Governing Environmental Change in International River Basins
The Role of River Basin Organizations

Paper prepared and presented by

Susanne Schmeier
Hertie School of Governance, Quartier 110
Friedrichstrasse 180, 10117 Berlin/Germany
schmeier@transnationalstudies.eu

Sabine Schulze
Institute of African Studies
University of Leipzig
Beethovenstr. 15, 04107 Leipzig/Germany
schulzes@uni-leipzig.de

Abstract

Hydrological changes such as variability in water availability, extreme events like floods and droughts or water pollution pose a serious challenge to effective management of internationally shared water resources – no matter whether they are induced by climate change, large infrastructure projects in the river basin or other forms of environmental change. To address these management challenges, many states have established transboundary River Basin Organization (RBOs). The purpose of this paper is to investigate the ability of such RBOs to respond to exogenous environmental and man-made changes by identifying institutional mechanisms and management practices that have been established by the respective institutions or their member states to react to transformations in the basins' environment. Drawing on the literature of neoinstitutionalist theory and hydropolitics approaches, a comprehensive analytical framework is being developed. It consists of the following determinants of adaptation capacity: *Membership structure, functional scope, decision-making mechanisms, data and information sharing, dispute-resolution mechanisms, finances and donor support*. Subsequently, the framework is applied to two case studies, the Okavango and the Mekong River Basin. The paper concludes that the adaptation capacity of RBOs depends significantly on these factors, however, further research to quantify their respective impact and to test hypotheses on a larger number of cases is needed.

1. Introduction

In international watercourses[1], the actions of one riparian state in using or protecting the river and its resources necessarily affect the opportunities of other riparian states, leading to collective action problems that can easily turn into conflicts. These conflicts do not only threaten the security in the respective river basin, but are also likely to negatively influence the overall socioeconomic development in the region if not solved cooperatively. Therefore, International Water Treaties (IWTs) have been signed in many river basins and River Basin Organizations (RBOs) have been established in order to institutionalize cooperation on the long term. Changes in the river basin, however, threaten to disturb the often fragile political balance in river basins by adding new challenges such as reduced availability of water, shifts in the river flow, in its sediment load or in precipitation patterns, or sea level rise in delta areas. For instance, climate change and related challenges such as increasing variability in water availability and increasing severity in extreme weather events pose serious threats to watercourses and the socioeconomic development dependent on them. Similarly, the development of large water resource infrastructures such as hydropower dams influences the ecological balance of the entire basin, thus also determining socioeconomic benefits riparian populations derive from the river. The establishment of cooperative governance mechanisms alone is therefore insufficient for the maintenance of long-term stable, cooperative and sustainable governance of shared watercourses. Instead, these institutions need to ensure the incorporation of changes in the river basin by providing mechanisms for governing change.

Acknowledging the vulnerability of cooperative water resources management mechanisms to changes in the river basin, many states have indeed established such mechanisms. Thereby, especially climate change adaptation and mitigation programs and policies have increasingly moved into the focus of policy makers. At the same time, especially climate change adaptation in international river basins has received increasing scholarly interest (refer, for instance, to Fischhendler 2004, Conway 2005, Hinkel/Menniken 2007, Ansink/Ruijs 2008, Drieschova et.al. 2008, Kistin/Ashton 2008, Goulden et.al. 2009, Van Pelt/Swart 2009, DeStefano et.al. 2010, Dinar et.al. 2010). Other types of change, mainly those related to man-made

[1] The term 'international watercourses' refers to international rivers as well as lakes. Similarly, the notion 'international river basins' includes international lakes as well and they are defined as river basins with rivers contributing hydrologically to a first-order stream, which, in turn, is defined by its outlet to the ocean or a terminal lake or inland sea, with any tributary crossing the political boundaries of two or more nations (Wolf 1999: 389). Following practice in the field of hydropolitics, both terms are used interchangeably.

alterations in the basin, have however received less attention on both the political and the academic agenda.

However, a comprehensive analytical framework for the assessment of the adaptation capacity of transboundary river basins and, in particular, the institutions that have been set up to cooperatively manage these basins, is lacking. It is thus the aim of this paper to develop such an analytical framework and investigate how and under which institutional conditions international RBOs are capable to successfully deal with man-made as well as naturally induced change (part I). The framework is applied to two case studies in Southern Africa (Permanent Okavango River Basin Water Commission, OKACOM) and in Southeast Asia (Mekong River Commission, MRC), which due to their high hydrological vulnerability and the particular dependence of riparian states on the river and its resources are of particular interest for the research question (part II). Based on findings from these two case studies, the final part allows us to draw more general conclusions of what determines the adaptation capacities of RBOs and to open the debate for further research.

Part I: Theoretical Framework

2. Mapping the Determinants of Adaptation Capacity

The following sections develops a comprehensive framework for the analysis of the adaptation capacity of RBOs, starting from treaty resilience as a response to challenges related to increasing variability in water resources related to changes in the respective river basin (2.1). In a next step, we move beyond IWTs, which are considered as a necessary, though not a sufficient condition for successful adaptation, and focus on the institutional determinants for responding to environmental change in a river basin (2.2).

2.1 Moving from Vulnerability to Resilience – The Role of RBOs

Research on the climate change adaptation capacity[2] of transboundary river basins has so far mainly focuses on IWTs and the specific provisions they contain with regard to the management of water resources variability as it is expected to increase as a consequence of climate change (e.g. Fischhendler 2004, Ansink/Ruijs 2008, Drieschova et al. 2008, De Stefano et al. 2010, Dinar et al. 2010) or has occurred in the form of case studies of specific basins only (Conway 2005, Hinkel/Menniken 2007, Kistin/Ashton 2008, Van Pelt/Swart 2009). Several factors have been identified as decisive for adaptiveness, namely water allocation mechanisms and their adaptability to changes in water flow and water quantity (Fischhendler 2004, Ansink/Ruijs 2008, Drieschova et al. 2008): Most often, researchers investigate different water allocation mechanisms and their respective adaptation-conduciveness (Fischhendler 2004, Drieschova et al. 2008). Thereby, flexible allocation mechanisms, such as water allocation on percentage shares instead of fixed volumes, are considered to be more adaptation friendly. In addition, several mechanisms further strengthening the capacities of treaties and specific water allocation mechanisms to adapt to variability have been identified, such as escape clauses (e.g. in times of drought), found, for instance, in the Treaty on

[2] First of all, it needs to be acknowledged that no consensus definition has been established on what is to be understood by 'adaptation', 'adaptive capacity' or 'resilience' (on the debate, refer to Gallopin 2006). Since it is not the aim of this paper to define the concepts and notions related to adaptation, we apply a very broad yet suitable definition of adaptation capacity, referring to the capacity of a natural entity, such as a river basin, to adapt to changes that occur within it – be they naturally caused or man-made. The state of great adaptation capacity is thereby often referred to as 'resilience'. More specifically, the adaptation capacity of an RBO refers to the capacity of the organization to develop, implement and coordinate measures leading to greater resilience in the entire river basin.

the Lesotho Highlands Water Project, or regular treaty renegotiations/periodic reviews, as adopted, for example, in the Great Lakes Water Quality Agreement between the USA and Canada in 1972.

One of the more recent studies (De Stefano et al. 2010) has analyzed the climate change resilience of international river basins by focusing on five characteristics: 1. the presence of an IWT, 2. the presence of water allocation mechanisms, 3. the existence of variability management mechanisms, 4. the existence of conflict management mechanisms, and 5. the establishment of an RBO. Depending on the presence of each of these characteristics, river basins have been grouped in categories from 0 (none of the characteristics present) to 5 (all present). Results show that most frequently, IWTs have been signed in international river basins, while variability management mechanisms on the other hand are rather rare. Moreover, river basins in OECD countries generally show a higher presence of these adaptation characteristics than Latin American and East Asian river basins which are more often characterized by the absence of such mechanisms. The respective presence of adaptation factors has also been mapped against the vulnerability of river basins to climate change and various basins could be identified that suffer from high climate change-induced water variability and a lack of adaptation mechanisms. Based on this methodology, various particularly problematic river basins could be identified in which high climate change-induced variability meets low treaty resilience. In such river basins, environmental change exceeds the capacity of the legal framework (if existent at all) to absorb the change, thus severely increasing the likelihood of conflicts among riparians (Wolf 2004: 6). Treaty-based adaptation instruments can thus provide a starting point for assessing whether and to what extent river basins are able to adapt to climate change and related water variability.

Adaptiveness, however, goes beyond the existence of pure treaty provisions and includes other factors that are not necessarily captured by an IWT in place. These factors include, for instance, national adaptation strategies and their coordination on the regional level, pre-existing regional cooperation structures providing a framework for cooperation, or informal dispute-resolution mechanisms. It can thus be the case that a river basin which is characterized by the absence of flexible treaty mechanisms nevertheless exhibits high overall adaptive capacity to climate change, due to factors other than treaty provisions allowing for climate change adaptation. It is therefore not sufficient to solely focus on treaty instruments when examining the adaptive capacities of river basins.

In many river basins riparian states have established RBOs in order to permanently institutionalize cooperation on shared watercourses. The presence of an RBO thereby adds additional adaptation capacity, likely to further increase the overall adaptability in the basin. The different RBO-related factors for climate change adaptation capacity therefore need to be taken into account as well. Based on more general research on International Organizations (IOs) as well as hydropolitics studies focusing on RBOs in general, several factors can be identified that are likely to influence the resilience of transboundary river basins to climate change: The *membership structure* of the organization, focusing on whether all riparians in the respective basin are included in joint climate change adaptation activities; the *functional scope* of the RBO, focusing on the degree of integration of water resources management and climate change adaptation; a *decision-making mechanism* that ensures the timely and efficient adoption of decisions; the existence and the well-functioning of *data and information sharing mechanisms* ensuring long-term cooperation; the existence and well-functioning of *dispute-resolution/conflict management mechanisms* allowing for solving emerging water-related collective action problems; the secured availability of *financial resources* for climate change adaptation activities in the basin; and the effectiveness of *donor support*, often of great importance for river basins in developing regions.

2.2 The Institutional Determinants of Adaptive Capacity

The following sections present the different institutional determinants of adaptation capacity in more detail, discussing theoretical approaches and hypotheses to each determinant as well as investigating the situation in various river basins with regard to the respective component. This aims at further refining the analytical framework before applying it to two specific case studies in part II.

2.2.1 Membership Structure – Integrating all Riparians into the Adaptation Process

With regard to the membership structure of RBOs an important distinction is to be made between inclusive RBOs, incorporating all riparians in the basin, and non-inclusive RBOs, bringing together only a subset of actors. International Relations (IR) theory generally argues that international institutions with a smaller number of actors are more effective in solving collective action problems (Axelrod/Keohane 1985, Snidal 1985, Keohane/Ostrom 1994). Similarly, some hydropolitics researchers agree that "large regional, especially international, organizations are less successful than small ones" (Just/Netanyahu 1998: 3, similarly Verweji 2000). On the other hand, most hydropolitics scholars (GWP 2000, Kliot et.al. 2001, Mostert 2003, Backer 2006, Goh 2007, Gerlak/Grant 2009) call for the integration of water resources management across actors. A trade-off can therefore be identified between outcome efficiency, more easily ensured by a small number of participants, and long-term impact effectiveness, ensured by broad territorial coverage of river basin management, ideally integrating all riparians in the river basin.

This is of particular importance for climate change adaptation work of an RBO: If upstream riparians are not integrated in joint governance mechanisms, as it is, for instance, the case with China in the MRC or Guinea in the Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS), upstream activities related to adapting to climate change can alter the water flow and the ecosystem of the river further downstream, while downstream climate change adaptation measures face a lack of reliability in terms of water flow from upstream, making climate change modeling more difficult. The same patterns apply to other changes in river basins, such as the construction of large hydropower projects in mountainous upstream stretches. Here, the externalities exported by the implementing state to downstream neighbors is particularly obvious, with many of the consequences of dam construction such as changes in the river's flow, altered sediment flow or the blockage of fish migration paths being felt downstream.

Among existing RBOs inclusiveness and non-inclusiveness are relatively evenly distributed, with 56 out of 108 RBOs studied being inclusive and the remaining 62 being non-inclusive (Schmeier 2010b). The most common type of RBO is thereby a bilateral RBO that unites two riparians of an otherwise multilateral river basin (with a total number of 41 RBOs), bringing together only two out of a larger number of riparians. This verifies our assumption that from a short-term efficiency perspective river basin governance is easier with a smaller number of participants. Nevertheless, we claim that with regard to the long-term effectiveness of river basin governance, the inclusion of all riparians into the governance of the river and its resources is an important precondition, since "excluding basin states from the process can lead to conflicts with these states or to suboptimal solutions" (Kliot et.al. 2001: 229). Only if all riparians participate in the coordinated governance of the river and its resources, negative externalities can either be completely avoided or forms of settlements be found.

2.2.2 Functional Scope – Ensuring Integrated River Basin Management

Similar to the membership structure, a tradeoff between problem-solving capacity and long-term impact effectiveness when managing change in a river basin can be observed with regard to the functional scope of RBOs: While some scholars emphasize the challenges multi-issue RBOs face with regard to problem-

solving (Bernauer 1997, Marty 2001, based on general IR theory such as Wettestad 1999, Koremenos et al. 2001), arguing that "the number of multi-purpose institutions is small and the number of multi-purpose institutions with a record of effectiveness is even smaller" (Marty 2001: 25), Integrated Water Resource Management (IWRM)-based assumptions call for the integrated management across sectors (Kliot et al. 2001, Dombrowsky 2007, Sadoff et.al. 2008). It can thus generally be assumed that multi-issue institutions have at least the potential to deal with change in the river basin, either in one sector already integrated in the organization's portfolio (e.g. an increase in hydropower dam construction) or with regard to cross-cutting issues such as climate change, while single-issue institutions can only focus on climate change adaptation in the specific sector their mandate focuses on. However, it also needs to be acknowledged that a very broad functional scope reduces the short-term problem-solving efficiency due to higher problem-complexity, often impeding timely decision-making and implementation. It is nevertheless argued here that a certain level of multi-issue scope is a necessary condition for effective adaptation to changes in the river basin.

Most RBOs are multi-issue institutions, while RBOs with a pure single-issue focus are rather rare (with the Danube Commission (DC), the Lake Victoria Fisheries Organization (LVFO), the Permanent Indus Commission (PIC) and the Zambezi River Authority (ZRA), focusing on navigation, fisheries, water allocation and hydropower respectively being some of the few examples). On the continuum between a singular functional scope and a broad portfolio, some RBOs focus on few but still more than one issue (e.g. ICPO and ICPR focusing on water quality and pollution control as well as on flood protection). These RBOs are believed to be able to adapt to changes such as climate change-induced water variability as well, but might be forced to slightly broaden their functional scope if required. This has been acknowledged by some of the respective RBOs. For instance, the ICPR is currently integrating climate change mitigation and adaptation in its portfolio, namely by establishing an Expert Group on Climate Change (KLIMA Group) that works under the supervision of the Working Group on Flooding, but extents its mandate across other issue-areas as well, including hydrological modeling, water quality, water level and fisheries issues.

2.2.3 Decision-Making Mechanisms – Providing for Timely and Efficient Decisions that Bind

Decision-making is a crucial component for the quality and effectiveness of international cooperation. Decision-making first of all relies on sound information management (as outlined in chapter 2.2.4). Additionally IR theory suggests that the kind of formalized voting rules are equally important for the effectiveness of environmental regimes (Wettestad 1999). In formal decision-making processes one can generally distinguish between three types of procedures: unanimity, consensus and majority voting rules. All of them are characterized by certain advantages as well as disadvantages in respect to adaptive water management. Unanimity voting rules for example can open up the option for one unwilling laggard state to obstruct the majority of actors from passing a decision (Wettestad 1999: 24). This behavior of laggard states might therefore decrease the possibility of institutions to react in a timely manner in cases of urgency such as of abrupt environmental change. On the other hand, decisions made on the basis of majority vote are more likely to be made promptly and, moreover, indicate a high power of the RBO vis-à-vis its member states (Dombrowsky 2007: 111). However, in this case decisions might be difficult to implement, especially among those members that disagreed with the respective decision taken, possibly decreasing the institution's effectiveness and making the availability of enforcement mechanisms – completely lacking in nearly all RBOs – a prerequisite for success.

In reality, majority-based decision-making mechanisms are extremely rare in RBOs (while the International Commission for the Protection of the Danube River (ICPDR) applies 4/5 majority for decisions taken by the Commission, the Commission Internationale du Bassin Congo-Oubangui-Sangha (CICOS) and the LVFO allow

for majority mechanisms to be applied in case the highest governing body of the RBO fails to reach consensus); all other RBOs, however, employ some sort of consensus or unanimity principle. It is therefore not the mechanisms by which the decisions are taken that should be focused on, but rather the timeliness and efficiency by which decisions are taken by the governing bodies of an RBO. In many RBOs experience over the past years has shown that coming to joint decisions with regard to the governance of shared water resources is often a big challenge and especially controversial decisions have taken a very long time or have never been taken – significantly slowing down the process of adaptation to natural or man-made changes in the river basin.

2.2.4 Information and Data Management – Establishing the Basis for Informed Adaptation

Water resources are part of wider and very complex ecological systems. These systems are exposed to a wide range of human actions whose impacts on the sensitive ecologies are manifold. Therefore, in order to manage water systems in a sustainable manner, a broad base of sound information is necessary. In respect to adaptive water management in international rivers relevant information includes data on the watercourse itself (quantity, quality, and timing), climate conditions and developments as well as technical, regulatory and conservation measures of the different water-related sectors such as navigation, hydropower, drinking water or agriculture (United Nations Watercourse Convention 1997, UNECE 2009).

Generating and sharing this data on a basin-wide level between all riparian stakeholders offers a number of advantages in respect to effective adaptive river basin management: Firstly, sharing information within RBOs is a prerequisite for common understanding of particular problems related to water management and thereby an important tool to build confidence between the different stakeholders. Existing consensual knowledge combined with mutual confidence is then more likely to lead to shared preferential solutions of certain problem issues and collaborative approaches for management, both necessary for responding to climate change impacts on shared water resources (Chenoweth/Feitelson 2001, Sadoff et al. 2008, Eckstein 2010). Secondly, the sharing of data and processing this data gives decision makers the flexibility to continuously review strategies, policies as well as activities and change management if necessary (Pahl-Wostl 2007: 53). In case of the absence of any form of information sharing on the other side, actors could follow an autonomous approach and attempt to maximize their own advantage, limiting inter-state cooperation and possibly acting as a driver of conflict (Turton et. al. 2005: 67). Additionally, withholding data or providing wrong information could be used as a weapon to intentionally inflict losses upon other riparian neighbours (Zawahri 2008: 285-86).

Based on the above outlined assumptions one can hypothesize that the existence and successful operation of information sharing mechanisms has a positive effect on the capacity of RBOs to adapt water management when environmental and social changes require change.

To evaluate different kinds of information management mechanism in respect to adaptive water management it is first of all important that an information exchange mechanism between all RBO member states exists. We then suggest that the level of information sharing is of high relevance which is why we look at the question whether the collection of data and other information is being coordinated by the respective institution (regional level) or remains in the hands of the riparian states (national level). Additionally, we ask whether non-member riparian states are included in generating as well as sharing information which we think is crucial for adaptive management.

A first look at the sample of RBOs suggests that data and information management remains in the hands of the RBOs member states as long as the level of institutionalization of the RBO is low and little has been achieved in terms of joint water resources governance (e.g. the case in the Organization of the Amazon

Cooperation Treaty (ACTO) and in the PIC), while data and information is increasingly managed at the RBO level as cooperation intensifies (for instance in the International Scheldt Commission (ICBC), in the ICPO and in the Lake Chad Basin Commission (LCBC)).

2.2.5 Dispute-Resolution Mechanisms – Maintaining Long-Term Cooperation beyond Conflicts

In many international river or lake basins members continue to experience disputes over the management of water resources even after joint institutions have been established. This is particularly true when facing unpredicted developments such as sudden environmental change (floods, droughts, saltwater intrusions) or socio-economic developments (economic growth, dam construction or increasing water demands). Therefore, incorporating clear conflict-resolution mechanisms for resolving conflicts is not only important for ensuring long-term stable cooperation on shared watercourses (emphasized by various hydropolitics scholars such as Vinogradov/Langford 2001, Ochoa-Ruiz 2005, Sohnle 2005, Dinar 2008, Fischhendler 2008), but also for adaptive and sustainable water management with regard to change (Giordano and Wolf 2003: 170).

Different tools and mechanisms are used in international RBOs to address water conflicts. Issues of dispute can for example be referred to oversight bodies such as the International Joint Commission (IJC) for waters shared between the USA and Canada. Also regional bodies such as the African Union (AU) or the Southern African Development Community (SADC) can serve as mediators if problems between riparians arise. In other cases, international actors play a significant role in conflict resolution. This is for example the case for the Indus Water Treaty where the World Bank has the responsibility to appoint a 'neutral expert' in case dispute between the two member states cannot agree (Sadoff et al. 2008). Without such conflict resolution mechanisms in place, the ability of a water system to adapt to the effects and impacts of climate change are seriously hampered.

With regard to the sheer existence of dispute-resolution mechanisms, it can be shown that most RBOs have some sort of dispute-resolution mechanisms in place, most often established in the underlying agreement. The level of dispute-resolution however varies significantly across RBOs: While some RBOs rely on the negotiation of potentially arising conflicts between the parties involved (e.g. the Comision Binacional Puente Buenos Aires Colonia (COBACIO), the Greater Tumen Initiative (GTI), the International Meuse Commission (IMC), and the Interstate Commission for Water Coordination in Central Asia (ICWC)), a smaller number of RBOs relies on RBO-based dispute-resolution in the first place (such as the Nigeria-Niger Joint Commission for Cooperation (NNCJ) and in the PIC). In some cases an external body is assigned to finally decide on disputes in case negotiations among the conflicting parties fail (e.g. in the case in the Commission International pour la Protection de la Moselle (CIPM), in the ICPDR , OMVS, or the Orange-Senqu River Commission (ORASECOM)), in other cases, the RBO itself serves as a dispute-resolution body in the case negotiations – the first choice of dispute-resolution in many RBOs – fail (e.g. in the ICPR, in the Lake Tanganyika Authority (LTA) and the LVFO).

This great diversity in dispute-resolution mechanisms indicate that developing a clear hypotheses that specify which mechanisms for the resolution of conflicts related to changes occurring in the river basin are the most effective for successful adaptation is rather difficult. It is therefore argued that it is most important that any form of dispute-resolution is provided that ensures the timely resolution of conflicts and that guarantee member states' commitment to complying with decisions taken in this context.

2.2.6 Financing of RBOs – Providing the Means for River Basin Management and Adaptation

In order to function properly and to cope with changes in the river basin, RBOs need the financial means to cover costs of administrative services, staffing, program and project financing, adaptation measures, knowledge production or capacity building. Adapting to changes in the river basin necessarily requires additional financial means – either based on additional member contributions, the acquisition of external funding or the reallocation of resources from other projects.

Generally, funding can be provided through different channels, most often by contributions from member states, external contributions from donors or any combination of these. Usually, it is assumed that regimes that succeed in establishing well-functioning, compliance-supporting financial mechanisms tend to be more effective than regimes that fail in this regard (Wettestad 1999: 37).

With regard to membership contributions, it can be distinguished between equal cost-sharing mechanisms where all members contribute the same share to the organization's budget (for example in the International Sava River Basin Commission (ISBC) and the LTA), and cost-sharing based on a specific key, assigning contributions according to criteria such as share of the river basin, GDP-based economic strength, or benefits from joint projects. The former mechanism for example exists in the ORASECOM where every member state pays 500,000 South African Rand/year to cover the operational costs of the secretariat. The latter mechanism can be found in the LCBC, where the annual national budget of each member state is taken as a basis for calculation. In the OMVS benefits from joint projects serve as the basis for cost-sharing calculations. Similarly, in the ZRA costs are partly covered by charging the water that ZRA delivers to two electricity companies in Zambia and Zimbabwe. Taking into account the different financial capacities of member states often found in developing river basins, establishing flexible financing mechanisms can significantly contribute to the sustainable funding of the institution.

2.2.7 The Engagement of International Donors – The Pros and Cons of External Involvement

Very often external actors such as international organizations and multilateral development organizations have played an important role in promoting cooperation: For instance, the World Bank has significantly contributed to the establishment of cooperation in the Indus River Basin by supporting the signature of the Indus Treaty in 1960 and has provided substantive financial and technical support to the Nile Basin Initiative (NBI); the United Nations Development Programme (UNDP) has made important contributions to the negotiations of the 1995 Mekong Agreement; and the Global Environmental Facility (GEF) has significantly supported cooperation in the Danube River Basin and promoted the ICPDR. Moreover, the provision of funding by external donors and multilateral development banks, often accompanied by technical assistance, is of great importance to ensure the long-term functioning of joint river basin governance. Most donor financing provided to RBOs in developing countries is however earmarked and targeted towards specific projects or programs, thus often challenging donor harmonization and alignment.

With specific regard to adaptation financing it is important to acknowledge that global climate change policy also provides a wide array of new financing mechanisms for developing countries that can help acquire the financial resources required for implementing adaptation and mitigation projects. For instance, the United Nations Framework Convention on Climate Change (UNFCC) Adaptation Funds are available for developing countries in order to finance both projects reducing the emission of Greenhouse Gases (GHG) and allowing for adaptation to climate change consequences. The World Bank has also established various funds that help developing countries to mitigate climate change consequences and the Water Resources Sector Strategy features various approaches for climate change adaptation in water resources management (refer to World Bank 2010). In addition, bilateral donors have increasingly developed ODA mechanisms

focusing specifically on climate change-related projects (e.g. the German Technical Cooperation (GTZ) is engaged in projects contributing to reducing GHG emissions in developing countries and in projects aiming at better adapting countries to and mitigating the consequences of climate change, especially for the most vulnerable poor, including projects on disaster risk management, flood protection and early warning systems).

The analytical framework developed in the previous chapter is now applied to two case studies –OKACOM and MRC. These case studies have been chosen based on a most different cases design, aiming at capturing the variety of river basin management issues in the developing world. While the Okavango River Basin is characterized by threats of various environmental problems, namely the degradation of the ecosystem in the delta, and OKACOM therefore has a clear focus on environmental protection, cooperation in the Mekong River Basin was developed based on a clear socioeconomic development mandate and has only recently incorporated sustainability considerations and environmental protection mechanisms. Moreover, the institutional design of the two RBOs varies significantly, as does their funding structure. Lessons learned from the study of OKACOM and MRC can therefore provide important insights on the adaptation capacity of other RBOs in the developing world as well.

Part II: Case Study Analysis

3. Case Study I: The Okavango River Basin and OKACOM

3.1 Environmental Change in the Okavango Basin

The Okavango River Basin, shared by the southern African states of Angola, Botswana, Namibia and Zimbabwe encompasses an area of 725,000 km² (UNDP 2005). The river rises in the highlands of Angola, from there flows through Namibia and finally ends eastward in Botswana in a vast swamp in the Kalahari Desert known as the Okavango Delta. The delta offers a unique habitat with a high biodiversity of fauna and flora and provides the basis of the regional tourist industry.

The Okavango River Basin is one of the least developed basins in Africa. Especially water resources in Angola, which contributes over 90% of the Okavango water, are unexploited. Angola thus far only uses a small portion of the water for domestic use and small-scale farming. The same accounts for the other riparians which use the water for household consumption, irrigation and cattle farming. No major infrastructure projects have thus far been developed along the river which makes it a unique case within international river basins inhibiting great future development potentials. However, growing population and economic development threaten to change this situation. Especially development in Angola, which had suffered a 27-year long civil war and today enjoys rapid economic growth, has to meet the needs of a recovering and growing population and industry. Angola therefore is likely to increase water extraction in the future and enhance infrastructure development within the basin such as for hydropower development. Water demand in the water-scarce downstream countries of Namibia and Botswana are also increasing. Since 1993 Namibia has striven to provide its population with water from the Okavango stream by building a pipeline from the Okavango River to Grootfontein and linking the river system with Windhoek (Eastern National Water Carrier). Botswana is generally concerned about such upstream development plans as it fears this could negatively affect the Okavango Delta which is so important for its tourism industry.

However, the potential impacts of social developments on the long term water availability in the river are far less significant than expected impact of climate change. Although making predictions for future climate change in the Okavango is particularly difficult – mainly because of the complex climate and a lack of data from Angola where most of the stream flow is generated – most climate models predict significant changes

in river flow in the second half of this century (Andersson et al. 2006, for an overview of different climate models refer to Todd et al. 2009, Burg 2007). Temperatures are expected to rise between 3 to 5°C ultimately leading to changes in evaporation rates which are expected to increase by 10 to 20%. Predictions of rainfall are far less certain and vary significantly depending on the time frame and type of model used. However, most predictions expect a decrease of rainfall in southern Africa, especially in the extreme west (Namibia) where loss could amount up to 40% (Christensen et al. 2007). Less overall rainfall and increasing temperatures are expected to reduce mean annual flow of the Okavango river up to 20% for the period of 2050 to 2080 with even proportionally larger impact on minimum monthly flow which show reductions of up to 27%. These variabilities indicate that the likeliness of extreme hydrological events will significantly increase (Andersson et al. 2006).

Thus generally drier conditions and a decrease in river runoff will lead to a shrinking of the Okavango Delta and the available habitat for ecosystem as well as resources for human consumption. Climate change therefore can deepen diverging interests between riparian states. For example if water shortages are blamed on upstream abstraction in Angola for the construction of hydropower dams, even if they are caused by climatological changes. The same is true for increasing water demand due to rising temperatures in a water-scarce country like Namibia which could be tempted to unilaterally realize its pipeline project to the Eastern National Water Carrier at Grootfontein. Both scenarios would necessarily affect downstream Botswana that depends on the biodiversity of Okavango Delta for the tourism revenues it generates.

3.2 Institutional Adaptability within the River Basin - The Role of OKACOM

3.2.1 Building of a Joint Institution – The Establishment of OKACOM

OKACOM has been established on the basis of two prior institutions: The Permanent Joint Technical Commission (PJTC) established between Namibia and Angola and the Joint Permanent Technical Commission (JPTC) between Namibia and Botswana. In both cases Namibia took a pro-active role as it saw the need to use the Okavango water supplies for its water scarce central areas. At the same time the country saw a chance to realize its demands after it reached independence in 1990. The new government of Namibia suggested bringing the commissioners of the two bilateral commissions together to set up a joint institution between Angola, Botswana and Namibia which finally led to the establishment of the OKACOM on 15 September 1994 in Windhoek (Pinheiro et al. 2003: 114-115).[3] It was however not before 2007 that the member states formally agreed on a permanent institutionalized structure for OKACOM and passed the Agreement on the Organizational Structure of the Permanent Okavango River Basin Commission (2007); refer to graph above (graph by author).

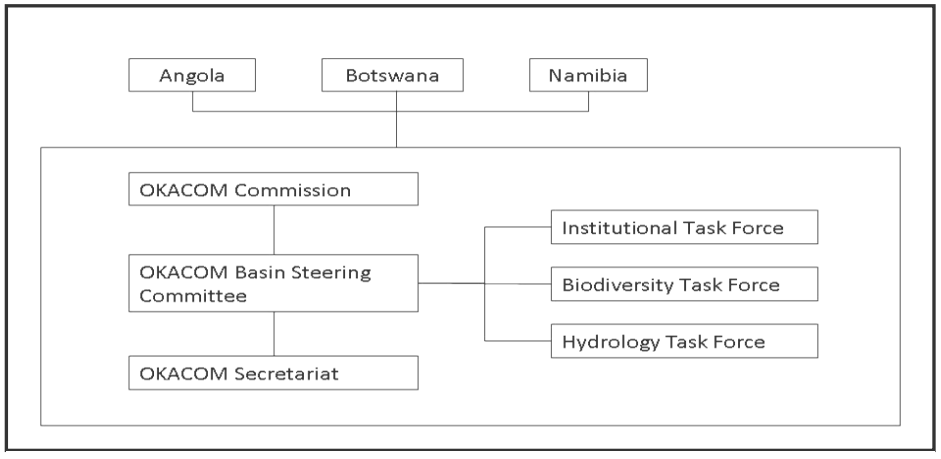

Fig. 1: OKACOM organizational structure.

[3] The formation of OKACOM was also driven by intensive lobbying of international and national nongovernmental organizations that wanted to prevent development measures along the Okavango in order to protect basins' ecosystem(refer to Klaphake and Scheumann 2006: 18).

OKACOM acts as a technical advisor to the member states on matters relating to the conservation, development and utilization of water resources of common interest to all member states (Agreement 1994, Art. 1). The organizational structure is defined by the Agreement on the Organizational Structure of OKACOM which came into force in 2007 (OKACOM 2007). The three main organs are the Commission consisting of representatives of each of the members which defines the overall policy objectives and supervises all activities of OKACOM, the Okavango Basin Steering Committee (OBSC) that acts as the technical advisory body to the Commission and consists of three main task forces, and the Secretariat (OKASEC) that provides administrative, financial and general secretarial services to the Commission (OKACOM 2007).[4]

3.2.2 OKACOM – Institutional Determinants of Adaptation Capacity

The membership structure of OKACOM is an inclusive one. Although Zimbabwe, which technically is a riparian state of the Okavango too, is not included in the 1994 Agreement, one can speak of inclusiveness as its contribution is relatively marginal. Though the Nata River catchment in Zimbabwe forms a part of the broader Okavango Delta only Angola, Botswana and Namibia have direct access to its perennial flow (Pinherio et al. 2003: 107). Therefore one can speak of an inclusive membership structure of OKACOM which supports effective adaptation as all riparians are integrated into the cooperative management framework. This is also likely to have a positive influence on future development work such as hydropower projects realized in Angola which will only be undertaken if all riparians agree and therefore any negative impacts on the downstream riparians are either avoided or some form of compensation mechanism will be applied.

OKACOM's functional scope is defined by the 1994 OKACOM Agreement (Art. 4) which states that the primary functions of OKACOM are to: Determine the long term safe yield of the river basin; estimate reasonable demand of all consumers; prepare criteria for conservation, equitable allocation and sustainable utilization of water; conduct investigations on the development of water resources and related infrastructure; recommend pollution prevention measures; develop measures for the alleviation of short term difficulties, such as temporary droughts; and address other matters determined by the Commission.

This relatively broad multi-issue functional scope provides a basis for an inter-sectoral water management approach considering such different aspects as environmental protection, water demand management and economic development under one institutional umbrella. Therefore OKACOM has the potential to deal with climate change issues in the river basin across sectors and pursue inclusive and sustainable development measures. However, it needs to be seen whether in times of increasing climate change actions can be taken in a timely and effective manner.

Additionally OKACOM is currently in the process of establishing initiatives to explicitly address impacts of climate variability and potential climate change. At the last meeting in May 2010 OKACOM countries agreed on a Protocol on Hydrological Data Sharing for the Okavango River Basin to share hydrological river information and to set up provisions of an early-warning information system. Thereby the basin Committee will be responsible for providing data on floods, droughts and water pollution levels to OKASEC which in turn will distribute data to the member countries (OKACOM 2010, Art. 14).

OKACOM's decision-making is carried out by means of negotiations among the concerned parties within the Commission and is based on consensus building (Agreement 1994, Art. 3). Although Commission

[4] Besides the formal structure of the OKACOM a Basin Wide Forum (BWF) has been established. It consists of 10 local community representatives from each of the member states and serves as a forum of communication and knowledge exchange.

meetings took place regularly during the 1990s no major decisions were concluded, primarily due to the Angolan civil war which resumed in the second half of the 1990s after breaking the 1994 Lusaka peace agreement. A case in point for the difficulties related to effective decision-making was the first attempt to carry out a Transboundary Diagnostic Analysis (TDA) when the OKACOM member states were not able to approve the final report of the project. Since reaching peace in Angola in 2002 OKACOM was able to move forward and decision-making within the Commission has picked up speed. From 2003 onwards OKACOM began launching a number of projects such as the Environmental Protection and Sustainable Management of the Okavango River Basin (EPSMO) Project which aimed at preparing a new TDA of the Okavango River Basin and to formulate a Strategic Action Program (SAP) to facilitate joint management of the water resources of the basin. Other newly launched projects included the Okavango Integrated River Basin Management Project (IRBM) as well as the Every River Has Its People Project (ERP).

Data and information management procedures and responsibilities are spelled out in the Agreements of 1994 and 2007. Art. 3 of the 2007 Agreement assigns information sharing at the level of OKACOM which has the right “to collect and disseminate information of common interest on the use and development of the Basin”. The role of all three OKACOM bodies in respect to information and data management are clearly spelled-out in the Agreement. Thereby the Commission has the main coordinating role: it is to “submit technical, economic, financial and legal information required for the preparation of the Master Plan for the integrated use of water resources of the Basin, for consideration and approval by the Contracting Parties” (Art. 7). The preparation of joint information including information for a Master Plan as well as annual and multi-annual work plans lies within the hands of OBSC (Art. 12). Finally, OKASEC is in charge of collecting and disseminating information on all OKACOM activities including the building and maintenance of a joint database (Art. 16).

In order to implement information sharing and communication system OKASEC has started to transfer and update a metadatabase which was designed by the IRBM project and compiled information of different existing databases in the region. This database will be enriched by information generated by the TDA that was finalized in 2009 (OKACOM 2009). Within the Okavango TDA process environmental, social and economic impacts of flow regime change due to changing water resource developments in the basin such as water abstraction, land use and climate change were evaluated and publicized in a number of papers that are all accessible online. The TDA did not only identify existing problems but also generated future resource development based on different water use scenarios. The most important achievement of the TDA however is the common standardization approach across the three countries which allows comparability of different datasets and thereby generates consensual knowledge on the current as well as possible future problems which again is likely to facilitate future agreements on collaborative development approaches.

Information and data management within OKACOM therefore is very promising. Especially the fact that knowledge is generated in joint projects where researchers of all three states come together to develop comparable methodological data and information is of great significance. This provides an important basis for building trust between the riparian states and presents baseline knowledge for future development. This kind of baseline information is also crucial to understanding current and possible future climate change implications and taking reactive as well pro-active measures such as mitigation and adaptation programs to adapt to environmental changes. Despite these very hopeful approaches towards data and information management, it remains to be seen whether the implications arising from this information will be implemented into respective national policies.

OKACOM's dispute-resolution mechanism is formulated in Art. 7 of the 1994 Agreement and specifies that "any dispute as to the interpretation or implementation of any Article of this Agreement shall be settled by the Contracting Parties". There are no further specifications on how such settlement could be reached or which possible third-parties could be referred to in case an agreement on a certain issue cannot be found between the contracting parties. It therefore remains to be seen whether this relatively vague mechanism will be sufficient in resolving possible future disputes once concrete development projects will be decided upon within the OKACOM Commission and whether more specific solutions can be found.

Different financing alternatives for OKACOM are spelled out in the 2007 Agreement which provides the option of finance raised through membership contributions, donor assistance or income raised from duties on the use of common water resources (Art. 19). Nonetheless, in reality OKACOM's financing thus far almost exclusively relies on donor funding. The Swedish International Development Cooperation Agency (SIDA) is one of the key international cooperation partners (ICP) in the financial model of OKACOM. SIDA has committed itself to supporting the activities of the Secretariat for a total period of ten years. During that time Swedish funding, as donor funding in general, will continuously decrease while member state funding increases (Pietersen 2008: 38)[5]. The United States Agency for International Development (USAID) is the other of the two major donor partners. USAID provided substantial support for the interim Secretariat Services for OKACOM, is currently co-funding the SIDA's OKACOM support program and finances projects such as the IRBM project or the Southern African Regional Environmental Program (SAREP). Finances covered by the member states include payments for delegations at OKACOM meetings as well as costs arising from hosting meetings.

Donor involvement in general plays a very significant role in the function of OKACOM. However, it is important to note that the establishment of OKACOM itself was a proactive initiative by the riparian states and not imposed by any external actor. Since its establishment, however, OKACOM has been dependent on donor contributions and was relatively successful in mobilizing international support. Besides contributions to the general budget, development partners have been particularly important in the process of data and information collection within basin. Especially the EPSMO project that is receives funds and technical support by GEF has just finalized the production of the TDA (2009) and thereby generated valuable scientific information and analysis on the state of the Okavango resources. EPSMO has established organizational links with National Coordination Units (NCU)[6] and OKASEC that will be able to use the final products of the project for the formulation and implementation of the basin-wide SAP. Thus involvement of ICPs in the Okavango is not only significant for the provision of financial support but also plays an important role in the provision and distribution of scientific knowledge.

Generally, one can therefore say that the involvement of international actors has been absolutely necessary for the functioning of OKACOM in respect of finances, technical support and knowledge generation. On the other side, however, this involvement also partly pre-determines OKACOM's strategic direction and prioritization of actions and could therefore endanger long-term sustainability and ownership.

[5] As contributions from international cooperation partners are phased out, membership contributions are expected to grow from an annual USD 100,000 (2008) to USD 400,000 (de Wet et al. 2009: 53).

[6] NCUs are informal management units linking project coordination at OKACOM level with the national level of the member countries.

4. Case Study II: The Mekong River Basin – Increasing Resilience

4.1 Change in the Mekong River Basin – The Urgent Need for Adaptation

The Mekong River Basin, covering an area of 800,000 km^2 in mainland Southeast Asia, is facing various challenges related to climate change. Although knowledge about climate change effects is still limited for the region, certain scenarios have been developed by researchers and can now be perceived as consensus (Eastham et al. 2008, IPCC 2008, MRC 2009a; for an overview of different studies conducted refer to Hinkel/Menniken 2007). First and foremost, higher temperatures (with an expected increase by 0.79 degree by 2030) are expected to occur in the basin, increasing drought risks in some areas and threatening on the river's ecosystem. Increasing annual precipitation by about 15.3% in average across the basin is expected, however concentrated in the wet season. Changes in precipitation between wet and dry season are thereby of particular importance for the basin, with the dry season becoming significantly drier and the wet season expected to experience even more precipitation, thus intensifying existing flood and drought patterns. In the Lower Mekong Basin (LMB) Thailand will thereby mainly be influenced by prolonged dry seasons, increasing drought threats in the country's Northeast, which heavily depends on irrigated agriculture; Lao PDR, on the other hand, is likely to be affected by increasing wet season and decreasing dry season flows, with floods risks increasing mainly in the tributaries (in the form of flash floods, often causing high numbers of fatalities); Cambodia will mainly be affected by increasing wet season flows, leading to increasing frequency, duration and severity of floods. In addition, changes in the dry season flow of the river threaten the re-filling of the flood plains and thus the productivity of the country's agriculture which is still facing major development challenges in terms of technical capacity and infrastructure development[7]; and Vietnam is mainly affected by salinity intrusion due to decreasing water flow from upstream especially in the dry season, pushing salt water into the delta and thus into the most productive agricultural region of the country, as well as by increased flooding in the delta[8].

As a consequence, climate change is likely to intensify existing collective action problems between riparian states, especially if adaptation measures taken at the national level create externalities affecting other riparian states as well. For instance, adaptation measures developed by farmers upstream in China, moving from rain-fed to irrigated agriculture due to changes in rainfall patterns and the increasing availability of storage facilities due to dam construction will necessarily affect downstream water availability. Similarly, water resources management in the case of extreme weather events such as floods and droughts in upstream regions necessarily affects downstream conditions as well, e.g. when dams are suddenly released in times of flood, worsening flood situations downstream.

In addition, the Mekong River Basin is facing severe challenges related to man-made changes in the basin, especially with regard to hydropower dam construction – both in terms of size of the projects and in terms of their potential impacts on the river basin, its ecosystem and its riparian states: In China, hydropower development is the most advanced, with four dams having been completed already on the Mekong mainstream[9] and another being in the planning or even construction phase. In the LMB, hydropower development has been scaled up significantly in recent years, with currently 13 mainstream projects being

[7] The unique hydrological system of the Tonle Sap is thereby of particular importance. During the wet season, the Tonle Sap changes its water levels and extends to a tremendous size, flooding surrounding flood plains and providing them with much needed water, sediments and fish, sustaining a unique ecosystem on which the population depends for their livelihoods.

[8] Consequences of severe floods are already today altering the country's development opportunities. For instance, floods in 2000, 2001 and 2002 have reduced the annual value of Vietnam's agricultural production in the delta by US-$ 200 to 300 million (MRC 2010a: 91).

[9] These are the Dachaoshan, Jinghong, Manwan, and Xiaowan Dams.

under consideration or even planning[10]. In addition, an enormous number of hydropower projects are planned on Mekong tributaries, mainly in Lao PDR and Vietnam.

First and foremost, the development of hydropower dams are likely to alter the flow regime of the river, which in turn affects water availability and sediment transports downstream – thus affecting agricultural production. In addition, hydropower dams block passages for migratory fish – species that are of particular economic importance in the Mekong River Basin and ensure a large share of the protein supply for local populations, especially in Lao PDR and Cambodia. Besides immediate threats to the socioeconomic development of affected countries (most often further downstream), the tremendous hydropower development in the Mekong River Basin is also likely to lead to the (re-)emergence of water-related collective action problems, potentially leading to conflicts among riparians, in turn affecting socioeconomic development opportunities in the basin.

4.2 Institutional Resilience in the Mekong River Basin – The Role of the MRC

The MRC has been established by Lao PDR, Thailand, Cambodia and Vietnam in 1995, based on the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, signed on April 4, 1995. The 1995 Agreement itself already provides several treaty-based adaptation clauses, namely by incorporating international water law principles such as the obligation to cooperate, the principle of equitable and reasonable utilization, the obligation not to cause significant harm, the principle of prior notification (Art. 5 and 26)[11].

The MRC as an RBO is based on a three-fold governance structure (see graph on the right; graph by author), consisting of a Council that determines the overall direction of water resources management on the ministerial level, a Joint Committee (JC), operationalizing water resources governance into strategies, programs and projects, and a Secretariat (MRCS), providing technical, administrative and financial services for program and project implementation as well as various other functions, going beyond most RBO Secretariats' functions (Schmeier 2010a). In addition, the MRC consists of a Donor Consultative Group (CDG), responsible for the coordination of donor activities in the region and with a relatively strong informal influence within the institution, and National Mekong Committees (NMCs) in each member countries, responsible for linking national water resources management policies and regional cooperation efforts in an efficient way.

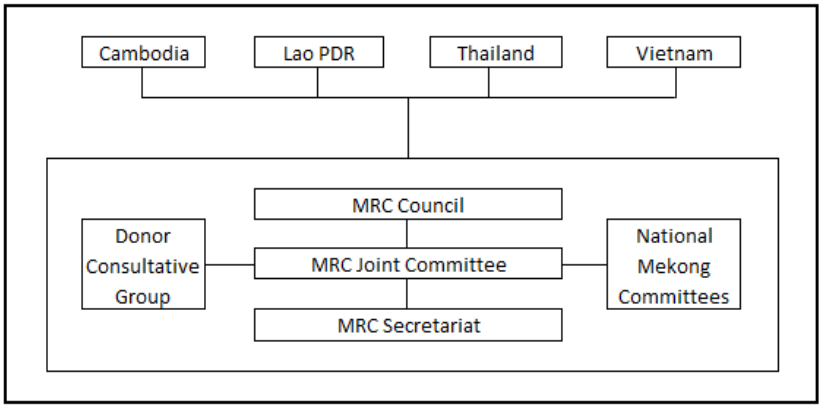

Fig. 2: MRC organizational structure

MRC's membership structure is characterized by non-inclusiveness. The 1995 Agreement has only been signed by the four downstream riparians (Thailand, Lao PDR, Cambodia and Vietnam), leaving Myanmar and China outside the cooperative framework. MRC's membership structure can therefore be regarded as

[10] These are the Ban Koum, Don Sahong, Lat Sua, Luang Prabang, Pak Beng, Pak Chom, Pak Lay, Xanakham Xayaboury Dams and in Lao PDR and the Kamchay, Sambor, and Stung Treng Dams in Cambodia.

[11] These provisions have been further developed in various Procedures (namely Procedures for Notification, Prior Consultation and Agreement, Procedures for the Maintenance of Flow on the Mainstream, Procedures for Water Use and Monitoring), which further specify how the various principles of water law are implemented and applied to the specific context of the Mekong River Basin.

an impediment for effective adaptation, since upstream riparians are not integrated into the cooperative management framework, leaving their actions with regard to hydropower development, climate change adaptation or other newly arising challenges outside of MRC's IWRM approach. For instance, Chinese measures to adapt to climate change, namely the shift from rain-fed agriculture to irrigated agriculture due to decreasing precipitation in the upper stretches of the Mekong River Basin and the availability of infrastructure for water storage due to the development of hydropower dams is likely to influence downstream water availability and thus downstream adaptation measures as well. Especially the still insufficiently developed cooperation with China, concerning the exchange of hydrological data as well as the operation of Chinese hydropower dams, is likely to become an increasingly significant impediment to successful integration in the river basin. While there are mechanisms in place to coordinate with upstream riparians (such as the annually held Dialogue Partner Meeting and the Agreement on Data Sharing signed with China in 2002), integrated water resources governance and thus comprehensive adaptation integrating all riparians is not ensured yet.

MRC's functional scope is determined by Art. 1 of the 1995 Agreement, giving the MRC the mandate to work on cooperation in "all fields of sustainable development, utilization, management and conservation of the water and related resources in the Mekong River Basin, including, but not limited to, irrigation, hydropower, navigation, flood control, fisheries, timber floating, recreation and tourism". This multi-issue focus of the MRC ensures a certain degree of integrated water resources management through uniting the different aspects of water resources use in the river basin under one organizational roof. Currently, the MRC is undergoing some fundamental changes with regard to its functional scope: In parallel to the implementation of the 3rd Strategic Plan 2011-2015 (MRC 2010), core functions will be developed and implemented (see MRC 2009c) that shift the MRC from an implementation-focused to a coordination-oriented RBO (refer to Schmeier 2010a). The impact of this organizational reform on MRC's adaptation capacity can, however, not be evaluated yet.

Moreover, the MRC has specific programs and initiatives in place that explicitly target important changes the river basin is experiencing, notably the Climate Change and Adaptation Initiative (CCAI), the Flood Management and Mitigation Programme (FMMP), and the Initiative on Sustainable Hydropower (ISH): MRC FMMP was established in 2002[12], based on the approval of the Flood Management and Mitigation Strategy which had been developed upon request of the MRC Council at its Meeting in October 2000. Its strategic goal is defined as "people's suffering and economic losses due to floods are prevented, minimized, or mitigated, while preserving the environmental benefits of floods" (MRC 2002: 1), to be implemented on the basis of six program components[13]. The CCAI was established based on a decision of the 20th Meeting of the MRC JC, foreseeing a regional initiative that supports MRC member countries in planning and implementing climate change adaptation work. Its work is based on a vision of "an economically prosperous, socially just and environmentally sound Mekong river Basin responsive and adapting to the challenges induced by climate change" (MRC 2009d: 6). In order to reach this vision, CCAI's objective has been defined as "climate change adaptation planning and implementation is guided by improved strategies and plans at various levels and in priority locations throughout the Lower Mekong Basin" (MRC 2009d: 16). This objective has

[12] The history of joint flood management and, especially, forecasting is much longer in the Lower Mekong Basin: Following severe floods in 1966, member states of the MC established a forecasting system which was operational in the early 1970s. Further improvements were made in the late 1970s, following a devastating flood in 1978. FMMP is thus built on a history of cooperation among LMB riparian states in the field of flood management, acknowledging the benefits of joint efforts in managing and mitigating the floods of a transboundary river.

[13] 1. The Regional Flood Management and Mitigation Center, 2. Structural Measures and Flood Proofing, 3. Transboundary Issues, 4. Emergency Management, 5. Land Use (MRC 2002: 6).

been operationalized into four main outcomes MRC CCAI aims to achieve[14], for which several indicators have been defined (MRC 2009d: 16). The establishment of ISH in 2008 (building on a hydropower strategy approved in 2001 already; MRC 2001) marks an increased involvement of the MRC in hydropower development in the Mekong River Basin, reacting to ongoing hydropower project planning, development and implementation. Its task is to coordinate hydropower-related analysis and adaptation across MRC programs[15] and to undertake Environmental Impact Assessments (EIAs) for dams planned in the LMB. This includes the facilitation of the Procedures of Prior Notification and Agreement, to be triggered as soon as the first mainstream dam in the LMB is moving ahead (expected for the next months). Moreover, ISH is engaged in promoting stakeholder dialogue in the basin, namely in form of Regional Multi-Stakeholder Consultations, and building capacity/knowledge sharing among policy-makers at all governance levels (including hydropower developers, riparian communities and external actors such as NGOs).

With regard to its functional scope, the MRC can thus be considered as capable of integrating climate change adaptation (as well as other responses to newly emerging challenges in the river basin) into its work program and ensuring the integrated management of water resources in the river basin under changing conditions.

Decision-making within the MRC is characterized by a very strong reliance on consensus-building, based on the so-called 'ASEAN-way'. Decisions taken by the MRC so far in its development have always taken a considerably long time, requiring consensus-making among participants before even bringing the issue to formal decision-making at the Council Meeting (as, for instance, the decision on the permanent location of MRCS has demonstrated in 2009, having resulted in a compromise that is prone to decrease MRC's efficiency notably). Decision-making within the MRC can thus be regarded as formally sufficiently codified, but practically relying on cultural and informal mechanisms often significantly delaying decision-making and thus implementation processes. Since adaptation requires timely decisions to be taken in order to respond to rapid changes in the river basin, MRC's decision-making procedures can be regarded as one of its main challenges with regard to successful adaptation.

Data and information management is spelled out in the 1995 Agreement (Art 30 mandates the MRC to "maintain databases of information" 1995 Agreement) and in the Rules of Procedures of the Council (Rule 21 states that MRCS "shall maintain and provide annual and other reports on data, information and analysis" for the Council and the JC). In addition, MRC has developed a formal data and information sharing protocol that clarifies data and information share between the four countries and MRCS. In addition, the Procedures for Data and Information Exchange and Sharing (2001) aim at operationalizing data and information exchange among MRC member countries, making available data and information for public access and thus promoting the overall cooperation among MRC members. Therefore, several binding principles have been established: Data and information exchange should be arranged in an efficient, equitable, reciprocal and cost effective manner; member states will provide data and information to MRCS on issues concerning water resources, topography, natural resources, agriculture, navigation, flood, infrastructure, urbanization, environment, administrative boundaries, socioeconomic developments and tourism; and MRC will ensure standards for data exchange and set modalities for sharing. In order to

[14] These four main outcomes of MRC CCAI are 1. Adaptation planning and implementation is piloted and demonstrated throughout the region; 2. Improved capacity to manage and adapt to climate change at different levels; 3. Strategies and plans for adaptation at various levels are in place and/or regularly updated and integrated with appropriate development plans, with implementation monitored and reported on a regular basis; 4. Regional cooperation, exchange and learning implemented through partnerships (MRC 2009d: 16).

[15] This includes the development of assessment tools for hydropower impacts on various sectors, including, for instance, the study of barrier effects of hydropower dams to fish migration, the analysis of specific design requirements for locks in order to ensure navigation on the river. This includes the acquisition, collection and analysis of hydropower-related data within the MRC, at the disposal of stakeholders in the basin.

effectively manage this data, MRCS will maintain an MRC Information System (MRC-IS). While not directly concerned with climate change, the availability of data and information and the exchange between MRC member states is a necessary prerequisite for effective climate change adaptation on the national and on the regional level, providing MRC with the means to develop, implement and monitor climate change mitigation and adaptation mechanisms. However, in the MRC's day-to-day work, sharing data and information within the MRC programs and projects as well as with stakeholders in the basin and beyond is rather weak, especially in comparison to its ambitious goals. This could significantly impede its adaptation work with regard to climate change, hydropower projects and other changes in the river basin. On the other hand, MRC has the general structures in place to ensure efficient data and information management and "only" needs to turn its general capacity into action.

Formally, dispute-settlement mechanisms are in place in the Mekong River Basin: Art. 34 and 35 of the 1995 Agreement define MRC's dispute-resolution mechanisms. There, MRC is asked to make "every effort to resolve the issue" (Art. 34), placing dispute-resolution at the first instance on the regional RBO-level. Generally, the Council is in charge of solving disputes that have been referred to it by the JC (which is mandated to solve disputes itself if they occur urgently between Council Meetings). In addition, there is the possibility to refer unresolved issues to the governments of member states for diplomatic negotiations or to request the assistance of a mutually agreed upon third party (Art. 35) – especially if the institutional resolution of the respective conflict fails[16]. Despite the existence of dispute-resolution mechanisms and the clear description of roles and mandates, experiences in the LMB illustrate the lack of well-functioning dispute-resolution mechanisms. In the past, conflicts arising related to the governance of the river and its resources and in particular to changes related to interventions of member states into the basin have neither been solved efficiently by the organization nor have any binding solutions been complied with by the members: For instance, the establishment of a specialized dispute-resolution mechanism on the Se San River, a tributary to the Mekong, led to little success, with members only meeting three times between 2000 and 2004 and not coming to a decision on how to solve the dispute between Vietnam and Cambodia. In response, these two countries established an alternative mechanism under the auspices of the Asian Development Bank (ADB), which has, however, also not been effective so far. This lack of effective dispute-resolution based on the 1995 Agreements mechanisms is mainly related to the specific consensus-culture in the river basin (often referred to as the 'ASEAN-way'), which favors informal discussions instead of formal mechanisms.

Upcoming changes in the river basin are likely to further challenge the culture of dispute-resolution in the region: The first Prior Notification and Consultation Process, expected to be triggered by Lao mainstream hydropower development later in 2010, will be another testing ground for the functioning of MRC dispute-settlement mechanisms.

Overall, MRC's funding availability is very favorable to effective river basin governance. The organization has access to a relatively large annual budget (US-$ 23 million in 2009; MRCb 2009: 3), especially in comparison to most other RBOs in the developing but also in the developed world. The first prerequisite for successful adaptation – the general availability of funding – is thus given. However, MRC's financing heavily relies on donor contributions: Currently, MRC member states contribute about 45% to the operating expenses of MRC (that is, to the core budget, excluding program costs), the rest is funded by donors, which also fund the Technical Cooperation Budget covering all program activities of the MRC (MRC 2006: 55 ff.). The most important donors are thereby Australia, Denmark, Germany, Japan and Sweden. Donor funding

[16] Interestingly, in the MRC institutional dispute-resolution comes before bilateral negotiations among the conflicting parties, thus structuring the dispute-resolution the opposite way of most other RBOs. This is, however, not the place to further investigate whether this particularity in dispute-resolution significantly affects MRC's overall effectiveness with regard to adaptation.

relies on several mechanisms, namely donor contributions to specific projects or actions falling within a certain MRC program component, donor contributions to a specific MRC program as a whole, contributions to the Water Management Trust Fund (WMTF), contributions to specific staff positions/staff secondment, or the provision of services to partners through MRC projects.

A high dependence on donor funding, however, poses significant threats to the long-term sustainability of funding, since donors can easily withdraw from their obligations, projects can end and member states (such as Thailand and, although to a lesser extent) Vietnam increasingly graduate from the developing country status, limiting the availability of ODA. Therefore, MRC member states have decided to riparianize the organization's funding structure, aiming at increasing member states' contributions while slowly scaling down external funding[17]. The outcome of the financial riparianization and in particular the resources member states are willing and capable to commit to adaptation activities will considerably determine the overall adaptation capacity of the MRC in the future.

5. Conclusion

The two case studies presented in this paper allow drawing some general conclusions on the role of institutional mechanisms on the adaptation capacities of RBOs and the soundness of the theoretical arguments which were outlined in the first part.

Overall, it could be shown that RBOs are important instruments for dealing with hydrological changes in the Okavango and Mekong river basins and that the institutional design of their respective RBOs influences their adaptation capacities. While a comparative overview of the adaptation capacities in the Okavango and the Mekong River Basins is presented in Annex I, the most important findings can be summarized as follows: Main opportunities for adaptation capacities arise through the broad functional scope that characterize both RBOs which allows a comprehensive management of adaptation processes. Also the joint and comprehensive approach of data and information sharing in OKACOM constitutes a great opportunity for understanding environmental changes and finding ways for adaptation. At the same time, both institutions face major obstacles for adaptive water management, primarily the non-inclusive membership structure of the MRC, where the major upstream riparian China is not integrated into the cooperative management framework, as well as the vague dispute-resolution mechanism in the case of OKACOM which could pose an impediment for future decision-making in case disagreements around the development of the Okavango resources arise. Moreover, both RBOs depend significantly on donor engagement, providing resources necessary for the RBOs work but also implying a high insecurity with regard to future funding and the challenge of lacking donor alignment and harmonization.

In addition, the paper also illustrates that the institutional setup alone is insufficient to determine the resilience of an RBO towards environmental change, it is equally important that respective mechanisms and policies are implemented appropriately. This can be illustrated along the case of the dispute-resolution mechanism in the MRC that clearly spells out responsibilities and how to proceed in cases of disputes, however fails when applied to existing disagreements.

Based on the above findings several issues can be identified that deserve further research: Namely the application of the framework to a greater number of cases including other regions of the world; designing models for quantitative analysis that also include non-institutional factors such as the overall relations between riparian states and their influence on inter-state relations and adaptation capacities; and research

[17] Member contributions are to be increased by 10% each year until 2014 in order to ensure that financial requirements for the core functions, estimated at about US-$ 2 million, are covered entirely by member states. Program funding, however, will remain dependent on donor funding until, at least, 2030.

on regional rather than global climate change patterns and the nature of hydrological changes is needed in order to improve our understanding of potential risks in specific river basins.

The two case studies presented in this paper have shown that institutional mechanisms and their application play an important role in responding to hydrological changes. Therefore academic research should further investigate the question on how RBOs need to be designed and which conditions are required to guarantee their effectiveness. Understanding institutions of transboundary water management is crucial for designing them in a way that makes them more adaptive to man-made as well as natural induced environmental change and by doing so improve the water security of their member states.

Abbreviations

ACTO	Amazon Cooperation Treaty Organization
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
AU	African Union
BWF	Basin Wide Forum
CCAI	Climate Change and Adaptation Initiative
CICOS	Commission Internationale du Bassins Congo-Oubangui-Sangha
CIPM	Commission International pour la Protection de la Moselle
COBACIO	Comision Binacional Puente Buenos Aires Colonia
DC	Danube Commission
DCG	Donor Consultative Group
EIA	Environmental Impact Assessments
EPSMO	Environmental Protection and Sustainable Management of the Okavango River Basin
ERP	Every River Has Its People Project
FMMP	Flood Management and Mitigation Programme
GEF	Global Environment Facility
GHG	Greenhouse Gases
GTI	Greater Tumen Initiative
GTZ	Gesellschaft für Technische Zusammenarbeit /German Technical Cooperation
ICBC	International Scheldt Commission
ICPDR	International Commission for the Protection of the Danube River
ICPO	International Commission for the Protection of the Oder
ICPR	International Commission for the Protection of the Rhine
ICWC	Interstate Commission for Water Coordination in Central Asia
IJC	International Joint Commission
IMC	International Meuse Commission
ICP	International Cooperation Partner
IO	International Organizations
ISBC	International Sava River Basin Commission
IR	International Relations
IRBM	Integrated River Basin Management Project
ISH	Initiative on Sustainable Hydropower
IWRM	Integrated Water Resource Management
IWT	International Water Treaty

JC	Joint Committee
JPTC	Joint Permanent Technical Commission
LCBC	Lake Chad Basin Commission
LMB	Lower Mekong Basin
LTA	Lake Tanganyika Authority
LVFO	Lake Victoria Fisheries Organization
MRC	Mekong River Commission
MRC-IS	Mekong River Commission-Information System
MRCS	Mekong River Commission Secretariat
NBI	Nile Basin Initiative
NGO	Non-Governmental Organization
NMC	National Mekong Committee
NNJC	Nigeria-Niger Joint Commission for Cooperation
OBSC	Okavango Basin Steering Committee
OECD	Organization for Economic Co-operation and Development
OKACOM	Permanent Okavango River Basin Water Commission
OKASEC	Permanent Okavango River Basin Water Commission Secretariat
OMVS	Organisation pour la Mise en Valeur du Fleuve Sénégal
ORASECOM	Orange-Senqu River Commission
PJTC	Permanent Joint Technical Commission
PIC	Permanent Indus Commission
RBO	River Basin Organization
SADC	Southern African Development Community
SAP	Strategic Action Plan
SAREP	Southern African Regional Environmental Program
SIDA	Swedish International Development Cooperation Agency
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WMTF	Water Management Trust Fund
ZRA	Zambezi River Authority

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Annex I: Comparison of Adaptation Capacity in the Okavango and the Mekong River Basins

Indicator	Okavango/OKACOM	Mekong/MRC
Membership Structure	Inclusive; all three riparians are members of OKACOM which allows comprehensive management of adaptation processes	Non-Inclusive; upstream riparians are not members of MRC; cooperation with non-members is very limited, while there influence (especially China) on the river and its resources is significant
Functional Scope	Relatively broad functional scope (1994 Agreement, Art. 4) including issues on environmental conservation, pollution prevention and joint development of water resources	Very broad functional scope (1995 Agreement, Art. 1) and very broad program and project portfolio; including projects directly focusing on on-going changes in the basin
Decision-Making Mechanisms	Consensus-based decision-making (1994 Agreement. Art. 3); rather slow during the 1990s; since reaching peace in Angola in 2002 decision-making has picked up speed	Consensus-based decision-making (1995 Agreement and Rules of Procedures)/ASEAN-way; decisions often take very long (due to need to establish consensus among members already before decisions are officially taken), which is likely to impede efficient immediate reactions to change occurring in the basin
Data and Information Management	Very ambitious data and information management plans (as spelled out in the 1994 and 2007 Agreements) with cooperative inter-state generation of baseline data and coordination and integration of different data systems; communication with local stakeholders takes place via the Basin Wide Forum	Spelled out in the 1995 Agreement and Rules of Procedures, but significant weaknesses in day-to-day implementation, especially with regard to communication with stakeholders and with upstream riparians
Dispute-Resolution Mechanisms	Weak dispute-resolution provision in 1994 Agreement (Art. 7) which has not been brought to test yet	Spelled out in 1995 Agreement (Art. 35), but so far never brought to test for major issues; first notification procedure will prove functioning of existing mechanisms
Financing	Mostly donor funding which is planned to decrease over time to be substituted by contributions of member countries; currently only very limited member contributions (covering costs for delegations and joint meetings)	Member contributions (very limited) and donor funding; sufficient availability of financial resources; ongoing process of financial riparianization
Donor Involvement	High degree of donor involvement in form of budget contributions and financial and technical program support	High degree of donor involvement (most often in form of project/program support), with challenges in donor alignment and harmonization; ongoing process of financial riparianization