Climate Diplomacy

REPORT

WATER AND CLIMATE DIPLOMACY

Integrative Approaches for Adaptive Action in Transboundary River Basins

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WATER AND CLIMATE DIPLOMACY

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EXECUTIVE SUMMARY

Many transboundary water basins around the world are facing climate-related challenges that will intensify in the decades to come. Successful adaptation will be an important precondition for ensuring sustainable development and political stability in these basins. At the same time, stability and cooperation are preconditions for successful adaptation. How can riparians best achieve these interrelated objectives? And with the international community seeking to support both processes, how can water and climate diplomacy strengthen each other?

This report outlines key water governance instruments that support climate change adaptation in transboundary basins. An increasing number of river basins use such instruments, for example data and information sharing mechanisms or flexible water treaties, to address the impacts of climate change and build adaptive capacities. Yet, this report also shows that in many basins such instruments are not employed at all or only to a limited extent. In identifying existing shortcomings, the report asks how such weaknesses could potentially be ameliorated by climate policy instruments.

Climate policy provides a number of tools, including vulnerability assessments and adaptation planning, that could further strengthen adaptation in transboundary basins, especially if they were applied at basin scale. Moreover, international climate finance can provide much-needed additional resources for adaptation activities. If well designed, these tools can also generate co-benefits by building trust between riparians over shared challenges and identifying mutually beneficial opportunities for managing change and uncertainty. However, achieving such synergies needs mutual cognizance and proactive engagement of the water and climate communities, in order to harness existing experiences and to transfer them to the transboundary level.

With this objective in mind, and drawing on empirical examples from transboundary river basins from around the world, the report concludes with a number of recommendations for national, transboundary and international actors. In response to the inter-related challenges of successfully managing environmental, socio-economic, and political change, they should:

- promote and support the incorporation of basin-wide, transboundary thinking in national adaptation planning and, simultaneously, the integration of climate change adaptation policies into existing and newly established basin institutions;
- support activities to strengthen linkages between regional and national river basin governance through the establishment of specific organizational units or standardized communication procedures;
- promote transboundary and, where possible, basin-wide data and information sharing, including specific climate change activities (e.g. vulnerability assessments), and facilitate their simultaneous use for confidence-building and ideally the elaboration of joint adaptation responses;
- ensure sufficient funding for the core tasks of river basin institutions through reliable membership contributions and facilitate access to bilateral and multilateral climate funding to cover additional costs of adaptation;
- support riparian states in establishing new basin institutions and strengthening existing ones by ensuring the integration of governance mechanisms that help dealing with change (such as flexibility mechanisms, dispute resolution provisions or standards for transboundary environmental impact assessments).

INTRODUCTION

Freshwater is an indispensable resource for human life and is integral to all societal activities, including sanitation, food and energy production, transportation, industrial development and recreational and cultural practices. A significant amount of the globally accessible freshwater is available either through surface water bodies, such as rivers or lakes, or is stored beneath the land surface as groundwater. Many river basins and groundwater aquifers are not confined within national boundaries but are instead shared by two or more sovereign nations. There are 286 transboundary river basins around the world, and almost 600 groundwater aquifers that cross national borders have been identified *(IGRAC 2014; UNEP-DHI and UNEP 2016).*

Today, many of these shared water resources are under increasing stress from developments such as population growth, industrialization and urbanization *(e.g. Vörösmarty et al. 2000; Wohl 2010).* These existing stressors are likely to be further aggravated by the impacts of climate change. Climate change is expected to affect all elements of the hydrological cycle in complex and sometimes non-linear ways, causing changes in water availability and water quality *(Draper and Kundell 2007; Ludwig et al. 2016).* For instance, alterations in the timing and amount of rainfall can lead to changes in river runoff and water availability. Shifting temperatures can affect the biodiversity of rivers and lakes and, for example, change the availability of fish resources and consequently impact food security. Furthermore, extreme weather events like floods can cause significant damage to water and other infrastructure and negatively affect agricultural production.

Cooperation tends to prevail in transboundary river basins, and many co-riparians have established institutionalized forms of collaboration. Yet the stability of such institutions could be threatened by climate change and its adverse socio-economic impacts. For example, projected changes in the timing of river runoff as a result of climate change in the Central Asian Syr Darya and Amu Darya river basins could worsen the already strained relations between upstream and downstream riparians. Upstream countries could find themselves in a situation where they need to expand their water storage facilities to manage changes in the seasonality of river runoff. This could provoke hostile reactions from downstream states which depend on water inflows upstream. Such dynamics could further weaken regional water governance institutions in Central Asia and beyond. In short, climate-related challenges may both negatively affect socio-economic development in shared basins and destabilize political relations between riparians.

As a consequence, existing water governance institutions such as transboundary water treaties and River Basin Organizations (RBOs) increasingly require capacities to manage the impacts of climate change in order to ensure long-term and stable cooperation between states. Acknowledging this need, the subject of climate change and ways to effectively manage adaptation has received increasing scholarly attention since the beginning of this millennium.[1] One prominent strand of literature has focused on the design of international water treaties, examining the conditions under which these institutions are most likely to survive in times of a changing climate *(e.g. McCaffrey 2003; Fischhendler 2004; Ansink and Ruijs 2008; Cooley and Gleick 2011; Drieschova et al. 2011).* More recently, scholars have also started to examine whether international institutions such as water treaties and RBOs contribute to better managing the impacts of climate change on the ground, and which factors account for successful adaptation and increased resilience *(e.g. Schulze and Schmeier 2012; Tir and Stinnett 2012; Blumstein 2016).*

[1] To date, there is no consensual definition of adaptation to climate change but rather a lively debate on the subject *(compare Gallopin 2006; Engle 2011).* This paper employs a broad definition of the term, referring to adaptation as the "process of adjustment to actual or expected climate and its effects" to avoid harm or exploit opportunities (IPCC 2015: 118). Adaptation capacities in the context of this paper relate to the resources and attributes of an institution that help to prevent or mitigate impacts of climate change.

Climate change has also become an important item on the policy agendas of many transboundary river basins *(Earle et al. 2015)*. These basins are now starting to take action by collecting climate-related data, developing adaptation strategies and implementing different activities on the ground. However, many RBOs have not yet begun or are only just starting to address the issue. Moreover, many challenges regarding climate change adaptation in transboundary river basins persist. These include uncertainty about climate change impacts; lack of coordination between regional, national, and local adaptation activities; lack of resources; and gaps between planning activities and implementation *(UNECE and INBO 2015)*.

The international community has committed itself to support work on overcoming these challenges. The global agreements adopted in 2015, notably the Paris Agreement and the Sendai Framework for Disaster Risk Reduction, as well as the 2030 Sustainable Development Agenda, aim to support regional cooperation in climate change adaptation, disaster risk reduction and water management *(UNECE 2016)*. This heightened attention at the international level could provide a window of opportunity to promote and increase support for climate change adaptation in transboundary water basins.

Climate change adaptation is not only important in itself. By improving transboundary water governance, it can also contribute to long-term stable cooperation under conditions of change. Like traditional hydro-diplomacy *(Pohl et al. 2014)*, it can thus serve as an agenda for regional development and political stability. This raises questions about potential synergies between climate change adaptation and hydro-diplomacy.

Seeking to harness this potential, this paper examines whether the challenges climate change implies are being addressed in transboundary river basins and how such attempts can be supported. In particular, the paper aims to address the following questions: Are existing water governance instruments adequate for addressing the impacts of climate change? Where they are not, how can climate policy instruments provide support to overcome existing weaknesses? And how can the international community, including foreign policy actors and international donors, support adaptation in transboundary river basins?

To examine these questions, this paper proceeds as follows. It begins by outlining the expected impacts of climate change on transboundary river basins and highlights the security implications associated with these impacts. The paper then moves on with an overview of the main mechanisms that influence the success of climate change adaptation and resilience in transboundary water basins as identified in current water governance research. Next, the paper identifies climate policy instruments that could be employed to further strengthen adaptation to climate change in transboundary basins. The paper concludes by outlining policy entry points for different transboundary actors, ranging from riparian states and river basin actors (such as RBOs) to external actors such as international donors and foreign policy-makers.

I. CLIMATE CHANGE: IMPACTS ON TRANSBOUNDARY RIVER BASINS AND SECURITY IMPLICATIONS

Over the last two decades, scientists have gained much understanding of how the world's climate is changing. Global mean temperatures since 1750 have steadily been increasing *(IPCC 2007: 3)*. This change in temperatures affects hydrological cycles and has clear implications for water quality and quantity *(Miller and Yates 2005)*. Global climate models furthermore predict significant changes in future global temperatures and precipitation patterns, and increasing numbers of floods and droughts *(Bates et al. 2008; IPCC 2013)*. While the exact impacts of climate change on specific river basins are still uncertain, climate change has already produced visible impacts in certain river basins and on the populations dependent on their water resources, and will even more so in the future. The impacts of these climatic shifts are projected to affect water resources of international river basins in a variety of ways *(compare e.g. Arnell et al. 2013; Whitehead et al. 2015)*:

1. Decreasing rainfall and higher temperatures will reduce available water resources in many parts of the world, particularly in Southern Africa and the Mediterranean. As these regions are already facing water scarcity problems, increased water stress will make them more dependent on international water bodies. Growing abstraction and consumption of shared water resources may in turn reduce the amount of water available for all other riparians.

2. Climate change is expected to **increase the amount and intensity of extreme weather events** like floods and droughts. Adaptation activities in upstream countries to such extreme events can furthermore impact abilities of downstream countries to manage the impacts of climate change. If, for instance, an upstream country expands its water storage facilities (in the form of dams or reservoirs) to improve water availability during drought periods, water resources for downstream countries are likely to decrease.

3. Water quality will be affected by climate change, for instance as a result of saltwater intrusion into coastal aquifers, or because of higher concentrations of pollutants in rivers as a result of extreme rain events or periods of drought. Also, changing temperatures can contribute to changes in water quality. Deteriorating water quality in turn can disturb ecosystems such as wetlands, lagoons or, in coastal areas, marine environments and consequently influence ecosystem services that can be derived for human well-being.

These climate change impacts on water resources can have security implications at both the inter-state and sub-national levels *(Pohl et al. 2014; Rüttinger et al. 2015)*:

First, inadequate access to freshwater can jeopardize agricultural production and livelihoods, threaten electric power generation and industrial development, pose problems for the navigability of waterways or endanger drinking water as well as sanitation services with consequences for public health. Such developments can pose several security risks at the sub-national level, including the onset of migration from rural to urban areas (because of diminishing opportunities for rural income generation), which would increase pressure on often underdeveloped urban infrastructure. Moreover, they can put state capacities under pressure, thus undermining governmental legitimacy. Such developments can spur conflicts between population groups, undermine stability and increase the risk of violence.

Second, climate change and the resulting impacts on water resources can also directly contribute to inter-state disputes. Many conflicts over water in international river basins today are about hydropower dams. These dams allow countries to generate renewable energy and also serve to enhance flood security

and increase water storage capacities as a buffer against flow variability. However, they are mainly realized in the upstream parts of a basin. Depending on their operation, they may decrease water availability and change water seasonality in the downstream parts as well as threaten the availability of fish and other water-related resources. The best-known examples for contentious dam projects in transboundary basins include the Grand Ethiopian Renaissance Dam (GERD) along the Nile, which is opposed by Egypt for fear of temporarily or permanently reduced inflows into its territory, as well as the Xayaburi dam (built in Laos) on the Mekong main stem, which will, among other things, impact the availability of fish resources in Vietnam (a main source of livelihoods in the country). In both cases, the construction of these hydropower dams has caused considerable problems in bilateral relations.

Construction Site of the Xayaburi Dam

As water bodies have often been used to demarcate borders, changing environments can also spur border disputes. For example, in the case of Lake Chad, decreasing rainfall, recurring droughts as well as abstractions from tributaries that feed the lake have resulted in significant shrinking of the lake surface over several decades. This in turn has led to increasing competition over fishing grounds and resulting disputes about the exact border demarcation between countries bordering the lake.

In short, there is sufficient potential for climate change to contribute to conflict and deteriorating inter-state relations in transboundary river basins. In the past, severe and, in particular, militarized conflicts over international water resources have been rare, partly because riparian states have established water institutions which help to avoid or address disputes at an early stage *(Wolf et al. 2003).* However, non-violent disputes still exist and the outlined impacts of climate change are likely to further affect inter-state relations and even threaten the stability of existing water institutions, if these institutions are not able to accommodate change *(Wolf et al. 2003; Dinar et al. 2015).* Moreover, even if states rarely go to war over water, regional stability may be undermined indirectly if downstream states suffer from degraded access to water and/or if they seek to sanction upstream states for non-cooperative behaviour. International water agreements and more institutionalized forms of cooperation like RBOs therefore need to be flexible and robust enough to cope with the emerging threats of climate change. Furthermore, considering that the majority of transboundary basins have no formal agreement or even an RBO in place *(Giordano et al. 2013; Schmeier et al. 2015),* the management of emerging disputes in these basins will even more likely require diplomatic and foreign policy support.

II. SUPPORTING ADAPTATION AT THE TRANSBOUNDARY LEVEL: THE ROLE OF WATER GOVERNANCE INSTRUMENTS

In many international river basins, institutions like water treaties and RBOs offer a range of legal and institutional provisions and have developed different governance mechanisms to address the diverse challenges of water management. In some cases, such institutions have also developed mechanisms to address climate change problems more directly.

Much research to date has focused on the design of international water treaties to ensure their survival and contribution to peaceful neighbourly relations *(e.g. Fischhendler 2004; Bakker 2007; Drieschova et al. 2008; De Stefano et al. 2010; Eckstein 2010; Odom and Wolf 2011; Dinar et al. 2015)*. Yet adaptation to climate change requires more than a well-defined and adaptable water treaty. An important question is whether basin institutions actually contribute to an improved management of the impacts of climate change on the ground. And if they do, which factors influence successful adaptation and improved resilience in river basins?

More recent research has moved in this direction and investigated whether international institutions themselves might be an adaptive response to the consequences of climate change by helping to offset the risks of conflict that arise from issues such as increasing water scarcity. Tir and Stinnett (2012), for instance, show that this intervening role of international water treaties largely depends on their institutional design. They look beyond the pure existence of variability mechanisms and find that more institutionalized treaties, including provisions for monitoring, enforcement and conflict resolution, can help to adapt to security challenges expected from climate change. Other studies have analyzed specific RBO case studies and their adaptation conduciveness *(Schmeier 2011; Schulze and Schmeier 2012; Heikkila et al. 2013; Blumstein 2016)*. They found that a range of institutional components and their specific design, such as organizations' membership structure, data and information management as well as the funding structure, can contribute to or hinder successful adaptation and resilience.

Taken together, the resilience and adaptability of international river and lake basins depends on a number of aspects, including *legal and treaty-related aspects, data and information sharing, dispute resolution and sustainable funding* of basin institutions. In addition to these specific governance mechanisms, *contextual factors,* including national water politics, are a crucial component in determining whether adaptation to climate change can be realized in a specific basin.

The remainder of this section presents an overview of the key factors that influence adaptation to climate change and resilience in international river basins.[2] The presentation of these factors as well as the illustrative examples accompanying them serve the purpose of highlighting their strengths and weaknesses and are ultimately intended to identify entry-points for water and climate diplomacy that could be employed to strengthen adaptive capacities within shared river and lake basins.

[2] While the presented list of factors should not be understood as an inclusive list, it also needs to be emphasized that research on the subject is still at a nascent stage and the exact linkages between the presented variables and adaptation are not very well understood in each case. Furthermore, one major gap of existing studies on the subject is that they often lack an assessment of the dependent variable (adaptability/adaptation capacities), hence rendering it impossible to clearly establish links (or the lack thereof) between any potentially explanatory factor and adaptation itself.

LEGAL PROVISIONS AND PROCEDURES – THE BASIS FOR SUCCESSFUL ADAPTATION

Climate variabilities and long-term changes can threaten the functioning of existing basin agreements and endanger cooperative relations between states *(Dinar et al. 2015)*. Changes in water availability can, for instance, lead to changes in riparians' interests concerning the use of water resources in a shared river basin, and hence their interests with regard to contractual obligations. For example, an upstream riparian might feel compelled to increase its water storage capacity if the climate becomes drier, and consequently lose its incentive to comply with an agreement that required it to release a fixed amount of water to downstream neighbours.

In a number of cases, the actors that were involved in drafting a specific international water treaty realized the need for flexibility and therefore included adaptability mechanisms *(Drieschova et al. 2008)*. Most adaptability mechanisms included in water agreements address the issue of flow variability, which can, for example, be caused by extreme events like floods and droughts that often inflict serious damage to ecosystems and populations *(compare e.g. Fischhendler 2004; Bakker 2007; Drieschova et al. 2008; De Stefano et al. 2010)*. For instance, the 1959 agreement which established the Sudanese-Egyptian Permanent Joint Technical Commission on the Nile (PJTC) outlines that the PJTC has the mandate to deal with issues related to low flow periods and "is charged with the task of devising a fair arrangement for the two Republics to follow" (Art. 4.1). In the 1964 agreement between the United States (US) and Canada regarding power generation and flood control at the Columbia River, Canada is required to provide additional water storage capacity to be used during high flow events in order prevent floods in the US.

However, many basin treaties do not comprise any flexibility in their design, which would allow them to react adequately to changing climatic conditions. Such rigidity can pose problems once major changes in the river basin arise. A failure to manage the negative impacts of climate change in a river basin can threaten the overall socio-economic development and also create new or reinforce existing conflicts between riparian states (see Box 1).

BOX 01 **ARAL SEA: WATER ALLOCATION UNDER CONDITIONS OF CLIMATE CHANGE**

The Amu Darya and Syr Darya River Basins that constitute the Aral Sea Basin – shared between Kyrgyzstan, Tajikistan (upstream) and Kazakhstan, Turkmenistan, Uzbekistan (downstream) – are the most important water sources in Central Asia, sustaining large agricultural lands and providing an important source for energy production. Since the 1960s the river system and in particular the Aral Sea has been affected by enormous environmental problems caused by high water abstractions for large-scale irrigation and water pollution from fertilizers and pesticides. By the mid-2000s, the Aral Sea had declined to 10 % of its original size and its once thriving fishing industry had collapsed. Although a number of projects realized over the last couple of years have slightly improved environmental conditions (e.g. the Aral Sea water level has increased and fish have in some parts returned), many challenges remain.

Shipwreck in the Dried-up Aral Sea

Large abstraction of water for agricultural purposes from the Amu Darya/Syr Darya system began during the era of the Soviet Union. Water resource allocation during that time was based on a fixed allocation mechanism according to which 46 % of the water was allocated to Uzbekistan, 44 % to Kazakhstan, 8 % to Tajikistan and 2 % to Kyrgyzstan. The largest share of releases was to be made during the summer months (when irrigation needs were highest) and to be reduced to only a quarter during the winter (World Bank 2004). After the breakdown of the Soviet Union, the newly independent states entered into an agreement in 1992 guaranteeing their adherence to the allocation system of the Soviet era and furthermore established the Interstate Commission for Water Coordination in Central Asia (ICWC) to manage and oversee the distribution of water resources between the five countries.

However, national interests in the Central Asian states developed in different directions. With upstream states being increasingly interested in hydropower production and downstream states expanding agriculture, the allocation system became less and less feasible. The upstream states were often unwilling and at times also incapable of providing the fixed amounts of water, and tensions between the states therefore increased. This situation was further complicated by changing climatic conditions and recurring droughts. A drought in 1997 led to serious tensions between Kyrgyzstan and downstream Uzbekistan and Kazakhstan when the former held back water flows during the summer months to increase electricity production and consequently exacerbated the already difficult situation for the downstream states (ICG 2002).

Despite the large-scale engagement of international actors and several attempts to establish a flexible yet precisely defined water allocation system that satisfies all actors, no sustainable solution has so far been found. As climate change models for the area predict decreasing precipitation during the summer (when water is needed for irrigation) and an increase during winter months, conflicts between the Central Asian states could further rise in the future *(Sorg et al. 2014).*

Because climate change has not been a major mainstream topic for very long, it is no surprise that only a small number of treaties contain an explicit reference to climate change. One such treaty is the Convention on the Status of the Volta River and the Establishment of Volta Basin Authority (VBA), signed in 2007, which mentions in its preamble the importance of considering "continuous degradation of natural resources of the Volta basin, especially its water resources, as a result of climate change and variations in the past decade". It can be expected that with growing concern about global climate change and its manifold implications for river and lake basins and riparian states, the number of treaty mechanisms tailored to specifically address climate change will increase as well.

Beyond international water treaties, riparian states and basin institutions have established further legal and procedural provisions to deal with changes in the natural environment, including climate change. In some basins, such as the Danube, Nile, Rhine, Mekong or Neman, the respective RBOs (or in case of the Neman, riparian states) have developed Climate Change Adaptation Strategies, which include general principles of adaptation at the basin level to ensure a coordinated approach and to avoid (unintended) negative effects that could occur from unilateral adaptation interventions. The specific goals of these adaptation strategies vary from basin to basin, depending on the values and priorities of countries and the specific basin context, but generally aim at reducing vulnerability of societies and ecosystems as a result of climate change. In the case of the Nile, for example, the Nile Basin Initiative's (NBI) climate change strategy is a broad framework for action, which outlines the member states' main objectives and guiding principles for addressing climate change *(NBI 2013).* While the NBI's climate change strategy emphasizes the need for risk reduction to ensure socio-economic development, the strategies of the International Commission for the Protection of the Danube River (ICPDR) as well as International Commission for the Protection of the Rhine (ICPR) highlight the need for flood and low flow as well as drought management measures.

A small number of basin institutions (including the Mekong River Commission (MRC) and the Orange-Senqu River Commission (ORASECOM) have already developed specific guidelines and/or procedures to address the transboundary impacts that can emerge if major infrastructure developments are realized in one basin country. For example, development projects along the Lower Mekong River always have to be notified to all other parties of the MRC and, in the case of developments along the mainstream, also require prior consultation and (under certain conditions) agreement amongst the parties to the MRC (compare MRC Procedures for Notification, Prior Consultation and Agreement (PNPCA)). In addition, the MRC and ORASECOM are currently in the process of establishing guidelines for Transboundary Environmental Impact Assessments (TbEIA) which aim at systematically assessing the transboundary impacts of major infrastructure developments like dams on downstream areas. Such TbEIAs will, once adopted, complement existing national EIA requirements which are usually restricted to environmental and social impacts at the national level. In both cases, however, the uncertainties connected to climate change are not included in the assessment process. The Niger Basin Authority (NBA) has recently prepared an annex to its Water Charter, which specifies the requirements for notification and conducting EIAs for activities with transboundary impacts. However, to implement this legal document it still needs to be translated into specific guidelines on how to conduct these EIAs. Lastly, the East African Community (EAC) had established its "Transboundary Environmental Assessment Guidelines for Shared Ecosystems" as early as 2003, which include the requirement to conduct TbEIAs for projects along shared watercourses (like Lake Victoria) that may have an impact on one or more countries of the EAC.

Assessing the impacts of large-scale infrastructure projects (like dams) on a water basin's environment becomes particularly important as a growing number of riparians perceive dams as an important means to adapt to climate change because dams, for example, enable storage of additional water for irrigation or urban consumption, can be used for flood control purposes or allow generation of low carbon energy *(compare Meijer et al. 2014; Earle et al. 2015).* Therefore, the international community, including international donors as well as private actors, has become more willing to finance such infrastructure projects despite the concomitant environmental and social risks *(Jensen et al. 2013).*

Overall, research found that institutions like international water treaties or RBOs are key factors for the peaceful management of disputes around shared waters, particularly in times of change *(Wolf 2003; Tir and Stinnett 2012)*. Cooperation around transboundary basins and the establishment of institutions should therefore be promoted as it has been done in the past by many actors. Furthermore, an increasing number of river basin institutions have established legal and procedural mechanisms to further address issues of change. Whether and under which conditions these additional legal provisions and procedures will contribute to adaptation and increased resilience of river basins (and beyond that, contribute to political stability), however, still remains a subject of future research.

DATA AND INFORMATION SHARING – A PREREQUISITE FOR INFORMED ADAPTATION

To thoroughly understand the impacts of climate change and to make informed decisions about adaptation with regard to the resulting changes in a river basin, riparian states must collect and share a broad range of environmental and social data and information. For instance, major changes in temperatures and river runoff – as expected in a number of river basins – will affect water quality through changes in sediment loads, nutrient concentrations, chemical composition or salt concentrations, with possible damage to ecosystems and human health. To develop adequate responses to such water quality problems, the causes and impacts need to be well understood.

For these reasons, scholars have argued that data and information sharing at the river basin level (e.g. through an RBO) is generally important for successful river basin planning and management *(e.g. Chenoweth and Feitelson 2001; Raadgever and Mostert 2005; Grossmann 2006; Gerlak et al. 2011)* and particularly significant in order to address climate change *(Eckstein 2010; Schulze and Schmeier 2012)*. The line of reasoning is that sharing data and information (or ideally the joint generation of it) leads to a common understanding of the causes and outcomes of environmental changes, helps to build trust between actors and ultimately supports agreement on how to approach or solve a certain issue.

Considering that there is often very limited information available on climate change and its impacts at the river basin scale (in particular with regard to forecasts of precipitation patterns and river runoff implications) this role of basin institutions is a highly crucial one. Many river and lake basin institutions have taken up this task of data and information management. In fact, it is often the starting point of cooperation at the river basin level and the major strength of a number of RBOs.

Over the last decade, a growing number of RBOs have also begun to collect data and information on climate change and its consequences for river basins. For example, ORASECOM in Southern Africa developed the first climate change model for the Orange-Senqu River Basin, delineating different climate change scenarios and their implications for river flow *(ORASECOM 2011, see also Box 2)*. The ICPDR conducted a meta- study on climate change which compiled an extensive amount of existing data and information and outlined the existing uncertainties associated with the predicted changes and impacts. It also set up a specific working group dealing with climate change. Similar working groups have been established for the Rhine (climate change expert group, KLIMA). Some RBOs have also established river basin monitoring programmes (for example the Amazon Cooperation Treaty Organisation (ACTO), ORASECOM, ICPDR and MRC). Although these monitoring programmes usually do not have a specific climate change focus, the parameters monitored (mostly water quality or runoff related) can be important indicators in observing the impacts of climate change at the river basin level.

BOX 02 ORANGE-SENQU RIVER: IMPROVING THE KNOWLEDGE BASE ON CLIMATE CHANGE

The Orange-Senqu Basin in Southern Africa is among the most developed basins on the African continent and an important source of water for three of the most economically developed states in the region. Partly because of this extensive use of its water resources, the basin faces a number of environmental problems. Among them, increasing water scarcity and pollution are most severe. These problems are likely to be augmented by climate change. Scientific knowledge about future climate change patterns for the region is however still scarce and implications for the Orange-Senqu River system remain very uncertain *(compare de Wit and Stankiewicz 2006; ORASECOM 2011).* The Intergovernmental Panel on Climate Change (IPCC) forecasts decreasing amounts of precipitation and surface runoff for the southern African region, with particular implications for groundwater recharge *(IPCC 2008: 81–82).* However, until recently no downscaled climate change model was available for the Orange-Senqu River Basin. Realizing this deficit, the Orange-Senqu River Basin Commission (ORASECOM) – the regional RBO which is very active on environmental issues – commissioned such a study. In this study, researchers for the first time modelled climate change scenarios and implications for river flow in the Orange-Senqu Basin *(ORASECOM 2011).* The results of this modelling show an average increase in temperature between one to two degrees in different parts of the basin. Rainfall is expected to slightly decrease in most mid-stream and down-stream areas and increase in the upper stream, the Lesotho Highlands *(Ibid: 6–10).* The translation of these projected climate changes into runoff generation is very difficult and scenarios are consequently very uncertain. According to the study, river runoff is likely to increase in the Lesotho part of the basin and the source of the Caledon River in South Africa, whereas other tributaries in the Lower Orange-Senqu are likely to experience a decrease in runoff. However, the study also found that increasing runoff in the source areas could possibly outweigh decreasing runoff in the drier downstream areas *(Ibid: 17).*

Senqu River behind Mohale Dam in Lesotho

Although important advancements with regard to data and information sharing have been made in a number of river basins, it remains a challenge in many others. Particularly in water scarce regions around the world, water is often highly politicized and water-related data is therefore treated as highly confidential *(e.g. Ferragina and Greco 2008)*. Sharing existing data or even committing to joint assessments with adjusted methodologies is a major challenge in these basins because of mutual mistrust. Furthermore, whether activities for sharing and increasing knowledge about the environmental and social aspects of climate change in transboundary rivers contribute to enhancing adaptation to climate change impacts ultimately also depends on whether this knowledge can successfully be linked to decision-making processes *(Timmermann and Langaas 2005; Weller and Popovici 2011; Armitage et al. 2015)*. It is precisely this aspect where major shortcomings remain in a large number of transboundary basins.

DISPUTE RESOLUTION – RESOLVING WATER DISPUTES TO COPE WITH CHANGE

In many international river and lake basins, riparians experience disputes over the governance of water resources when facing unpredicted developments, such as sudden environmental change (floods, droughts, saltwater intrusions) or socio-economic challenges (economic growth, dam construction or increasing water demands). Such disputes can also occur in basins where a regional basin institution has been established *(e.g. Fischhendler 2004; Metz 2011; Berardo and Gerlak 2012)*. Therefore, scholars have argued that incorporating clear conflict-resolution mechanisms is not only important for regional water governance in general *(Vinogradov and Langford 2001; Ochoa-Ruiz 2005; Dinar 2008; Fischhendler 2008; de Bruyne and Fischhendler 2010; Boisson de Chazournes 2013: 181–84; Schmeier 2013: 105–08)*, but also of particular significance in basins that experience environmental changes such as climate change *(Giordano and Wolf 2003: 170; De Stefano et al. 2010)*.[3]

In many river basins different types of dispute resolution mechanisms have been included in international water treaties. In most cases, disputes are referred to oversight bodies *(usually RBOs themselves; compare Schmeier 2014)*. For example, disputes arising over shared water bodies between the US and Canada are referred to the concerned RBO, the International Joint Commission (IJC) *(1910 Agreement: Art. 10)*. In other cases (and sometimes in addition to the first mechanism), issues of dispute are handled through negotiations between the disputing parties. For example, in the Orange-Senqu basin a dispute between member states should be resolved through consultation or negotiation between the parties to the ORASECOM Agreement *(2000 Agreement: Art. 8.1)*. Similarly, in the Niger Basin members to the NBA are required to resolve issues of dispute bilaterally between themselves *(1980 Convention: Art. 15)*. In some instances, transboundary water agreements provide the option to refer an issue of dispute to an external institution or actor. In the case of ORASECOM, for instance, parties can, if they were unable to resolve a dispute between themselves, refer the issue to the regional Southern African Development Community (SADC) Tribunal *(2000 Agreement: Art. 8.2)*.[4] Similarly, in the case of the Lake Victoria Basin Commission (LVBC), unresolved disputes can be referred to the East African Court of Justice *(2003 Protocol: Art. 46)*. In the Indus River Basin, disputes that cannot be resolved by the Permanent Indus Commission (PIC) can either be addressed by a neutral expert or become subject to arbitration *(1960 Treaty: Art. 9)*. Both external options for dispute resolution have been used to resolve different conflicts over the Indus water resources (see Box 3).

[3] Although scholars tend to argue that the presence of a dispute resolution mechanism supports conflict management (e.g. McLaughlin-Mitchell and Zawahri 2015), there is to date little empirical evidence that supports this assumption. Furthermore, we do not know which mechanisms may be more suitable or effective for solving certain types of conflicts.

[4] Since the SADC Tribunal was disbanded in 2012, in reality this option is no longer available. If a dispute between the members were to arise, the parties to ORASECOM could therefore only rely on bilateral consultation and negotiation.

BOX 03 CONFLICT RESOLUTION IN THE INDUS RIVER BASIN: THE KISHENGANGA ARBITRATION

The Indus River Basin, shared by India, Pakistan, Afghanistan and China, has been a source of conflict between the two main riparians India and Pakistan since their independence from Great Britain. In 1951, the World Bank (WB) intervened and started mediating between the two parties, which eventually culminated in the signing of the Indus Waters Treaty *(IWT, 1960)*. Under this treaty, India is granted control over the eastern tributaries of the Indus River while Pakistan has control over the western tributaries. The treaty also established a Permanent Indus Commission (PIC), composed of one Commissioner from each country, to implement the treaty and to promote cooperation between the two parties in the development of the Indus system. The treaty also makes provisions for the solution of disputes that may arise between the two countries. According to Article IX of the treaty, any dispute should, as a first step, be dealt with through the PIC. If a dispute cannot be solved this way, the issue could be referred to either a neutral expert or to a Court of Arbitration. For the latter, the treaty makes very detailed provisions in Annex G. While the first two provisions of conflict resolution outlined in the treaty (negotiations and the appointment of a neutral expert) had previously been employed to resolve issues of discontent, the provisions for arbitration were first used in 2010. In that year, Pakistan initiated an arbitration proceeding against India on the issue of the Kishenganga Hydro-Electric Project (KHEP). KHEP, implemented on the Kishenganga/Neelum River in India, involves the diversion of water for the purpose of hydropower generation and the release of this water into another tributary. Concerned about the impacts of KHEP on water flow within its territory and the construction of its own hydroelectric project along the Neelum River, Pakistan filed a request for arbitration. The arbitration tribunal was established as outlined in the treaty of 1960 and issued its final decision in 2013. According to the arbitration award, the inter-tributary transfer in India does not breach the country's obligations under the IWT and it could, therefore, proceed with the construction of the plant. The tribunal however, also declared that India has an obligation to ensure a minimum downstream flow *(Final Award 2013: 30-32, 43)*. The decision made by the tribunal, which according to the IWT has a binding character, has been accepted by both countries.

The case of the Indus River Basin exemplifies that the existence of a functioning dispute resolution mechanism can help to solve water related disputes even in a highly conflictive political setting. However, many river basin institutions have no specific dispute resolution mechanism in place *(see Schmeier 2014)*. In case a dispute emerges between riparian states, these basins lack any pre-determined process of addressing the contested issue, thereby increasing the potential for the conflict situation to worsen.

However, it would be wrong to limit a transboundary institution's conflict mitigating role to the presence and functioning of a specific dispute resolution mechanism. RBOs also prevent and mitigate conflicts through other mechanisms, such as providing platforms for negotiation, prior notification or data and information sharing *(Blumstein & Schmeier forthcoming)*. All these functions for attenuating and resolving conflict will gain in importance as climate change-induced hydrological changes exert additional pressures on the social fabric in, and the political economies of, transboundary basins.

SUSTAINABLE FUNDING – FINANCING RIVER BASIN ADAPTATION

To successfully manage institutions and implement joint activities in shared river basins requires financial and technical resources. Conducting projects to increase adaptation and resilience is often an additional task that needs to be managed beyond the already existing responsibilities of basin institutions. This may require supplementary resources for specific data acquisition, staff training or concrete adaptation measures within the water basin. Such additional requirements can often overstretch an RBO's capacities, particularly of such institutions in developing countries which already find it difficult to fulfil their core water management responsibilities.

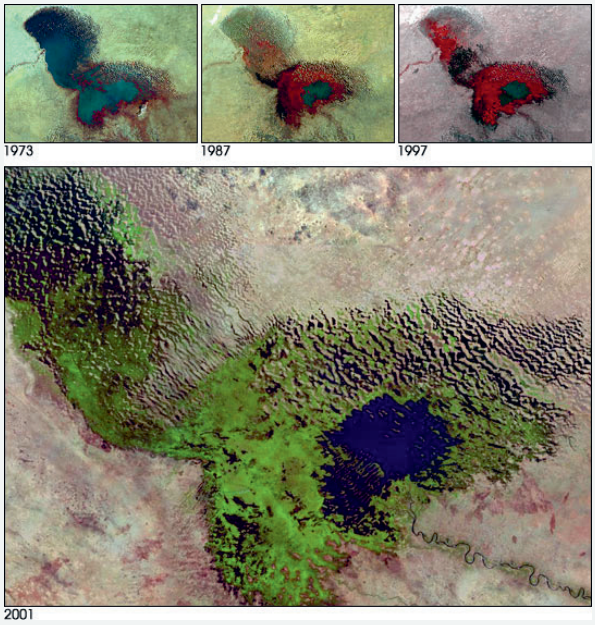
Funding for transboundary water institutions and their day-to-day activities is provided by different means: most often through membership contributions or external support from donors and, in fewer cases, through these institutions themselves (e.g. by generating fees for hydropower) *(Henkel et al. 2014; Schmeier 2014).* In many regions, providing additional funding for adaptation-relevant measures and activities can be a challenging issue for riparian countries. Sometimes these countries channel resources into activities with more immediate benefits for socio-economic development and poverty alleviation, whereas adaptation to impacts of climate change is perceived as more of a long-term contribution to development. In these cases, funding from international and bilateral donors can be beneficial if it supplies additional technical and financial resources to facilitate cooperation and to implement activities in support of adaptation.

External funding for RBOs and transboundary river basin activities is already provided by a growing number of bilateral as well as multilateral sources and has steadily increased since the beginning of the century *(compare GIZ 2013; EUWI 2013).* Many bilateral implementing organizations either provide funding directly to an RBO, through other regional organizations, such as SADC or EAC, or through multilateral organizations like the African Development Bank's (AfDB) African Water Facility or the WB's Cooperation in International Waters in Africa (CIWA) programme.

Transboundary river basin activities and institutions have also received funding through multilateral sources. The primary multilateral financing mechanism for transboundary river basins is the Global Environment Facility (GEF), which coordinates three major international funds, including the Global Environment Facility Trust Fund as well as two more climate-focused funds *(Gerlak 2004; Söderbaum and Granit 2014).* Since its establishment in the 1990s, the GEF Trust Fund has supported more than 180 programmes and projects through its focal area of international waters, most of them focusing on transboundary rivers or lakes. Since 2013, GEF has also begun to fund specific climate change programmes in international basins through its Trust Fund. One of these projects addresses climate change impacts in Lake Chad and aims at strengthening the Lake Chad Basin Commission's (LCBC) capacities to address climate change issues (see Box 4). Although a total of only 3 GEF transboundary water projects have a specific climate change focus so far, the launch of these projects points to the possibility that "traditional" water financing mechanisms could increasingly address aspects of climate change in the future.

BOX 04 GLOBAL ENVIRONMENTAL FACILITY: LAKE CHAD PROJECT

Lake Chad is Africa's fourth largest lake. Fed by groundwater and several rivers, the basin forms part of the territory of Cameroon, Central African Republic, Chad, Niger and Nigeria. Lake Chad is a vital source of freshwater that sustains the well-being and livelihoods of more than 20 million people in West and Central Africa. In 1964, the Lake Chad Basin Commission (LCBC) was established to increase water cooperation for economic development in the basin. Over the past decades, however, the lake has experienced increasing environmental pressures due to a combination of human over-exploitation, mismanagement and climate change. Apart from human impact, climate-induced warming and declining rainfall have caused the gradual drying-up of Lake Chad. Notably, between 1973 and 2002 the lake lost over half of its water. The shrinking of the lake has brought about numerous adverse impacts, such as reduced fish stocks, siltation, loss of vegetation and depletion of grazing land. Moreover, as the lake surface diminishes, the lake is moving towards the territories of Chad and Cameroon. This development can potentially cause international tensions in a region that has long been destabilized by intra-state and border conflicts *(Onuoha 2010)*.



Shrinking Lake Chad

To address the progressive degradation and diminution of Lake Chad, the LCBC – in cooperation with the riparian states, development partners and international donors – has initiated several projects to help recover the lake. One of these projects is supported by the Global Environment Facility (GEF) with a US$6 million grant *(GEF 2013)*. The project, which runs from 2013 to 2017, aims to improve Lake Chad management by building climate resilience and reducing ecosystem stress. The project will be implemented through six components. These include the strengthening of the LCBC and its subsidiary bodies; strengthening of national monitoring capabilities; establishment of effective governance and financial support mechanisms; and identification of investment opportunities. The project is closely linked to the implementation of the Lake Chad Basin Strategic Action Programme (SAP), which was developed in a consultative process and approved in 2008.

In addition, the international community and development partners have set up a broad range of specific climate financing mechanisms to help developing countries acquire the additional financial resources needed to implement mitigation as well as adaptation measures. While these climate financing instruments primarily focus on the national level, they could conceivably be used to support climate-related activities in transboundary contexts as well (for a more detailed analysis of climate finance, see Chapter 3).

Although external financing seems to be necessary for adapting to climate change impacts, in many river basins in the Global South high reliance on donor support also encompasses risks, particularly with regard to ownership and the long-term sustainability of funding *(Mostert 2005; Klaphake and Scheumann 2006; Blumstein 2016)*. Once major funding sources break away, the continuation of adaptation projects can be at risk or, even worse, the functioning of a transboundary cooperation mechanism (like an RBO) can be jeopardized. A significant part of funding for river basin institutions should therefore come from member states themselves. Furthermore, more flexible financing mechanisms, which include a mix of different funding sources, such as membership contributions, donor support or other generated revenues (e.g. through payments for ecosystem services), could contribute to more sustainable funding.

CONTEXTUAL FACTORS

The water governance mechanisms outlined above do not work in a vacuum but are interrelated with a number of regional as well as national water as well as non-water issues. This role of contextual factors, in particular the role of national politics, has been analyzed by many scholars who find it highly relevant for water policies at the transboundary level in general *(e.g. LeMarquand 1977; Lowi 1993; Frey 1993; Elhance 1999; Pachova et al. 2008)* and for climate change adaptation in particular *(Schmeier 2011; Sanchez and Roberts 2014)*.

Considering that adaptation strategies and activities developed at the transboundary level usually need to be implemented at the national level (or below) – especially in those cases where basin organizations do not have an implementing mandate – linkages between the regional river basin and national levels need to be provided for *(Schmeier 2011: 11-12)*. These linkages are to some degree ensured through representatives from member states who hold various positions in different RBO organizational bodies and who report back to their national line agencies. Moreover, some RBOs (including the MRC, LVFO and ACTO) have established specific bodies (national committees or commissions) to ensure that activities and strategies developed at the transboundary level are implemented in the various riparian countries.

Such linkages are, in reverse, also important to inform the regional level and ensure that adaptation activities employed in one riparian country do not negatively affect another country and possibly obstruct adaptation capacities there. If, for example, the agricultural sector of an upstream state shifts from rain-fed to irrigated agriculture as an adaptive response to decreasing precipitation, this will affect water availability downstream.

Considering these externality effects and the necessity to align different adaptation approaches, it is furthermore essential that all riparian countries participate in transboundary river basin activities and are members of existing basin institutions. The question of who should be involved in river basin management is a widely discussed issue in hydropolitics research as well as in broader environmental (policy) research *(e.g. Bernauer 1997; Netanyahu 1998; Verweij 2000; GWP 2000; Kliot et al. 2001; Dombrowsky 2005; INBO 2012; Schulze and Schmeier 2012)*. While most scholars argue that including all riparians of a river basin in cooperation efforts and regional institutions is required to ensure long-term effectiveness and that this is a prerequisite to avoid (unintended) negative effects with regard to climate change adaptation, some also argue that such an inclusive approach can complicate negotiation processes and obstruct more short-term functioning *(e.g. Verweij 2000)*.

In reality, many international basin institutions such as RBOs only comprise a subset of riparian actors. The exclusion of certain actors can pose a problem for coordinated adaptation if a non-included country is in a geographical position that allows it to significantly impact the river basin, or if it has otherwise important influence. In particular, regional powers (or "hydro-hegemons") are often not included in transboundary river basin institutions or prefer bilateral forms of cooperation over a basin-wide approach. For example, in the case of the Mekong River Basin, the upstream riparian China is not a member to the MRC. As China has a significant influence on the Mekong River (e.g. through a number of large dams), the absence of the country in the MRC poses a major problem for adaptation downstream. In the Orange-Senqu River Basin, South Africa is a member of ORASECOM. However, when it comes to contested issues, such as the allocation of water from the Orange-Senqu system, which are key to adaptation activities for other riparians of the basin, it uses bilateral negotiations and institutions.

Thus, while including all riparians of a river basin in an existing RBO is a significant precondition for coordinated adaptation, it might not always be feasible or desirable to include all riparians with regard to the effective functioning of these institutions.

Moreover, domestic interests and concerns frequently shape the politics around water resources at the regional level. The interests of riparian countries are often embedded in different values around how to use and/or protect shared water resources. For instance, in the Cubango-Okavango River Basin, significantly diverging interests constitute a major obstacle for successful cooperation and adaptation in the basin. The key problem in the basin is one of differing values, namely whether the river and its resources should be exploited economically (e.g. for hydropower or irrigation agriculture) and be used for national strategies to adapt to increasing water scarcity, which the upstream riparians Angola and Namibia favour, or if the natural flow of the river should be maintained, which is the aim of downstream Botswana. In such cases, it can be very difficult to reach agreement on how to address climate change and adaptation issues – for example, with regard to the question of how much additional water abstraction in Namibia and hence change in the ecosystem of the river delta in Botswana is acceptable.

Summing up, missing or weak links between regional and national levels as well as the absence of major riparian actors can hinder successful adaptation to climate change in transboundary water basins. Donors and foreign policy actors could therefore support activities to strengthen such linkages, either through the establishment of specific organizational units or by supporting standardized communication procedures. Furthermore, foreign policy actors could leverage cooperation outside existing regional water institutions for the benefit of coordinated adaptation without aiming to include (unwilling) riparians as full members of existing basin institutions.

WATER GOVERNANCE AND TRANSBOUNDARY CLIMATE ADAPTATION: CHALLENGES AND OPPORTUNITIES

Climate change has a number of significant effects on transboundary river basins that require major efforts at the regional and national levels to create the required adaptive capacities to ensure resilience and regional stability. Although significant steps have already been taken to create such capacities, several shortcomings still remain.

First, although the existence of institutionalized cooperation between riparians is one of the major components for managing environmental change, a large number of basins still lack any water agreement. Others have institutions in place but lack flexibility or governance mechanisms for dealing with change. In these cases, international donors and foreign policy actors can provide support to create institutionalized forms of cooperation as well as to integrate governance mechanisms that help dealing with change – such as provisions for environmental flows, guidelines for conducting TbEIAs or specific dispute resolution mechanisms.

Joint data and information management is a crucial component for understanding the impacts of climate change and often a prerequisite for developing successful adaptation capacities. While sharing data and information is successfully conducted in a number of international river basins, limited resources, mistrust or politicization of water issues prevent successful data and information management in others. In the latter case, water diplomacy in combination with donor engagement could play a role as facilitator and provide (financial or technical) incentives for generating unbiased data and information through a regional basin organization. Knowledge generated at the regional rather than national level is likely to be more acceptable for riparian countries and hence can serve as a basis to develop adaptation measures.

Dispute resolution mechanisms can be important governance mechanisms to address disputes, including disagreements that arise because of climate change impacts in river basins. However, many RBOs have no formal dispute resolution mechanism in place (or only vaguely formulated ones). In case a major dispute arises in such a basin, riparians first have to agree on a procedure to address the issue, which is much more difficult than establishing such a mechanism in advance. Foreign policy actors as well as development organizations can help to address water related disputes in international basins in different ways: they can act as mediators once a conflict breaks out and riparians are not able to solve the issue between themselves. Additionally, they can ensure that mechanisms to address disputes are integrated in newly drafted basin agreements or that such mechanisms are included or specified retrospectively.

Finally, resources (including technical, financial and human) are another key factor for developing and maintaining capacities to adapt to change. However, many countries, particularly least developed countries (LDCs), lack such resources to provide for adaptation. Although bilateral and multilateral support to transboundary river basin governance is available, it is not always sufficient to cover additional costs for adaptation measures. Tapping specific climate change funding mechanisms could provide opportunities to generate this additional capital to finance river basin adaptation.

III. SUPPORTING ADAPTATION AT THE TRANSBOUNDARY LEVEL: THE ROLE OF CLIMATE POLICY INSTRUMENTS

The previous chapter discussed the extent to which water governance mechanisms can be harnessed to support adaptation to climate change in transboundary river basins. While these mechanisms harbour considerable potential, some shortcomings have also been identified. To address some of these weaknesses and strengthen adaptive activities at the basin level more generally, this chapter examines how climate policy instruments can be used to supplement and enhance water-related instruments for the purpose of transboundary climate change adaptation. The most important of these instruments, which have emerged from international climate negotiations and the broader spectrum of climate diplomacy, include *vulnerability assessments (VAs), national adaptation planning* and *climate finance*. In the following, each instrument will be introduced and discussed in turn.

VULNERABILITY ASSESSMENTS

Vulnerability to climate change has been defined as the propensity or predisposition to be adversely affected by climate change due to a susceptibility to harm, coupled with a lack of capacity to cope and adapt *(IPCC 2014)*. VAs have increasingly been used as an instrument to assess such vulnerability. In the context of climate change adaptation, a VA is "... a study that identifies current and plausible future impacts of climate change, the sensitivities of people and ecosystems to the impacts, and the existing capacities that can support adjustment to impacts..." *(Chaudhury 2014)*. In 1994, the Intergovernmental Panel on Climate Change (IPCC) published the first technical guidelines for assessing climate change impacts and adaptations. Since then, conceptual thinking on VAs has evolved considerably, and numerous guidelines and handbooks now exist that provide advice and best-practice examples for stakeholders, consultants and policy-makers *(see, e.g. Morgan 2011; UNEP 2013b; Fritzsche et al. 2014)*.

Generally, VAs can fulfil diverse purposes, such as detecting current and potential "climate change hotspots," serving as a starting point for identifying suitable adaptation interventions, and tracking changes in vulnerability over time. They can be based on a diversity of quantitative and qualitative methods and can vary in temporal scope (short, medium, long-term) and spatial extension (community, local, national, ecosystem, regional, basin) *(Fritzsche et al. 2014: 26-27)*. Spatially, most VAs so far cover scales from the community through to the national level. In the water field, for instance, studies have been conducted to assess vulnerability at the household level *(Pandey et al. 2015)*, the metropolitan scale *(Gober and Kirkwood 2010)* and the river-basin scale within national boundaries *(Chang et al. 2007; Obuobie et al. 2012)*. Although an increasing number of countries conduct climate change impact and vulnerability studies, these assessments are currently usually limited to the national level *(Koeppel 2013)*.

By limiting VAs to the national level, however, basin countries forego a number of important contributions that such assessments could make to climate change adaptation at the basin-scale. In transboundary contexts, an assessment of climate change impacts as well as the identification of biophysical and social vulnerabilities is crucial to prevent adaptation activities in one riparian country from increasing vulnerabilities in another basin country *(Koeppel 2013; UNECE & INBO 2015)*. Furthermore, such transboundary VAs can provide the basis to identify potential synergies for joint adaptation activities. If, for example, flooding is a main risk in a downstream country while lack of water resources constitutes a challenge in an upstream country, the joint development of dams and reservoirs in the upstream country could provide a possible, mutually beneficial adaptation activity best pursued in cooperation.

As with data and information sharing in general, the process of preparing a VA is also an opportunity to raise awareness and build trust of the parties involved. In many basins, local or national efforts to adapt to emerging or future climate conditions are already underway. VAs can be an effective means to draw attention to such efforts, evaluate them, and, if deemed successful, promote them in other parts of the basin. Also, in politically tense basins, the opportunities for information-sharing and data harmonization generated by VAs can be an important way to avoid misunderstanding and build trust between co-riparians. If conducted in a systematic, comprehensive and inclusive fashion, VAs can offer a solid and explicit foundation to proceed with joint adaptive action in transboundary river basins *(Fritzsche et al. 2014; UNECE and INBO 2015).*

VAs have already been conducted in a small number of international river basins. For example, in 2013, the UN Environment Programme (UNEP) published a vulnerability assessment report on the Nile River Basin. The report, which was prepared in cooperation with the NBI and the Nile Basin states, makes use of satellite and other data to answer questions surrounding the potential future impacts of climate change on the Nile water systems, the hotspot areas that are especially vulnerable to these changes, and possible actions to manage or avert negative effects of climate change (UNEP 2013a). In the Neman River Basin, shared between Belarus, Lithuania and the Russian Federation, a joint assessment of water resources and climate change impacts has recently been conducted. In a similarly designed project in the Dniester River Basin shared between Ukraine and Moldova, a basin-wide vulnerability assessment to extreme floods and climate change has been developed *(Koeppel 2013).*

As these cases demonstrate, VAs can be used at the transboundary river basin level where they contribute to a better understanding of climate change effects and social and environmental impacts on international basins. They could furthermore be used to identify potential options for reducing environmental and social vulnerability. In particular, they can be used as a tool to coordinate different national adaptation processes and to identify potential synergies at the transboundary level.

NATIONAL ADAPTATION PLANNING

In the realm of international climate negotiations, two additional instruments were established under the UNFCCC to promote planning processes for climate change adaptation in LDCs: National Adaptation Programmes of Action (NAPAs) and National Adaptation Plans (NAPs). While NAPAs focus on the most urgent adaptation needs of LDCs and identify priority adaptation activities at the national level, NAPs address more medium and long-term adaptation needs.

To date, 50 LDCs have completed and submitted their NAPAs to the UNFCCC Secretariat. The priority sectors and areas addressed in these NAPAs have been water resources, agriculture and food security, coastal zones and early warning and disaster management *(LDC Expert Group 2012a).* A number of countries recognized in their NAPA that climate change impacts such as water scarcity, soil degradation and rising sea levels may be causes of conflict, with demographic change being an aggravating factor.

The NAP process was established in 2010 as part of the Cancun Adaptation Framework to complement existing short-term NAPAs. The assessment of overall climate change vulnerabilities at different levels is an integral part of NAP implementation *(LDC Expert Group 2012b).* Given their comprehensive and medium to long-term nature, it is noteworthy that NAPs are not about a single programme or plan, but a process. In prioritizing adaptation options, countries are advised to pay attention to criteria such as potential co-benefits, conflict prevention, and integrating adaptation and development planning *(LDC Expert Group 2012b).*

NAPAs and NAPs have so far mainly been used to identify adaptation needs at the national and sub-national level. They often point to the geographic links that result e.g. from shared waters, which may become a reference point for future joint action. So far, however, this awareness seems to have had little impact on actual adaptation planning. An early UN Development Programme (UNDP) assessment of the importance of fresh water resources in NAPAs indicated that references to transboundary river basin organizations or basin-wide initiatives were almost completely absent, undermining the possibility of more integrated regional adaptation planning *(UNDP 2009)*. Looking at the NAPAs submitted thus far, this assessment continues to hold.

The lack of regional focus in NAPAs could be attributed to the state-centred nature of the UNFCCC *(Tänzler et al. 2013)*, but also to the fact that adaptation planning at the national level is already a great challenge for many countries. Extending these planning exercises to the regional level may run the risk of overwhelming many national actors from a capacity and resource perspective. Nevertheless, a stronger consideration of the transboundary dimension in national adaptation planning would be crucial. If national actors fail to take the cross border consequences of adaptation interventions into account, climate change adaptation might strain inter-riparian relations, thereby increasing the risk of water-related conflict – for example, if a water storage facility is constructed upstream without considering down-stream effects such as reduced water availability for human livelihoods and ecosystem needs *(Tänzler et al. 2010)*. Yet there is also a positive case to be made. Precisely because national capacities are limited, regional assessments can create opportunities and synergies insofar as national governments can profit from regional capacities. This is one of the reasons why the LDC Expert Group highlights the potential benefits of regional cooperation in one of its most recent publications to inform the adaptation process *(LDC 2015)*.

Although not yet widespread, national planning instruments have already been used in the context of transboundary water management activities. One example is the Niger Basin Authority, which used NAPs and NAPAs to coordinate and prioritize planning for different adaptation activities and to tap international funding for financing these and other adaptation activities (see Box 5).

BOX 05 NIGER RIVER BASIN: USING NATIONAL ADAPTATION PLANNING AT THE TRANSBOUNDARY LEVEL

The Niger, the second largest river on the African continent, is shared by 9 West African countries. The river sustains a population of 120 to 130 million people, most of which live in great poverty and depend on the river resources for agriculture, fisheries and transportation.

At the same time, the Niger Basin is an area of great political instability. Several countries have experienced violent conflicts, coup d'états and brutal military dictatorships over the last decades. In Mali, Tuareg groups launched a rebellion in 2012 and the Islamist group Boko Haram continues to destabilize the north-eastern region of Nigeria and several neighbouring countries.

To some degree, these destabilizing developments have been fuelled by the basin's challenging climatic conditions. The climate of the Niger River Basin is characterized by high variabilities, with severe droughts and floods occurring on a regular basis. These variabilities are expected to further increase with future climate change. Projections foresee high rainfall variability and exacerbating extreme events like floods and droughts, which will further increase hardship for riparian populations dependent on rain-fed agriculture, pastoralism and fisheries.

Niger River in Niamey

To adapt to these challenges and increase the resilience of basin populations, several water storage dams are currently under construction, among them, Fomi in Guinea, Taoussa in Mali and Kandadji in Niger. The aim of these dams is to boost hydropower production for economic development, increase water storage for agricultural production and reduce flooding. To harmonize activities around dam building and other national adaptation projects, the basin's RBO, the Niger Basin Authority (NBA), has taken up an important coordination and planning role. For example, the NBA conducted an assessment of the needs and interests of the 9 riparian states' national development activities as outlined in national planning instruments, including NAPs and NAPAs, and subsequently undertook a prioritization of the activities that should be implemented by 2025. This process, which culminated in the Sustainable Development Action Plan (SDAP), also included negotiations and environmental assessments of the above-mentioned dams and arrangements for environmental flows *(Earle et al. 2015).* Although some disagreements still remain, it is becoming apparent that the NBA has taken steps to fulfil a basin-wide planning and coordination role.

Considering that most of the Niger Basin riparians range amongst the world's least-developed countries, resources for funding adaptation activities are very scarce. To improve funding for adaptation activities, the NBA (with support from the WB and the AfDB) has recently launched the "Niger Basin Climate Resilience Investment Plan" (CRIP). The plan has been developed by the riparian countries through the NBA to advocate for technical and financial support to implement adaptation-relevant projects and activities identified in previous planning documents, such as the SDAP and different national climate change adaptation plans like NAPAs or NAPs. CRIP lists 246 specific investments for adaptation in the Niger Basin, such as climate insurance for farmers in Burkina Faso, adaptation of farming calendars and crops in Benin, anti-erosion activities in Mali or rehabilitation of water storage structures in Nigeria.

CLIMATE FINANCE

As outlined in chapter 2, funding for climate change adaptation in transboundary river basins is limited, and LDCs in particular often find it difficult to raise the necessary financial resources. The international community has, therefore, set up a number of specific funding mechanisms for climate change mitigation and adaptation. Such climate finance – although primarily focused on the national level – could provide an important funding source for transboundary river basin adaptation in the future.

To support adaptation to climate change, a number of bilateral donors have developed official development assistance (ODA) mechanisms focusing specifically on climate change-related projects. For example, Germany's International Climate Initiative (IKI) provides funding to projects focusing on climate change mitigation, adaptation and biodiversity projects (see example in Box 6).

BOX 06 NILE RIVER BASIN: HARNESSING BILATERAL CLIMATE FINANCE FOR ECOSYSTEM-BASED ADAPTATION

The perception that climate change will impact hydrological regimes in the Nile River Basin, thereby affecting livelihoods and hydro-political arrangements, is now widely shared. With climate change being regarded as a priority issue within the basin, several initiatives related to climate adaptation are now underway. For example, most of the eleven Nile riparian states have adopted NAPAs to promote climate change adaptation at the national level. At the transboundary level, the Nile Basin Initiative (NBI) has started working on internalizing and mainstreaming a climate agenda and has initiated a range of activities contributing to climate resilience based on a no-regret approach *(Earle et al. 2015)*. One of these measures consists in the development of mechanisms for soliciting climate change adaptation funds. One project that has successfully obtained bilateral climate funding aims to contribute to biodiversity conservation and ecosystem-based adaptation in the Nile River Basin by developing the capacities of the NBI and its member states. It is implemented by the Deutsche Gesellschaft für International Zusammenarbeit (GIZ), with the NBI as the partner institution, and is financed by the German International Climate Initiative (IKI) with a € 6 million grant from 2015 to 2020 *(IKI 2016a)*. IKI is a funding programme which supports transformative mitigation, adaptation, REDD+, and biodiversity projects in developing countries, emerging economies and transition states. While IKI's primary level of intervention is the national level, it also supports multi-country projects at the regional and global levels. It is open to a broad range of participants beyond national ministries and government agencies, including international and multilateral organizations, as long as the respective project has an implementation partner in the target region *(IKI 2016b)*.

Climate finance is one of the central topics in international climate negotiations, and donor contributions to climate finance are expected to increase substantially over the next few years. As agreed at COP-15 in Copenhagen in 2009, the international community aims to provide US$ 100 billion per year starting in 2020 for climate change mitigation and adaptation. The need for adaptation finance has increased considerably in recent years and there is now a broad consensus that half of these financial resources will be needed to meet adaptation needs. Acknowledging that financial support is vital to plan and implement adaptation measures as part of the UNFCCC and the Kyoto Protocol, some support has been made available, especially for LDCs. Three climate funding channels bear noting in this regard, namely the GEF, the Adaptation Fund and the Green Climate Fund (GCF).

The GEF operates three funds which support a range of issues around environmental protection, including climate change adaptation. These are the GEF Trust Fund, the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF). The GEF Trust Fund finances activities in 6 focal areas, among them climate change and international waters. Although the Trust Fund constitutes the most important international financing mechanism for transboundary water activities, it is not a specific climate change fund as are the LDCF and SCCF.

The LDCF, established under the UNFCCC, has been set up to support LDCs in responding to climate change and, in particular, to prepare and implement NAPAs and NAPs. Finally, the SCCF supports adaptation activities that increase climate resilience in areas such as water resources, land, agriculture, health, infrastructure development, disaster preparedness, fragile ecosystems and coastal zones. The SCCF has also been requested to consider supporting NAPs in developing countries that are not LDCs. Neither of the two climate-dedicated funds (the SCCF and the LDCF) has yet been used for funding activities in shared river basins whereas the Trust Fund has financed transboundary river basin activities.

Another international climate finance mechanism, the Adaptation Fund, was set up under the Kyoto Protocol in 2001 to support adaptation projects and programmes in developing countries that are particularly vulnerable to the adverse effects of climate change. The Adaptation Fund's resources are sourced from the Clean Development Mechanism. To become accredited and receive funding, entities are required to meet certain legal and fiduciary standards. Although most accredited entities are national or multilateral actors, a small number of regional bodies have also been accredited. Among them is the Sahara and Sahel Observatory (OSS), which among other issues works on transboundary waters *(OSS 2013)*. To date, the Adaptation Fund has not been used to fund adaptation programmes in transboundary water basins, but regional projects with a climate change adaptation focus in the Lower Mekong and Lake Victoria Basins are currently under review and, if approved, will be supported by the fund (compare Box 7).

BOX 07 **LAKE VICTORIA BASIN: FINANCING BASIN-SCALE CLIMATE ACTION THROUGH THE ADAPTATION FUND**

The Lake Victoria Basin is shared between Burundi, Kenya, Rwanda, Tanzania and Uganda. Climate change projections for the basin predict an increase in mean annual temperatures and more variability in rainfall patterns, leading to a decrease in water quality and availability. The socio-economic impacts associated with these changes are likely to particularly affect rural communities within the basin. To reduce vulnerability to the negative effects of climate change and build climate resilience in the Lake Victoria Basin, the Adaptation Fund is currently reviewing a project proposal on "Adapting to Climate Change in Lake Victoria Basin" which seeks to improve the integration of climate change into regional transboundary water catchment management within the basin. If accepted and endorsed by the fund, the project is to receive US$5 million in funding between 2017 and 2019 *(Adaptation Fund 2016)*. Among the outcomes envisaged are improved institutional capacity to integrate climate resilience into transboundary catchment management – for example through the establishment of an LVBC Climate Change Unit; increased regional resilience to climate change promoted through innovative, community-based projects; and enhanced regional knowledge management frameworks (Ibid.). As an Adaptation Fund-accredited multilateral implementing entity, UNEP can directly receive funding, and will be responsible for project implementation. The regional basin organization, LVBC, cannot play this role since it is not accredited with the Fund. However, the LVBC will play an important role as the project's executing entity. In this function, its tasks will involve the coordination of a partner consortium for project execution, the establishment of a project management unit, the facilitation of stakeholder engagement and close coordination with agencies at the regional and national levels.

The newest climate finance mechanism, the GCF, was initiated at COP-16 in Cancun. GCF has been established as a mechanism to assist developing countries in managing impacts of climate change (mitigation and adaptation measures). The fund is now operational, and among its first approved funding proposals for 2016 is a project to support the World Bank's Climate Adaptation and Mitigation Programme for the Aral Sea Basin in Tajikistan and Uzbekistan, supported with US$ 19 million *(GCF 2016)*. Although the application for this GCF proposal was submitted by national governments and not a regional or basin organization, this project indicates that the climate finance landscape could provide important and in many cases much-needed funding for transboundary climate change adaptation, which would otherwise not be available.

All three climate funding channels – via the GEF, Adaptation Fund and the GCF – have thus started to include transboundary dimensions one way or another. However, to make full use of the diplomatic potential of climate change-related efforts, the regional and basin levels need to become a higher funding priority. One way of involving them would be via a planning and coordination role, as happened in the Niger basin. A next step may involve getting RBOs or related regional organizations directly accredited as implementing entities, which would further strengthen their capacity for coordination. To become accredited, an institution must meet a variety of standards regarding legal status, financial and management integrity, institutional capacity, transparency, self-investigation and corruption. These standards currently make it quite challenging for RBOs to become accredited, especially for smaller organizations with limited capacity.

Recognizing these challenges, some actors have started to use capacity building for trying to bridge the gap between the availability of climate finance and access to it by transboundary actors. For example, UNECE will organize a workshop on "Financing climate change adaptation in transboundary basins" in September 2016 that aims to support basin-wide adaptation measures. The workshop will bring together national and basin-level actors with representatives of bilateral and multilateral donors, financing institutions and the private sector to facilitate the sharing of lessons learned *(UNECE 2016)*. Similar capacity building has also been provided by some RBOs. For example, the NBI has trained staff on how to access climate change funding mechanisms with the aim to make such funding more accessible for transboundary activities *(Earle et al. 2015: 146)*.

CLIMATE POLICY AND TRANSBOUNDARY CLIMATE ADAPTATION: CHALLENGES AND OPPORTUNITIES

As the above discussion has shown, climate policy instruments in the form of VAs, national adaptation planning and climate finance have significant potential to contribute to a better understanding of climate change impacts and the adaptation potential in transboundary river basins. However, these climate policy instruments have to date only marginally been used to improve adaptation in transboundary river basins. A focus on the national level and lack of capacities make it difficult for many regional actors to get direct access to these resources. Nevertheless, in some basins, e.g. in Eastern Europe and in Africa, we are already seeing promising approaches that aim to realize the potential synergy effects that can result from a stronger integration of water governance mechanisms and climate policy instruments for the benefit of transboundary climate change adaptation. Although experience on the ground is still limited, the final part of this paper presents a number of recommendations for riparian states, RBOs and international development partners and donors on how to strengthen transboundary climate adaptation for peace and development in shared basins.

IV. RECOMMENDATIONS: ENTRY POINTS FOR SUPPORTING CLIMATE CHANGE ADAPTATION IN TRANSBOUNDARY BASINS

This paper has illustrated that the impacts of climate change are not only a threat to socio-economic development but can also contribute to (re-)emerging conflicts in transboundary river basins. It is therefore important to build capacities to adapt to climate change and increase resilience in internationally shared water basins to strengthen environmental protection, economic and social development as well as regional political stability.

Steps have already been taken in a number of transboundary basins to address the impacts of climate change and to increase environmental and social resilience to change. However, as this paper has shown, a number of shortcomings still exist: Though river basin institutions have been identified as an important precondition for managing change in transboundary river basins and avoiding change-related conflicts, many basins still have no water agreement in place. In cases where water agreements exist, they often lack the required flexibility and governance mechanisms to deal with change, such as a flexible treaty design, clear/workable dispute resolution mechanisms, provisions for environmental flows, or guidelines for conducting joint environmental or social impact assessments. Furthermore, data and information sharing between riparians, despite being implemented in a growing number of river basins, is often hampered by lack of resources, mistrust or politicization of water issues. Finally, although climate policy instruments, such as VAs, national planning instruments or international climate finance mechanisms, harbour significant potential to enhance transboundary climate change adaptation, they have so far only been employed in very few river basins.

Considering that riparians and basin institutions in developing and transitional countries often lack the financial, technical and human resources necessary to address these shortcomings, international and regional actors from across different sectoral communities can play important supportive roles in fostering cooperation and adaptation to climate change. Below we summarize potential entry points for closer and more integrated cooperation, at the national, regional and international level:

Riparian Countries

- ensure sufficient funding for the core tasks of river basin institutions through reliable membership contributions;
- support activities to strengthen linkages between basin-wide and national water management institutions through, for example, specific national bodies and/or standardised communication and reporting procedures;
- promote the incorporation of climate change adaptation policies into existing and newly established basin institutions, including work programmes and legal frameworks;
- promote the incorporation of basin-wide, transboundary thinking in national adaptation planning.

River/Lake Basin Organizations

- improve shared knowledge on the impacts of climate change, for example through commissioning downscaled climate models at basin level that include efforts to capture flow changes;
- map out funding opportunities for climate change adaptation and develop funding strategies to improve long-term sustainability of funding;
- for larger RBOs, explore the possibility of becoming accredited to international climate finance mechanisms.

International Community, especially Climate, International Development and Foreign Policy Actors

- support the development of VAs and data and information sharing activities to improve knowledge about climate change impacts in transboundary river basins as a basis for informed planning of adaptation measures;
- promote, where possible, that VAs are carried out at the basin scale and facilitate their simultaneous use for confidence-building and, ideally, the elaboration of joint responses;
- seek to better understand which institutional set-ups of transboundary water institutions are particularly conducive to adaptation, and help facilitate the sharing of good practices, for example by supporting basin-wide exchange forums and research projects;
- facilitate access to bilateral and multilateral climate funding mechanisms, for example by supporting RBOs to become accredited to climate financing mechanisms such as the GCF;
- support activities to strengthen linkages between regional and national river basin governance through the establishment of specific organizational units or communication procedures;
- where basin institutions do not comprise all riparians, consider using adaptation issues to promote cooperation between regional basin institutions and non-member riparians;
- support riparian states in establishing new basin institutions and ensure the integration of governance mechanisms that help deal with change (such as flexibility mechanisms, dispute resolution mechanisms or standards for TbEIAs);
- establish or strengthen donor coordination mechanisms to create synergies between different actors in one basin and to avoid duplication of activities;
- support the mediation of political disputes that relate to transboundary waters.

The climate-related challenges facing many transboundary river basins are considerable. In order to plan and implement successful adaptation activities, RBOs and riparian countries will often need the support of the international community. By working together, national, regional and international actors can harness the full potential of water governance and climate policy instruments for both adaptation and stability. A stronger integration of water and climate interventions can help create synergy effects and co-benefits in transboundary basins that otherwise remain unavailable.

While the conditions and priorities in each basin are unique and context-dependent, this paper has identified a number of possible entry points to facilitate coordinated and integrated action in transboundary climate change adaptation. As examples throughout this paper demonstrate, several basins are already moving in this direction, for instance by jointly assessing climate change impacts at the basin level, integrating adaptation planning at different scales and gaining access to climate finance. Thanks to their on-the-ground experience, these basins may have valuable lessons to share when it comes to putting some of this paper's recommendations into practice. If equipped with sufficient awareness, resources and political will, actors in other basins can build on these experiences when developing their own responses and initiatives to adapt to a changing climate. Ultimately, their success will be an important precondition for ensuring sustainable growth and peaceful inter-riparian relations in transboundary water basins.

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LIST OF ABBREVIATIONS

ACTO	Amazon Cooperation Treaty Organization
AfDB	African Development Bank
CIWA	Cooperation in International Waters in Africa
COP	Conference of the Parties
CRIP	Niger Basin Climate Resilience Investment Plan
EAC	East African Community
GCF	Green Climate Fund
GEF	Global Environment Facility
GERD	Grand Ethiopian Renaissance Dam
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICG	International Crisis Group
ICPDR	International Commission for the Protection of the Danube River
ICPR	International Commission for the Protection of the Rhine
ICRAG	International Groundwater Resources Assessment Centre
ICWC	Interstate Commission for Water Coordination
IJC	International Joint Commission
IKI	International Climate Initiative
INBO	International Network of Basin Organizations
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
IWT	Indus Waters Treaty
KHEP	Kishenganga Hydro-Electric Project
LCBC	Lake Chad Basin Commission
LDC	Least Developed Country
LDCF	Least Developed Countries Fund
LVBC	Lake Victoria Basin Commission
LVFO	Lake Victoria Fisheries Organization
MRC	Mekong River Commission
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NBA	Niger Basin Authority
NBI	Nile Basin Iniative
ODA	Official Development Assistance
OKACOM	Permanent Cubango-Okavango River Basin Water Commission
ORASECOM	Orange-Senqu River Commission
OSS	Sahara and Sahel Observatory
PIC	Permanent Indus Commission
PJTC	Permanent Joint Technical Commission
PNPCA	Procedures for Notification, Prior Consultation and Agreement
RBO	River Basin Organization
SADC	Southern African Development Community
SAP	Strategic Action Programme
SCCF	Special Climate Change Fund
SDAP	Sustainable Development Action Plan
TbEIA	Transboundary Environmental Impact Assessment
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USAID	United States Agency for International Development
VA	Vulnerability Assessment
VBA	Volta Basin Authority
WB	World Bank

LIST OF BOXES

www.climate-diplomacy.org

www.ecc-platform.org
www.auswaertiges-amt.de
www.adelphi.de