indispensable.

11.9 Select the proper instruments to communicate about climate change impacts on water resources and adaptation options

101. It is important to seize and create as many opportunities as possible to disseminate information about adaptation to climate change in transboundary basins, keeping in mind that appropriate means of communication have to be identified for each occasion.

102. The most interactive way of communicating is through the organization of events requiring the physical (or remote) presence of the recipients, like conferences, workshops and site visits. Nowadays, many international events at the global level are talking about evolutions in the approach to climate changes: national dialogues for the development of adaptation national plans, meetings about building or updating basin management plans, etc. With a narrower focus, regional conferences at basin or sub-basin scale attempt to raise awareness and promote reflection and discussion on adaptation in specific areas. Additionally, workshops, especially when involving non-water experts (sociologists, agronomists, energy professionals, health specialists, etc.), necessitate of the active participation of attendees and, thus, foster dialogue and the emerging of new ideas.

103. A totally different channel of communication is represented by those tools based on a one-way flow of information, such as written documents (like flyers, brochures, newsletters, etc.), visual and audiovisual materials (e.g. posters, infographics, films, etc.) and other instruments combining the two (such as websites).

104. Indirect, but more engaging means of communications are mass media demanding the dynamic involvement of the user, like games and videogames. In the last years, serious gaming, simulations of real-world events or processes designed for the purpose of solving a problem, have experienced a wide spread.

Box Communication in the AMICE project

The AMICE project developed a communication plan with aim not only to communicate between the partners and to disseminate the project results but also to communicate with stakeholders and the public at large about climate change and the effects this may have on their environment. To achieve this,

messages should be clear, simple, tailored. The communication plan dealt with the issues: why, who, what, how and when to communicate.

The why deals with what you want to communicate; what is the problem and what you want your audience to do? This will differ for the different audiences that are identified in the 'who'. The who deals with the audience you want to reach; internal in the project and external to stakeholders and the public. It also entails identifying potential allies and people that can make decisions. The what relates to the message that you want to give. This is also different for different audiences. The why, who and what determine the how and when. The how deals with the media (meetings, newspapers, brochures, reports, video's press releases, Internet) to be used, again depending on the audience. The when depends on the project planning, but also on special occasions. For instance, World Water Day can be a good occasion to organise an event.

AMICE has put much effort into reaching the wider public. For this purpose it organised , a.o., meetings and field visits open to the local population. It also developed an interactive documentary. This documentary targets the general public of the Meuse basin and is composed of several one-minute filmed sequences of the river, the tributaries, the investments, etc. while each sequence is viewable independently. All sequences are translated into the 3 languages of the Meuse basin and the film is linked to all partners' websites and the AMICE website. Especially the documentary proved to be a good communication medium. Because of budgetary constraints, the documentary was not translated into the English language, which was felt as an important omission by the project partners.
Source: http://www.amice-film.eu/; http://www.amice-project.eu/docs/pa1_pr4_1302196426_AMICE_COMMUNICATION_PLAN_in_text.pdf

Box

Children contest on water and climate change in the Dniester basin

Box …
Movies used for raising awareness and communicating on adaptation to climate change in the basin

The French basin agency "Adour Garonne" in the process of elaborating the adaptation plan has developed three movies to illustrate the possible impacts and consequences of climate change in the future (by 2050) in the Garonne basin.

Ref : http://www.eau-adour-garonne.fr/fr/grands-dossiers/la-garonne-2050.html
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