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WATER GLOBAL PRACTICE

Promoting Development in Shared River Basins

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Tools for Enhancing Transboundary Basin Management

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Preface

The United Nations Sustainable Development Goals (SDGs), adopted in September 2015, outline the new global development agenda. Goal Number 6, which seeks to ensure availability and sustainable management of water for all, recognizes the important transboundary dimension of meeting the world's future water demands. Target 6.5 calls on the world community to implement integrated water resources management at all levels, "including through transboundary cooperation as appropriate," recognizing the greater benefits that can be achieved in transboundary basins through coordinated versus unilateral action.

The world's 286 transboundary river basins support the socioeconomic well-being of more than 40 percent of its population, as well as the ecosystems on which they depend (UNEP-DHI and UNEP 2016). Many of the countries that share these basins are developing or emerging economies that are actively looking to further develop and utilize their water resources—yet their desire to do so may negatively impact neighboring countries. With a growing number of basins in which water use and demand permanently or temporarily exceeds the amount of renewable water available, and uncertainty from climate change, Target 6.5 becomes increasingly relevant to development interventions ("hard" and "soft" solutions) designed to secure availability of supplies and create resilience. Infrastructure investments, such as storage reservoirs ("hard" solution), are among the measures that can increase available supplies locally or at the basin-scale by tapping into previously inaccessible resources. For example, floodwaters can be captured to increase dry season flows. Coordination of flow regulation ("soft" solution) can be used to ensure that growing water demands can be met both within and between countries sharing transboundary basins.

This report aims to contribute to relevant knowledge for achieving Target 6.5. It guides the reader through the process of identifying appropriate tools to achieve sustainable and mutually beneficial water resource

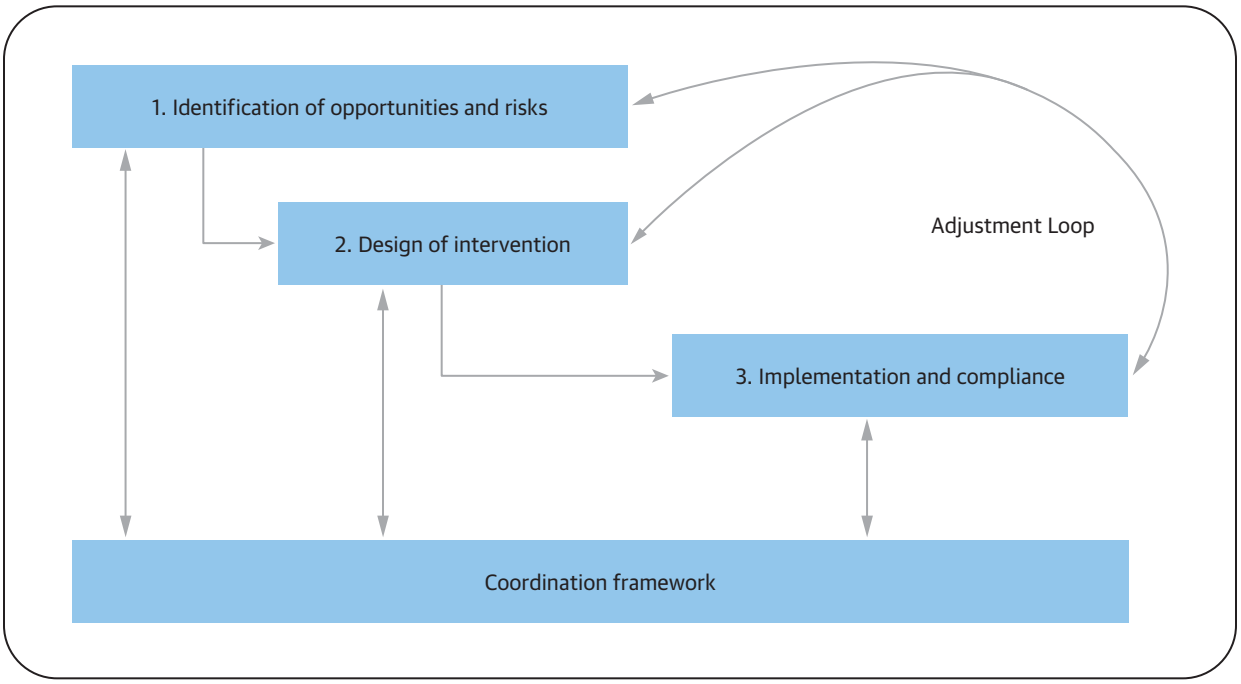
management in transboundary river basins. It aims to assist countries and development partners, such as the World Bank, in their efforts to develop more water secure economies and societies through harnessing the shared freshwater resources of transboundary basins.

The report presents the process of choosing the appropriate tools for individual basins and development challenges along a three-stage process of coordinated basin development. As shown in figure P.1, the three stages of process are (1) identification of opportunities and risks of basin development; (2) design of interventions; and (3) implementation and compliance with agreed actions. Along the process, coordination frameworks, such as joint basin management institutions, provide platforms for countries to interact and identify new opportunities to deepen coordinated development in specific sectors or to expand cooperation to other sectors and beyond the basin.

This report then identifies a series of tools that can be used to (a) realize and/or increase mutual benefits for riparian countries; (b) mitigate transboundary harm; and (c) promote cross-border coordination in order to reduce the risk of tensions and conflict that may occur due to the development of transboundary water resources. It distinguishes between tools that are available to countries directly (i.e., that do not require involvement of third parties) and complementary tools that are typically provided by development partners or other third parties.

Some of the tools have been tested over the years and employed successfully by countries and development partners in coordinated basin development. Other tools are new, and have been developed by refining existing tools to respond to country demands. For example, new payment guarantee mechanisms have been developed that could be used to guarantee

FIGURE P.1. Three-Stage Process of Coordinated Basin Development



compliance with storage reservoir release schedules for downstream hydropower production or irrigation benefits in transboundary river basins.

This report does not make direct recommendations and is not intended to be presciptive about which tools to use. Rather it presents the wide array of tools available and guides practitioners and decision makers in the process of making their choice.

The results of the analysis are presented in three parts. This report includes parts I and II. Part III is documented in a companion report, "Promoting Development in Shared River Basins: Case Studies from International Experience" (Altingoz et al. 2018).

Part I: Summary Report

Part I lays out the case for engaging in coordinated basin development, both for countries as well as for development partners. It guides through the three-stage process of coordinated basin development and guides in the choice of the appropriate Country and/or Third-Party tools. The report then summarizes the lessons learned from the application of the framework and the tools presented in part II based on case studies from international experience on coordinated basin management in transboundary river basins, which are presented in more detail in in the companion report, "Promoting Development in Shared Rivers Basins: Case Studies from International Experience" (part III of the overall study, Altingoz et al. 2018).

Part II: Toolbox

Part II identifies a wide range of tools that countries and development partners can employ to increase the effectiveness of working in transboundary basins. The Toolbox accounts for the complex interdependencies that exist between riparian states; for the fact that riparian coordination may equally be required in basins that do not currently or do not yet face physical water scarcity or water quality challenges; and that interventions need to be adjusted to the specific basin conditions. Although the focus of this report is on transboundary river basins, most tools can equally be applied for shared groundwater resources and other common-pool resources.

Part III: Case Studies

Part III (Altingoz et al. 2018) presents six case studies of international experience on coordinated basin management in transboundary river basins: Kura-Araks, Columbia, Chu and Talas, Vuoksi, Douro, and the Rhône. The case studies focus on specific operations within these basins. Each case study is preceded by a summary that explains the application of the three-stage process of coordinated basin development framework and tools described in part I and part II.

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Case study reports that informed the analysis were authored by Mehmet Altingoz, Suren Gevinian, Melissa McCracken, and Aaron T. Wolf (Kura-Araks Basin); Glen Hearns (Columbia Basin); Vadim Ni (Chu and Talas Basins); Antti Belinskij, Marko Keskinen, and Niko Soininen (Vuoksi Basin); Afonso do Ó (Douro Basin); and Christian Brethaut (Rhône Basin). The water scarcity analysis, which provided the basis for section 1.2 "Water Stress Projections in Transboundary River Basins," was authored by Paul Glennie, with support from Maija Bertule and Peter Koefoed Bjørnsen.

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Abbreviations

AGRHYMET	Agrometeorology, Hydrology, Meteorology Regional Center
ANDE	Administración Nacional de Electricidad
AOP	assured operating plan
AU	African Union
AWF	African Water Facility
BCH	British Columbia Hydro and Power Authority
BCU	basin country unit
BP	Bank policy
BPA	Bonneville Power Administration
BRIDGE	Building River Dialogue and Governance (IUCN)
CADC	Commission for the Application and Development of the Convention
CAEWDP	Central Asia Energy and Water Development Program
CAP-NET	Capacity Development in Sustainable Water Management (UNDP)
CE	Canadian Entitlement
CEMAC	Economic Community of Central African States
CICOS	International Commission of Congo, Oubangui and Sangha River Basins
CIT	community integration tax
CIWA	Cooperation for International Waters in Africa
CRB	Columbia River Basin
CRT	Columbia River Treaty
DMU	decision making under uncertainty
DOP	detailed operating plan
DSS	decision support system
EAC	East African Community
EFAS	European Flood Awareness System
ENCOM	Eastern Nile Council of Ministers
ENTRO	Eastern Nile Technical Regional Office

ESCP	environmental and social commitment plan
ESCWAE	Economic and Social Commission for Western Asia
ESF	environmental and social framework
ESHS	environmental, social, health, and safety
ESS	environmental and social standards
EU	European Union
FAO	Food and Agricultural Organization
FCOP	flood control operating plan
GDP	gross domestic product
GEF	Global Environment Facility
GIS	geographic information system
GWh	gigawatt hours
IBRD	International Bank for Reconstruction and Development
IBWC	International Boundary Water Commission
ICJ	International Court of Justice
ICPDR	International Commission for the Protection of the Danube River
ICPR	International Commission for the Protection of the Rhine
ICREB	International Columbia River Engineering Board
IDA	International Development Association
IFC	International Finance Corporation
IFI	international finance institution
IGAD	Intergovernmental Authority on Development
IJC	International Joint Commission
IUCN	International Union for the Conservation of Nature
IW:LEARN	International Waters Learning and Exchange Network (GEF)
IWRM	integrated water resources management
IWT	Indus Waters Treaty
JTC	joint technical committee
kWh	kilowatt hours

LHDA	Lesotho Hydropower Development Authority
LHSE	Lao Holding State Enterprise
LHWC	Lesotho Highlands Water Commission
LHWP	Lesotho Highlands Water Project
LIBOR	London Interbank Offered Rate
LVBC	Lake Victoria Basin Commission
M	meters
MAF	million acre feet
MDTF	multidonor trust fund
MIGA	Multilateral Investment Guarantee Agency
MoU	memorandum of understanding
MRC	Mekong River Commission
MSIOA	Multisector Investment Opportunity Analysis
MW	megawatt
NAP	National Action Program
NBA	Niger Basin Authority
NBI	Nile Basin Initiative
NBTF	Nile Basin Trust Fund
NCORE	Nile Cooperation for Results Project
NE	neutral expert
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NMHS	National Metoerological and Hydrological Services of Georgia
NT2	Nam Theun 2 Project
NTPC	Nam Theun 2 Power Company
O&M	operation and maintenance
OKACOM	Permanent Okavango River Basin Commission
OKR	Open Knowledge Repository
OMVS	Organisation pour la Mise en Valeur du fleuve Sénégal
OP	operational policy (World Bank)

ORASECOM	Orange-Senqu River Commission
OSCE	Organization for Security and Cooperation in Europe
OVTS	Orange-Vaal Transfer Scheme
PEB	permanent engineering board
PPA	power purchase agreement
PWC	permanent water commission
RAK	river awareness kit
RBO	river basin organization
ROR	run-of-river
RSA	Republic of South Africa
SADC	Southern African Development Community
SAP	Strategic Action Program
SAWI	South Asia Water Initiative
SDG	Sustainable Development Goal
SEA	Strategic Environmental Assessment
SEE	Southeastern Europe
SEEA	System of Environmental-Economic Accounting for Water
SIG	Services Industriels de Genève
SOGED	Société de Gestion et D'Exploitation du Barrage de Diama
SOGEM	Société de Gestion du Barrage de Manantali
SOMELEC	La Société Mauritanienne d'Electricité
SPEG	Société de Production d'Electricite a Partir du Gaz
SPV	special purpose vehicle
TA	technical assistance
TCTA	Trans-Caledon Tunnel Authority
TDA	Transboundary Diagnostic Analysis
TNMN	TransNational Monitoring Network
TWAP	Transboundary Waters Assessment Program (GEF-UNEP)

TWO	transboundary water opportunity analysis
UAHP	Upper Arun Hydropower Project
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Program
UNEP-DHI	United Nations Environment Program and DHI Group Partnership—Centre on Water and Environment
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USACE	US Army Corps of Engineers
USAID	United States Agency for International Development
WMO	World Meteorological Organization
WUP	Water Utilization Program
WWAP	World Water Assessment Program
ZAMCOM	Zambezi Watercourse Commission
ZRA	Zambezi River Authority

Water infrastructure. © drnadig/iStock.

Part I Summary Report

Columbia River Basin. © 4nadia/iStock.

Chapter 1
The Case for Coordinated Basin Development

Introduction

Given global trends on population growth, economic development, and urbanization, the pressure on the world's freshwater resources is rising. About 1.6 billion people live in countries with physical water scarcity, and this number may double over the next two decades (World Bank 2016). Estimates suggest that within the next three decades, the global food system will require between 40 and 50 percent more water, municipal and industrial water demand will increase by 50–70 percent, and the energy sector will see water demand increase by 85 percent (World Bank 2016). Ecosystems that are already suffering significantly from human water exploitation will likely receive even less water in the future than they do today.

About 60 percent of the world's freshwater flows occur in transboundary river basins that cover more than 40 percent of the total land area of the planet. More than 2.8 billion people inhabit these basins, representing more than 40 percent of the world's population (UNEP-DHI and UNEP 2016). This proportion is even higher when transboundary aquifers and lake basins are also considered. Countries are relying more and more on transboundary water resources to meet their growing water demands; yet actions to this end may have cross-border impacts.

Transboundary freshwater systems create inevitable linkages and interdependencies between countries. The use of shared water resources by one country will, in most cases, impact other countries sharing the same system. At the same time, coordination among countries in the development of transboundary basins can yield greater benefits than would be available to individual countries pursuing unilateral development.

Coordinated development therefore holds a significant potential to address the continued rise in water demand.

The new global development agenda recognizes the benefits of coordinated development of water resources flowing in transboundary basins. In 2015, the United Nations SDGs were approved as part of the agenda to end poverty, protect the planet, and ensure prosperity for all. As one of the seventeen goals, SDG 6 focuses on ensuring access to water and sanitation and on achieving sustainable management of water. Its Target 6.5 calls for integrated water resources management at all levels, "including through transboundary cooperation as appropriate."

The objective of this report is to assist with the implementation of this new development agenda. It summarizes the wide array of tools available to countries for the design of their cooperation on transboundary basins. Many of the countries that are actively looking to further develop and utilize transboundary water resources are developing or emerging economies. Accordingly, development partners, such as the World Bank, other international financial institutions (IFIs), and bilateral donors, may increasingly find themselves confronted by requests for assistance to facilitate coordinated development of shared freshwater systems. It is critical that these actors understand the challenges of working in transboundary basins, and that they have the tools at their disposal to facilitate transboundary cooperation to achieve mutual development benefits and manage associated risks. This report is therefore written for both countries and development partners, as well as other interested practitioners and stakeholders.

After presenting the case for coordinated basin development, this report guides through the process of choosing the appropriate tools for individual basins and development challenges along a three-stage process of coordinated basin development, comprising (1) the identification opportunities and risks of basin development; (2) the design of interventions; and (3) the implementation and compliance with agreed actions.

This report distinguishes between tools that are available directly to countries and tools that are offered by third parties, including those offered by the World Bank and other development partners. These tools can assist in the optimization of basin development and the achievement of mutual benefits and sustainable use, while preventing or mitigating transboundary harm that may occur to basins or to the populations dependent on them.

The report then summarizes the lessons learned from the application of the framework and tools presented based on a number of case studies from international experience on coordinated basin management in transboundary river basins.

Many river basins connect countries across borders. They originate in one and receive further flow contributions through rainfall and tributaries in other territories they cross along the way to a sea or inland delta. These transboundary rivers establish hydrological interdependencies between countries. The use of the shared waters in one country may affect water availability for use in another country—seasonally (e.g., in case of flow changes through storage or other flow management infrastructure), quantitatively (e.g., in case of consumptive use), qualitatively (e.g., in case of pollution), and over time (downstream development or water resources may foreclose future use upstream).

These cross-border impacts invariably affect relations among the countries sharing and depending on the same water resources. They may catalyze cooperation where cooperation is perceived as mutually beneficial. Navigation for river transport and trade, for example, is one of the oldest and most established forms of cooperation along transboundary rivers. Other issues related to country cooperation include information exchange for flood forecasting and early warning systems to prevent flood damage; coordination on

upstream storage and flow releases to smoothen seasonal hydrologic extremes and ensure water availability also in dry seasons; as well as flood risk and water quality management, including through wetland restoration and green infrastructure.

At the same time, cross-border impacts can cause tensions among co-riparian countries—tensions that can spill over into country relationships concerning other sectors or that may be compounded by tensions unrelated to water that might already exist between countries. Experience shows that water-related tensions are more common in basins where water quantity is of concern to riparian countries. Cooperation or coordinated development may not easily occur where solutions to overcome water scarcity and quantity issues are not obvious. And it may be further hampered by decision makers' perceptions of political or other non-water-related risks to cooperation.

However, the case of the Senegal River Basin, for instance, illustrates that water availability concerns are not necessarily a stumbling block for cooperation. Faced with the experience of devastating droughts, the riparian countries have set up a durable, basin-wide cooperation framework over the past decades that delivers multiple benefits, including beyond the water sector. This and other basin experiences highlight that countries usually cooperate when the benefits of cooperation outweigh the perceived costs.

The following sections present a summary analysis of benefits that can be obtained from cooperation; and the global water trends and risks, which indicate that coordinated basin development will likely become more important in the decades to come. A depiction of the conditions that create an enabling environment for cooperation and coordinated basin development concludes this section of part I. The subsequent section then describes the three-stage process framework that can guide countries and development partners in the choice of appropriate tools for identification, design, and implementation of coordinated basin management.

1.1 Benefits of Coordination

Over the course of history, countries have jointly, or in a coordinated manner, developed shared river basins with expectations to unlock benefits that cannot be achieved through unilateral development. Coordination can take many forms: it can range from simple consultation on development plans, to information sharing, to joint infrastructure investments, to comprehensive basin management focusing on water and even non-water-related sectors, such as in the La Plata Basin and the Amazon Basin, where the watersheds also serve as geographic space to organize economic integration more broadly.

An example of a basin where countries have achieved significant mutual economic benefits through cooperation is the Columbia Basin in North America (Altingoz et al. 2018). In the 1940s, Canada and the United States of America set up a joint technical committee, the International Columbia River Engineering Board, to study the development potential of their shared basin. The results of the Board's analysis concluded that through developing reservoirs in the upper basin and coordinating cascade operation with already existing dams downstream, significant flood control and power generation benefits could be achieved. The cooperative regime set up by the two countries, based on the 1961 Columbia River Treaty (CRT), resulted in significant economic benefits. In terms of prevented flood damage, it is estimated that the flow regulation provided by new upstream dams during 1972, 1974, 1996, and 1997 prevented damage of US$260 million, US$306 million, US$227 million, and US$379 million, respectively (US Army Corps of Engineers 2013). Average annual flood damage prevented in the United States that can be attributed to the Treaty is estimated at US$75 million. Flood risk control has also allowed additional investments in irrigation and port facilities in the lower basin. In terms of electricity benefits, the so-called Canadian Entitlement (CE) benefits the province of British Columbia, Canada, where the Dams are located, with electricity valued at about

US$120 million to $300 million annually since 1998/1999 (Province of British Columbia 2016).

In the La Plata Basin, cooperation on hydropower generation development on the shared river stretches of the Paraná River have equally generated significant benefits from electricity production. The Itaipu Dam, jointly developed by Brazil and Paraguay and managed by an entity co-owned by their respective power companies, Eletrobrás and the Administración Nacional de Electricidad (Ande), provides almost 75 percent of the electricity consumed in Paraguay and about 15 percent of electricity consumption in Brazil. Because Paraguay only uses about 5-10 percent of the electricity produced at Itaipu, its sells the remainder of its share to Brazil and receives an annual compensation payment of about US$360 million from Brazil for the use of Paraguay's share of the hydraulic resource (Kramer et al. 2012). The development of the hydropower potential that the country shares on its border rivers with Brazil and Argentina (with which it has developed the Yacyretá Dam) has provided Paraguay with significant export revenues and linkages to the markets of its larger neighbors.

Beyond the investment in and coordination of large infrastructure, important gains can already be achieved from far less cost-intensive measures. The introduction of regulations on pollution prevention and water quality standards ("soft" solutions) coupled with investments in sewage treatment plants and wetland restoration can restore availability of freshwater for human use. These measures have been successfully employed in the 1980s and 1990s in Europe to restore the multiple benefits that the waters of transboundary rivers can provide. Similarly, damages caused by severe weather events, floods, dam failures or glacial lake outburst can be significantly reduced through the establishment of reliable flood forecasting and early warning systems, as well as through regular exchange of data and information between riparian countries. An assessment comparing a noncooperative scenario with a coordinated scenario for information exchange and dam operations among the countries sharing the Zambezi Basin found that exchange of information can result in up to US$15.7 million of monetary benefits in addition to ecologic benefits for the Zambezi Delta (Giuliani and Casteletti 2013).

The economic rate of return for hydrometeorology systems for the countries in Central Asia, which share the Aral Sea Basin, has been estimated as high as 36 percent, partially due to reducing costs of extreme events, which cost the countries up to 1 percent of gross domestic product (GDP) (World Bank 2008). As the management of water for agriculture in the lower parts of the basin depend on the hydrology and reservoir management upstream, these investments coupled with information exchange can assist with optimization of flow regulation for irrigated agriculture. In Central Asia, as in other basins around the world, investments in hydrometeorology systems combined with information exchange will improve climate risk management and help countries in their efforts to enhance resilience to climate change through adaptation.

Further to improved water management, information sharing can improve trust through increased transparency, and build institutional capacity. Coordination mechanisms that monitor basin conditions, such as river basin organizations or permanent technical committees, can play an important role in constantly assessing the effectiveness of coordinated basin management and compliance of countries with agreed commitments. And, more importantly, they provide useful platforms for countries to interact and identify new opportunities to deepen cooperation and to expand it to new sectors, including beyond the basin.

The preceding examples highlight that, further to measures that can be carried out by countries unilaterally (e.g., water use efficiency increases and quality management measures), additional benefits can be achieved through coordinated management in transboundary river basins. Opportunities for countries

participating in coordinated basin management include better water quality, energy power trade benefits resulting from better utilization of upstream water storage and hydropower developments, reduction in flood risks through flow management, information sharing and coordinated hydrological forecasting. Overall, cooperation and coordination can lead to better utilization of water systems.

Coordinated basin management becomes more important in basins where water resources are not available in abundance, and in situations of seasonal or absolute water scarcity. In these cases, transboundary impacts caused by developments in one country are usually more immediately felt elsewhere; for instance, rivers with low flow volumes lack the capacity to dilute pollution, and additional consumptive uses upstream may deprive downstream users of water resources that sustain their livelihoods.

The next section summarizes the risks to transboundary basins posed by global trends of increasing water demand caused by population growth and economic development and the shifts in precipitation patterns due to climate change. The assessment is based on the Global Environment Facility Transboundary Waters Assessment Program's (TWAP) *Transboundary River Basins: Status and Trends* analysis (UNEP-DHI and UNEP 2016).[1]

1.2 Water Stress Projections in Transboundary River Basins

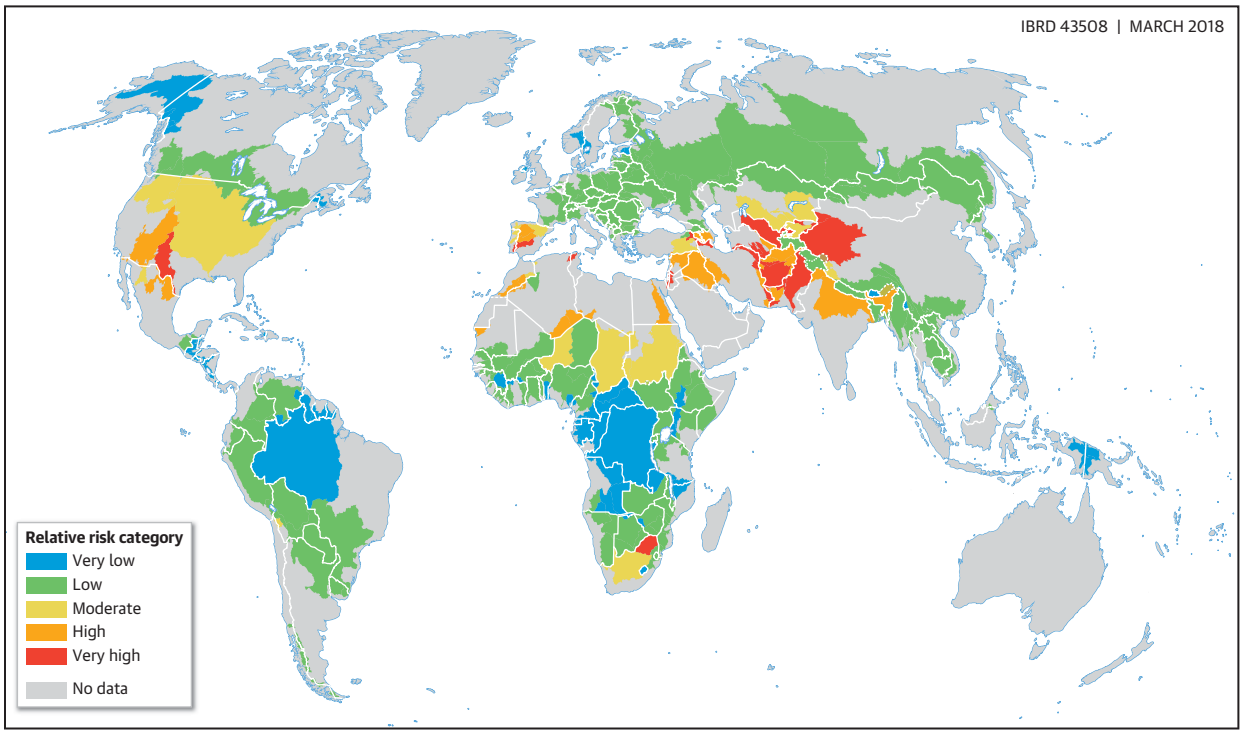
Water stress is increasing in a number of the 286 transboundary river basins around the world. Using environmental water stress, human water stress, and agricultural water stress indicators[2] under a "business-as-usual" scenario, significant changes to river flows are predicted. These changes are due to a combination of climate change effects (both less and more water), infrastructure investments to regulate flows, and human water consumption.

At the basin level, a fairly high degree of correlation exists between environment, human, and agricultural water stress. The baseline locates the hotspot basins in Central Asia and South Asia, in the Middle East, in Northern and Southern Africa, and between the United States and Mexico (map 1.1). Five basins in Central Asia—the Harirud, Helmand, Kowl E Namaksar, Murgab, and Tarim—and the Rio Grande in North America have very high risk for all three indicators. Afghanistan is part of all five identified river basins in Central Asia, the Islamic Republic of Iran is part of three, and Turkmenistan is part of two basins.

An analysis of differences between basin country units (BCUs)[3] demonstrates that the core challenges in managing water within transboundary basins are country-to-country differences in water dependency and risk exposure. Across all three indicators, basins that may have had a "very low" or "low" risk at the basin level contain BCUs that have high or very high risk. For example, the Senegal River Basin shows a "low" maximum relative risk category across all three indicators (map 1.2, panel a). Similarly, the human water stress indicator is very low. However, this indication masks the differences among BCUs within the basin: Guinea and Mali are at very low risk, whereas Mauritania is at very high risk (map 1.2, panel b).

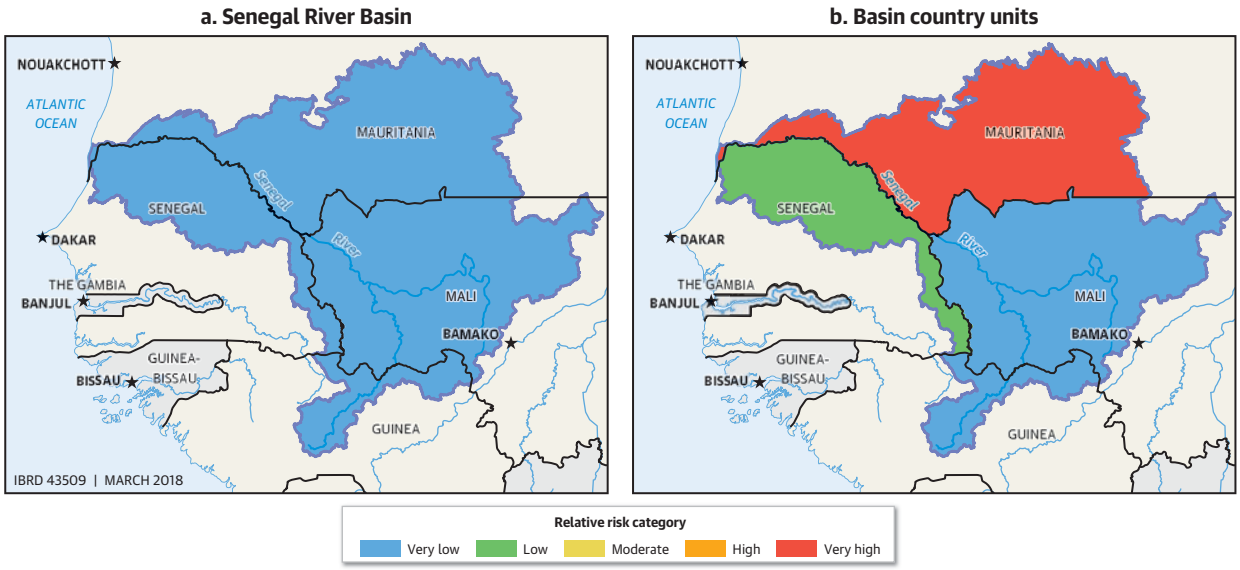
In the future, significant changes to river flows are expected due to a combination of climate change (both less and more water), dam management, and water consumption. More rainfall is projected in the Sahel region of West Africa, and some BCUs are projected to have lower human water stress due to climate-driven increases in availability. Drier conditions are expected in basins and BCUs in South Africa, Eastern Europe, and the southern European countries (Spain and Portugal), and relative risk is projected to increase in these areas. In the Ganges-Brahmaputra-Meghna Basin, projected increases in water availability are cancelled out by significant increases in population growth and water demand. Environmental water stress, which is assessed based on the human induced monthly variations to the natural flow regime

MAP 1.1. Water Stress: Maximum Risk Category of Environmental, Human, and Agricultural Stress, by Basin

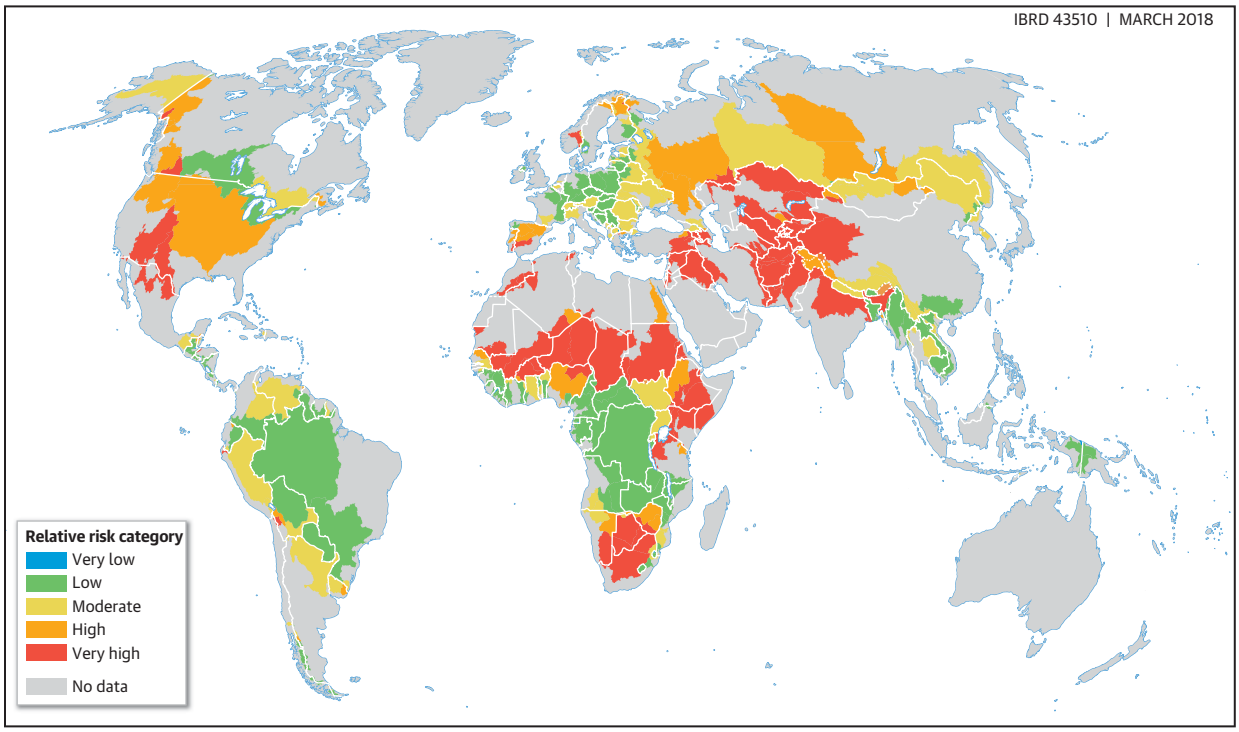


Source: "Global Environment Facility Transboundary Waters Assessment Program 2015. http://twap-rivers.org."
Note: GAUL = Global Administrative Unit Layers.

MAP 1.2. Human Water Stress for the Senegal River Basin and Basin Country Units



MAP 1.3. Change in Relative Risk in 2030 (Water Environmental Stress Indicator)



Source: Global Environment Facility Transboundary Waters Assessment Program 2015. http://twap-rivers.org.

considering water withdrawals and dam management, is expected to increase significantly in basins and BCUs in Northern and Southern Africa, as well as in Northwestern America, Northern and Eastern Europe, and the Russian Federation by 2030 (map 1.3). Agricultural water stress can be expected to increase roughly in line with environmental water stress, as the two indicators are reasonably highly correlated. Irrigation is expected to increase water demand both due to growing food demands and increased evapotranspiration (water use by plants) in many regions of the world, though this may be offset to some extent by potential improvements in irrigation water use efficiency.

In addition to the water quantity perspective, several other factors affect water stress and the way water resources are managed in transboundary river basins. These need to be considered in the use of tools to address transboundary impact. One of the key factors is water quality; available water must be of adequate quality for the intended use. Overlaying water quality risks on top of water quantity risks would likely result in even more extreme scenarios than the ones previously described. As with other risk factors, there are technical solutions to address the challenge. Based on experience in various basins, water quality can generally be cooperatively managed and improved with greater impact and ease than physical water scarcity.

The *Transboundary River Basins: Status and Trends* analysis illustrates that many of the world's transboundary basins are at risk due to a complex blend of stresses, including human, environmental, and agricultural water stress. A number of the transboundary

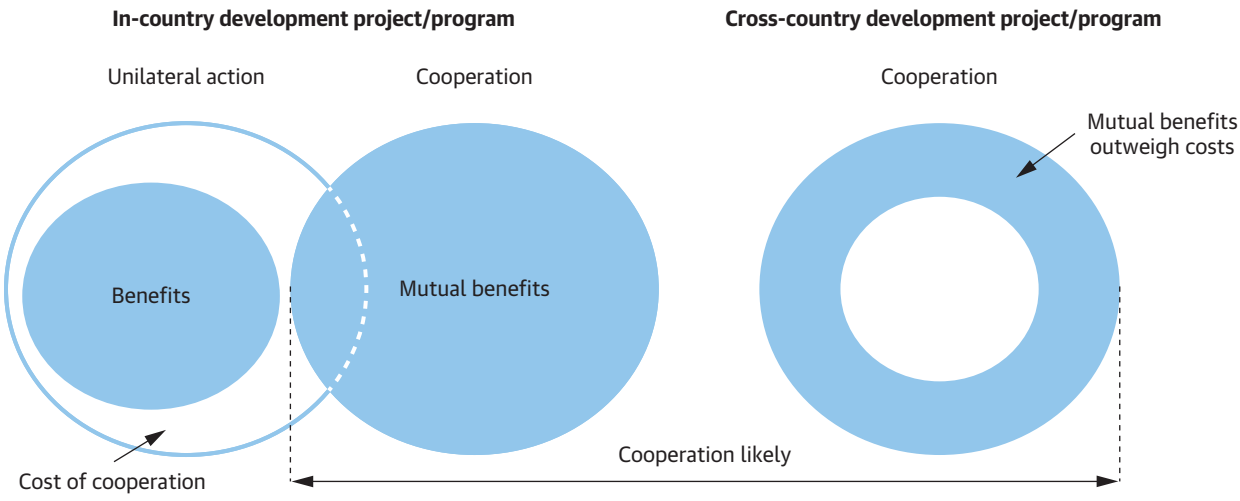
basins at risk are shared by fragile or conflict-affected countries, elevating the water scarcity challenges not only to a development risk but also to a security risk. In "closing" transboundary basins, where water demand exceeds supply seasonally, the introduction of new uses or the change in existing uses by one basin country is likely to have impacts on other basin countries. Investments that cause consumptive use or changes in seasonal flow patterns will likely impact existing uses elsewhere, potentially depriving others of the benefits they derive from the shared resource. In cases of unilateral development, without coordination or consultation with co-riparian countries, this can lead to significant negative or unintended consequences, and in the worst-case scenario may become a cause of conflict.

The existence of multiple hotspot basins now and the projected increase in numbers in the future suggest an urgent need for countries and development institutions[4] to identify adequate interventions to address impending water stress as well as the adequate tools that can facilitate coordination on basin management to achieve mutual benefits and mitigate the risk of harm. The following section discusses the conditions that enable cooperation, and refers to the potential role of third parties in facilitating coordinated basin development.

1.3 Enabling Conditions for Cooperation

Based on experience, countries do not cooperate in the management of transboundary waters because they are compelled by an ethic of cooperation. They cooperate when the net benefits of cooperation are perceived to be greater than the net benefits of noncooperation and when the distribution of these net benefits is perceived to be fair (figure 1.1). The benefits and costs considered in this calculation are not only of financial or economic nature, they may also involve considerations such as national security or stability of a government, or others, such as social and environmental well-being. For in-country operations with transboundary impact, cooperation may happen when mutual benefits outweigh the costs of cooperation and the benefits that can be achieved for the country in whose territory the operation is located are greater than when acting unilaterally. Cross-country projects involving the territory of two or more countries generally take place only in the presence of a joint understanding between those who agree that the benefits outweigh the costs.

FIGURE 1.1. Cooperation Potential



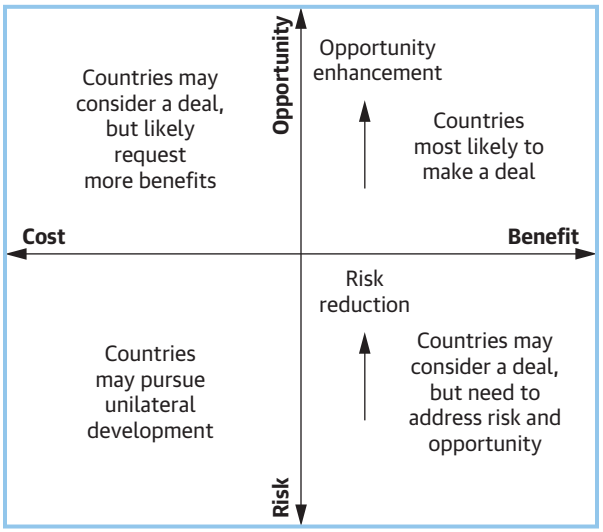
1.3.1 Perceived Risks and Opportunities

In addition to cost-benefit calculations, countries also consider exposure to risks. Countries may therefore discount benefits based on perceived risks of engagement in cooperative solutions. When faced with opportunities for cooperation that would bring benefits to their country, policy makers decide whether or not to cooperate. Individual decision makers in riparian countries operate within the political context of their countries and consider external and internal drivers of decision making. Decisions are informed by the perceived risks of engagement; that is, the perception that an act of cooperation will expose the country to harm will jeopardize something of value to the country, or will threaten the political future of individual policy makers.

Policy makers will need to see positive political gains from cooperation. Perceived political opportunity for a given country can be defined as the perception that an act of cooperation will enhance the country's well-being, will augment something of value to the country, or will improve the political future of individual policy makers (Subramanian, Brown, and Wolf 2012). Positive gains, both economic and political, must be evident. In the mid-1980s, when the riparians of the Danube River came together, they faced not only the possibility of improved water quality monitoring (and subsequent improvement), but also the opportunity for the Western and Eastern European countries to intensify communication, at least at the technical level. Likewise, the cooperative stance of Aral Sea riparians in the early 1990s has been attributed to their decision to seize the political opportunities for investments in environmental remediation (Subramanian, Brown, and Wolf 2012). Unbiased third parties can facilitate between-country exchanges, interpret each country's interests, help clarify mutually beneficial cooperation opportunities, and extend assurances regarding the flow of cooperation benefits.

For each country, the possibilities of cooperation and the discussion of benefits can trigger an analysis of benefits and costs as well as a consideration of risks and opportunities; the higher the benefits and opportunities relative to costs and risks, the greater the likelihood of sustained cooperation (Subramanian, Brown, and Wolf 2012). Figure 1.2 illustrates how perceptions of political risks and opportunities might influence country decisions over cooperation, and how risk reduction and opportunity enhancement might change those perceptions over time. Countries considering cooperation assess their positions on the x-axis in terms of net benefits (benefits less costs) and on the y-axis in terms of net opportunities (opportunities less risks). Benefits and costs are economic, whereas opportunities and risks are political. These "positions" in the framework may determine the likelihood of cooperation in that given situation, as described in the text in each quadrant. The northeast quadrant depicts the balance of costs/benefits and risks/opportunities most conducive to cooperation. Reducing risks and seizing opportunities, reducing economic costs and increasing economic benefits will move countries from their initial positions into the northeast quadrant.

FIGURE 1.2. Influence of Perceptions

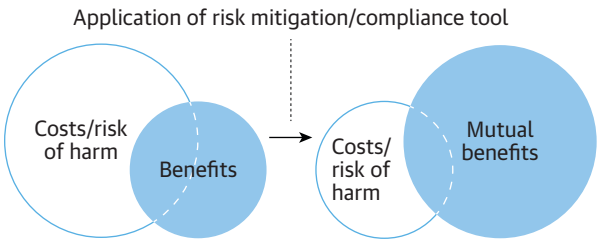


Source: Subramanian, Brown, and Wolf 2012.

The level and type of risks will likely vary depending on both the scope of the agreement and the hydropolitical context of the basin in question. Perceived risks appear to lie at the core of decisions by countries to cooperate or not on issues of shared waters (Subramanian, Brown, and Wolf 2012). Risk mitigation tools can be adopted unilaterally by a country implementing an operation without coordination with other riparian countries; for instance, through enforcement of legislation requiring pollution prevention. However, whereas an in-country project involves the risk of significant transboundary harm, other affected riparian countries may demand some sort of guarantee from the implementing country that these risks are mitigated. For instance, affected countries may ask for a guarantee that any harm that occurs will at least be repaired or compensated for; or they may ask for the establishment of a mechanism that would, for example, guarantee compliance with arrangements requiring that large storage and flow regulation infrastructure is operated also to their benefit. Thus, depending on the tools that are employed, the potential costs and risks of harm may be turned into transboundary benefits (figure 1.3).

Tools that promote compliance or that can effectively hedge risks may help tip the balance toward cooperation among riparian countries on operations with transboundary impact. This may be the case where the mutual benefits that can be achieved through cooperation are greater than the benefits that can be achieved through unilateral action. It is therefore important that riparian countries carefully analyze the benefit and cost potential and identify adequate tools that can facilitate benefit optimization. On the Douro River, where Portugal and Spain both engage in hydroelectricity production, the two countries agreed to a compensation mechanism as a means to ensure compliance with agreed limitations on withdrawals and flow diversions (Altingoz et al. 2018).

FIGURE 1.3. Turning Costs/Risks of Harm into Benefits

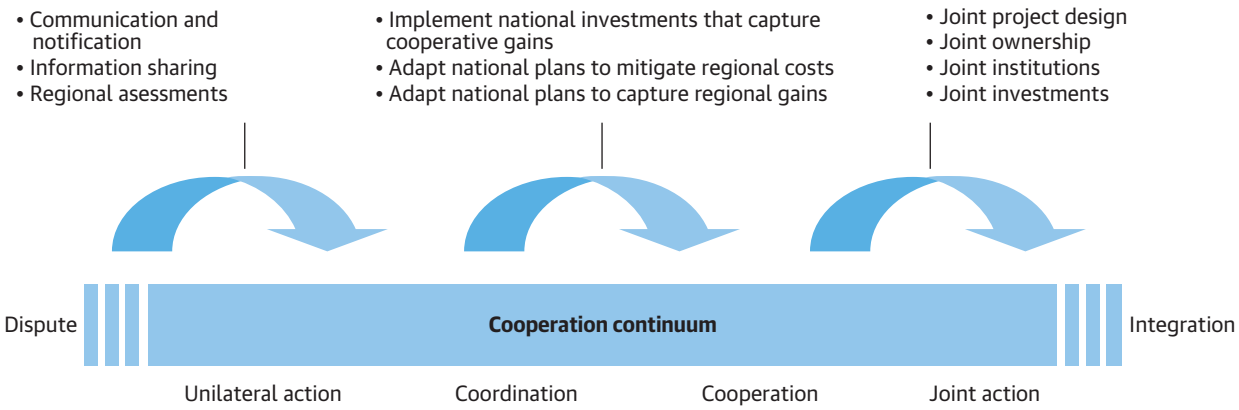


Identifying the right level of effort and investment in international cooperation is a key to capturing real gains without incurring excessive costs. If a country cannot find a way to compensate for or control risks, it may choose not to enter into a cooperative agreement. Instead, it may either maintain the status quo or pursue its own interests to the extent possible without an agreement. However, if the risk is reduced or removed, the potential for cooperation may increase. Third parties can assist both by identifying tools to manage risks and by providing them. Among others, they can provide technical assistance and independent data during the identification process; they can provide a space for discussions as conveners and facilitators during the identification and design process; and they can provide guarantee mechanisms, such as independent monitoring or financial guarantees to promote compliance.

1.3.2 Identifying Effective Cooperation

There are no blueprints for cooperation on transboundary waters projects. In reality, innumerable practical avenues of cooperation exist that countries can undertake to their mutual advantage, each with different potential benefits and different associated costs. Each basin is unique; each case is different. Different modes of cooperation should be considered in response to different circumstances. The most appropriate mode of cooperation will depend on many factors, including hydrological

FIGURE 1.4. Cooperation Continuum



Source: Adapted from Sadoff and Grey 2005.

characteristics, the economics of cooperative investments, the number of interested or affected riparian countries, the costs of engaging and any potential risks. These together determine the potential benefits and costs to be balanced in choosing a cooperative strategy (Grey et al. 2016).

In some basins, information sharing and basin-wide strategic assessments may be enough to promote better, more cooperative management. In others, joint actions might be needed on environmental flow regulation, water storage, and drought and flood mitigation in order to yield significant net benefits. A cooperation continuum (figure 1.4) can be conceived, from unilateral action (independent, nontransparent national planning and management), to coordination (sharing information regarding national planning and management), to collaboration (adaptation of national plans for mutual benefits), to joint action (joint planning, management, or investment).

It is important to note that this continuum is nondirectional, because more cooperation is not necessarily better. It portrays increasing levels of cooperative effort, but it does not suggest that this is a goal in all basins. The continuum is dynamic, as various points are appropriate for different activities at different times. Countries may adapt their activities to increase or decrease the intensity of their cooperation in response to new opportunities or developments within or outside the cooperative process. Finally, the continuum is also iterative. There are repeated, discrete opportunities for cooperation, and the success of earlier cooperation, particularly in terms of realized benefits, will likely promote increasing cooperation. In this iterative context, the riparian countries are aware that noncooperative actions may impact and possibly diminish future cooperation (Grey et al. 2016).

The next section describes the ways in which countries go through the process of identifying, designing, and implementing coordinated basin management and individual interventions that are part of the process. Structured around the three-stage process framework, it describes the various phases of the coordination process, the tools that can be used during each stage, and the dimensions to consider for the choice of tools as well as for the content design of the tools. These considerations help identify the adequate level of effort and investment required to address the individual basin development issue(s) at stake.

Notes

1. See http://www.geftwap.org/water-systems/river-basins.

2. *Environmental Water Stress* is based on the human induced monthly variations to the natural flow regime considering water withdrawals and dam management. *Human Water Stress* is based on the maximum risk of two subindicators: availability per person (m^3/person/year), and water withdrawals as proportion of availability, that is, relative water use: mean annual withdrawal divided by the available water supply (percent). *Agricultural Water Stress* is based on the relative water consumption by crops under irrigation compared to water availability.

3. A basin country unit is the portion of a country within a particular river basin.

4. Development partners, such as the World Bank, other IFIs and bilateral donors, will increasingly find themselves in situations where investment support in one country (including for projects outside the water sector) risks to negatively impact other countries. This leaves them with the decision to either step away from the investment avoiding responsibility for potential harm or to engage proactively in efforts to design projects that not only mitigate the risk of harm, but seek to be mutually beneficial to achieve acceptance of a project by affected countries. It is therefore critical that they have the tools at their disposal to facilitate transboundary cooperation and the sharing of both risks and benefits.

Itaipu Dam on the Paraná River. © Chandra Dhas/iStock.

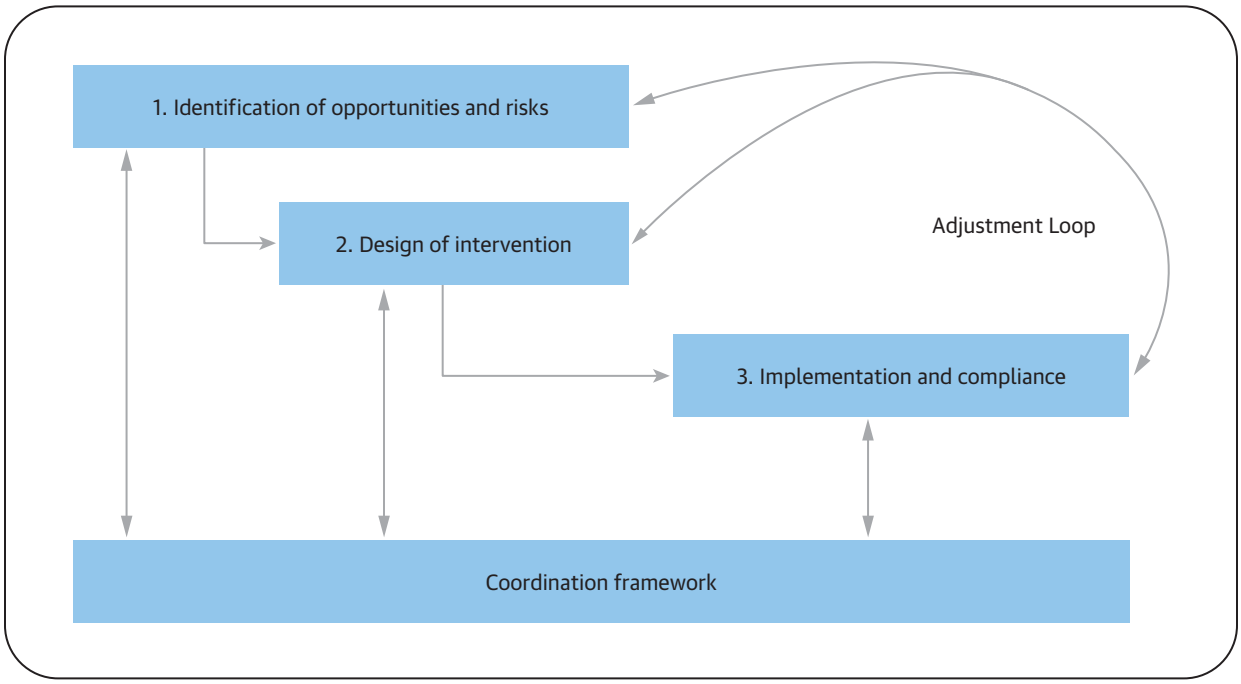
Chapter 2
Framework and Tools for Engagement

Each basin context is unique; therefore, the process by which riparian countries initiate and structure basin coordination will display different characteristics in each and every case. Countries may determine that regular information exchange on their respective uses of a river basin is sufficient to ensure effective coordination and sustainable resource use. Countries planning to use the hydropower potential of river stretches along a shared border face the option of ceding the rights to develop the river stretch to one country and providing access and use of their territory as needed, or they may decide on a joint investment. Although the specific actions in each of these processes will be different, in each of the cases the stages of the coordination process will broadly be the same: identification, design, and implementation. The subsequent sections provide a conceptual framework that can guide countries, and their development partners, through the choice of tools they can employ throughout the process of coordinated basin management.

2.1 The Three-Stage Process of Coordinated Basin Development

The process of coordinated basin development can be structured along three stages: (1) identification of development opportunities and risks; (2) design of a specific intervention or a broader plan for basin management; and (3) the implementation of the project or process (figure 2.1). The three-stage process framework can be applied to both project-based interventions and programmatic basin approaches. It does not make much difference whether one country or multiple countries are contemplating a specific project, such as the establishment of a flood forecasting and early warning system, or whether they are considering broader multisector basin development. The process

FIGURE 2.1. Three-Stage Process of Coordinated Basin Development



for participating countries will broadly be the same and follow these three stages.

Each of the three stages can benefit from structured coordination frameworks that provide the "rules of the game" for cooperation. At the identification stage, these can be global or regional agreements that outline principles for cooperation (e.g., multilateral environmental agreements, global or regional water conventions) or these may be existing organizations (e.g., the East African Community provided the institutional umbrella for the establishment of the Lake Victoria Basin Commission). At the subsequent stages, countries can decide on and design an adequate framework based on the characteristics of the given situation.

As outlined above, coordination processes are nonlinear, iterative, and dynamic. Countries learn over time what works best in any given situation, or underlying conditions may change prompting the need for adjustment. Basins may be faced with new challenges and demands, such as a change in the composition of water uses and users in the basin, shifting water use to different, or less or more consumptive sectors. Changes in hydrological patterns may require adaptation. Over the past decades, cooperation that set out with a strong focus on water quality management turned to other issues as riparian countries on the Danube and Rhine Rivers moved on to coordinate wetland restoration efforts to adapt to the increase in the number and severity of flood events which challenge the highly regulated river beds.

Moreover, as coordination between two or more countries on transboundary water resources is complex, the perfect is the enemy of the good. Trying to establish the perfect cooperation modalities that consider all eventualities and potential risks from the outset may lead to a situation where coordinated development never takes off. It can be beneficial for countries to start at a low level of cooperation along the continuum (figure 1.4) or to start with "imperfect" cooperation and then improve on it over time. Spain and Portugal have revised the international agreements based on which they coordinate flow management in their

shared river basins twice, in the 1960s and in 1998, to adjust for changing circumstances and enhance compliance rules (Altingoz et al. 2018). Similarly, prompted by environmental concerns, France and Switzerland have reviewed and improved the sediment flushing modalities at Verbois Dam in the Rhône Basin (Altingoz et al. 2018). The Adjustment Loop in the above framework (figure 2.1) reflects this iterative character of coordination processes and accounts for the adjustments to cooperation that have taken place in many transboundary basins over time.

The process steps of the three-stage process framework are explained in more detail in the following sections. The next subsection describes how this framework can guide countries in the choice of tools that can be applied in each of these stages. This is followed by an explanation of five dimensions that should be considered when deciding on the tools used and their content.

2.2 Tools for Coordinated Basin Management

Just as each transboundary river basin has unique characteristics, each situation that is being pursued by countries in their efforts to develop transboundary water resources will be different. Whether countries engage in project-based engagements or wider basin management approaches, they will find themselves in the same three stages of coordination during the process. Nevertheless, some of the tools employed for these two distinct approaches will be different. For example, strategic environmental assessments are generally used for basin planning approaches, whereas the assessment of transboundary impact through detailed environmental and social impact assessments typically takes place for project-based interventions. Similarly, detailed design studies are typically used for the latter rather than for basin-level engagements.

For this overview, the tools both for a basin approach and individual projects are presented together for each phase in tables 2.1, 2.2, and 2.3. This is done because a number of the tools are appropriate for both project-based as well as wider basin-level engagements, and in order not to introduce too many layers into the tables. However, distinctions are made between those tools that are available to countries directly and those that are typically provided by development partners or other third parties. It is acknowledged that some overlap exists in these two tool categories. They are presented separately to show what can be done by countries directly and in which ways they can engage third parties in support of their efforts.

The tools referred to here as "Country Tools" are those that are directly available to countries without requiring participation of third parties. The Country Tools presented in tables 2.1, 2.2, and 2.3 and in more detail in part II: Toolbox are based on the large body of international experience of effective coordination in transboundary basins. These tools have been used directly between and by countries to manage transboundary water resources in a coordinated manner in order to achieve mutual benefits and/or to mitigate risks of harm. These are tools that can be used for basin diagnostics and the identification of opportunities, information exchange, basin planning, joint investments, and basin development as well as to promote compliance with agreements and dispute settlement.

As has been mentioned above, third parties can play an effective role in supporting riparian countries in basin coordination processes. They can offer tools and services to client countries and may be engaged in multiple ways. They can help with meeting financing gaps and the provision of technical assistance as well as advisory services during the identification, design, and implementation stages; they can join the process as facilitators or countries may request support from third parties for the promotion of compliance with between-country agreements. The involvement of third parties, in particular those that have a "weight of presence," can encourage compliance and provide impartiality in monitoring implementation.

The "Third-Party Tools" presented here are those typically provided by bilateral and multilateral donor agencies, international finance institutions (IFIs), and the private sector as well as civil society organizations. The majority of them have been tested successfully over many years. Some of them are new and have been developed by refining existing tools to respond to country demands, in particular those related to promoting compliance. For example, the World Bank can now finance a payment guarantee for a nonloan service related to government payment obligations in favor of foreign public entities or a foreign government (see "Third-Party Guarantee: Lom Pangar/Nachtigal Dams" **box 2.1**). Such a guarantee could, for instance, be used to guarantee compliance with storage reservoir release schedules for downstream hydropower production or irrigation benefits, provided any such noncompliance can be monetized and results in a payment obligation for the relevant foreign public entity or a foreign government.

The following presents the process of choosing appropriate tools in each of the three stages of the coordinated basin management framework and lists the Country Tools and Third-Party Tools available under each stage. The tool numbers (**T1**, **T2**, etc.) correspond to the tool numbering in part II: Toolbox.

As indicated in the following tables, a number of these tools can be applied for multiple stages. This is particularly the case for coordination frameworks. For instance, a joint technical committee can be convened to identify opportunities or to design interventions, or for the management of activities. International treaties can be used for all three stages: (1) an existing international treaty, or basin organization that has been set up based on an international treaty, can provide a joint platform for the identification of new development opportunities; (2) countries can commit to jointly designing a project through an international treaty; and (3) a treaty can be negotiated during the design stage in order to set up a legal framework for implementation that outlines the agreed rules of implementation, mechanisms to enhance compliance, and procedures for dispute settlement in case disputes occur during implementation. For example, the 1927 Protocol on the Beneficial Uses of Boundary Waters concerning the use of boundary waters of the Araks and Arpaçay/Akhuryan Rivers between Turkey and Armenia and the Joint Boundary Water Commission, which was established based on the Protocol, provided the coordination framework which allowed the two riparian countries (then the Soviet Union and Turkey) to identify the irrigation benefits a dam on their shared

BOX 2.1. Third-Party Guarantee: Lom Pangar/Nachtigal Dams

Lom Pangar Dam reservoir will unlock the energy production potential of a downstream run-of-river (ROR) hydropower cascade in the Sanaga River Basin in Cameroon. The dam will store water during the wet periods for release during dry seasons. New ROR structures, including Nachtigal Dam, are planned to satisfy demand from the industrial sector, to supply the national grid and to contribute to basin management.

Lom Pangar is co-financed by the World Bank, European Investment Bank and African Development Bank through concessional lending. The project is expected to yield downstream ROR power generation projects (including at Nachtigal), which can be supported by guarantee instruments to help Cameroon mobilize private financing and hedge certain risks (offtaker credit risk and country/political risk). The presence of the World Bank through these guaranteed arrangements generally also helps promote compliance with operating agreements.

river would provide. Subsequently, they signed two additional bilateral agreements, in 1964 and 1973, to construct the Arpaçay Dam and reservoir.

2.2.1 Identification of Opportunities and Risks

The identification of individual water-related development projects in transboundary basins should begin with a good understanding of the basin conditions, as well as of the needs and interests of riparian countries. The basin situation or context needs to be analyzed to identify opportunities as well as the potential costs and risks of cooperation. This can be done through transboundary diagnostic assessments or multisectoral investment opportunity analyses. In light of increasing water stress, early engagement in coordinated basin planning is important in order to determine a basin's development potential before it becomes a closing basin. This upstream planning is important to identify cooperation options before they become more difficult to implement due to increasing competition among users over the same resources.

There are multiple tools that can be employed by countries to gain a comprehensive understanding of opportunities and potential risks. Strategic basin assessments can be employed to determine the development opportunities, as well as their benefits and costs, for the basin countries and to the basin. These assessments can be carried out unilaterally with publicly available data on the overall basin conditions even beyond a country's border. Yet in order to appreciate the complete context of a basin, more detailed data may be needed. Status assessments that are carried out jointly among interested countries will be more useful. The joint creation of an agreed knowledge base on a basin or sub-basin area that will be affected by an engagement can, at the same time, build trust and confidence between the participating countries. It facilitates transparency and trust, and can pave the way for future cooperation.

Coordination frameworks, such as framework treaties or existing organizations within which basin countries already interact typically provide an enabling environment to initiate upstream assessments. For instance, a number of studies on basin diagnostics and sub-basin or basin-wide development opportunity analysis have been carried out by the Nile riparian countries within the context of the Nile Basin Initiative (NBI) and the technical offices engaged on the Eastern Nile and the Nile Equatorial Lakes, respectively.

Table 2.1 summarizes the various tools that are available to countries and that are offered by third parties to structure the process of identifying basin development opportunities and risks, as well as individual projects.

2.2.2 Design of Intervention

Once mutually beneficial projects (or programmatic engagements) have been identified, the countries move to designing the intervention and determining the scope and objectives of cooperation, if and as appropriate. The optimal type of cooperation will vary in each case. It is important for countries to identify the most effective level of engagement that helps them achieve their agreed objectives. Benefit sharing mechanisms that include redistribution of benefits and costs or compensation may be needed to ensure mutual gains. The investment or cooperative engagement will be defined based on these parameters. Countries need to decide on the financing modalities and design of the intervention, including assessment of any associated environmental and social impacts. In the case of joint investments, countries may consider setting up joint expert groups or other mechanisms to carry out the design work.

At this stage, countries should also start defining any coordination frameworks that may be needed for implementation. Such frameworks would, for instance, define the rules of engagement and/or provide for a semipermanent or permanent structure that give continuity and stability to the relationship. Frameworks may provide prescriptive parameters for resource development and management and/or may

TABLE 2.1. Identification of Opportunities and Risks

Country tools	Third-Party tools
Identification of opportunities and risks tools	
Diagnostic tools	***Neutral knowledge provision***
(T1) Basin inventory	(T70) Data and information provision
(T2) Basin water audit	(T71) Experts to conduct assessments and studies
(T3) Transboundary Diagnostic Analysis	(T72) Just in time notes, analysis, and advice
(T4) Economic valuation of basin resources	***Capacity building***
(T5) Vulnerability mapping and risk assessment	(T73) Tailored workshops and training programs
(T6) Stakeholder analysis	(T74) Twinning
(T7) Nexus assessments	(T75) Study tours
(T8) Benefit assessments	***Financing cooperation***
(T9) Multisector investment opportunity analyses	(T76) Seed financing for joint management mechanisms
(T10) Project feasibility studies	(T77) Recipient-executed grants
(T11) Strategic-level environmental/social impact assessments	(T78) Multidonor trust fund programs
Basin planning	***Facilitation/dialogue processes***
(T12) Multisector development plans	(T79) Convener
(T13) Climate change adaptation plans	(T80) Broker
	(T81) Weight of presence
Coordination framework	
Intention and commitment tools	
(T42) Declarations	
(T43) Memoranda of understanding or minutes of ministerial meetings	
(T44) International treaties	
Joint management mechanisms	
(T50) Advisory functions	
(T53) Inclusiveness functions	
(T54) Ad hoc mechanisms	
(T55) Joint technical committees	
(T58) Basin coordinating committees or councils	
(T59) River basin organizations, authorities or commissions	

define the rights and obligations of water users. Several other aspects need to be considered: any need for mechanisms that promote compliance, the level of flexibility needed to adapt to changes in hydrological or underlying conditions in the future, and the definition of dispute settlement procedures ahead of time, so that if and when a conflict occurs, there are predefined, agreed-upon procedures to resolve it. The issue of compliance is central to the design and conclusion of international agreements. The establishment of mechanisms to achieve enough mutual benefits so that the costs of noncompliance are too high to make defection worthwhile is one of the keys to lasting cooperation and the effectiveness of international agreements.

The level of formality and binding nature of these agreements usually depends on the level of detail and how much binding effect countries want to give to their commitment. For example, if the objective is merely to generally coordinate on basin development, a declaration or statement of principles adopted by heads of state or government or other senior decision makers may suffice. If the intervention is a joint hydropower investment, or another complex project, a series of more detailed legal agreements may be required. These would likely include co-financing agreements, establishment of a joint management mechanism, and any offtake or purchase agreements, including with private sector parties.

More and closer cooperation is not necessarily always better; the coordination framework needs to be adapted to the nature of the planned intervention. The establishment of permanent institutions with broad mandates, including advisory, policy development, implementation and monitoring, as well as dispute settlement functions, is not always necessary. Depending on the characteristics of the project, effective coordination may already be achievable through a simple information-gathering and exchange mechanism. It always depends on the plans for and the style of coordinated basin development and individual interventions that the involved parties have in mind. Country and Third-Party tools that can be employed in the design stage are presented in table 2.2.

2.1.3 Implementation and Compliance

At the implementation stage, regular information exchange on the status of the intervention and, if applicable, its operations are the main concerns. Information tools for management can be used to effectively monitor implementation. The information obtained may also reveal necessary adjustments to the existing engagement and/or new opportunities for development that can be taken up by the countries in an "Adjustment Loop" (figure 2.1).

Implementation may be supported through joint mechanisms that manage data exchange, oversee operations, and/or monitor compliance with agreements. Dispute settlement tools can be used to determine noncompliance and to agree on solutions for how to restore compliance or find an agreed alternative to the implementation of earlier agreements. For example, in the case of the Kura-Araks Basin, the Permanent Water Commission, which manages the joint utilization and operations of Arpaçay Dam, is the first instance to address differences over compliance. Only if it cannot resolve a conflict are the governments notified. A large number of transboundary water agreements contain dispute settlement provisions (Altingoz et al. 2018). These provisions usually involve a multistep approach, which typically starts with negotiations and may end, as a final step, with dispute resolution by the binding decision of a third party, such as an independent/impartial expert, court, or tribunal.

Table 2.3 presents the various dispute settlement tools, as well as a variety of other tools available to be used during the implementation stage.

2.3 Dimensions of Coordinated Basin Management

When deciding on the appropriate tools to be used for each stage in the process, countries need to consider a series of dimensions that will inform the choice and content of the tools ultimately used. Each transboundary river basin context displays unique characteristics in terms of hydrology, geography, climate, socioeconomic indicators, population, culture, history, and politics. All these characteristics must be taken into account when selecting tools to identify and realize mutual benefits and/or mitigate harm. At the same time, the transboundary impacts—the benefit and harm potentials of each intervention—display different characteristics. For example, the risk of transboundary harm may affect only one other riparian country in a multicountry basin or a planned project may bring benefits to all riparian countries. In the

TABLE 2.2. Design of Intervention

Country tools	Third-Party tools
Design of intervention tools	
Joint investments	***Neutral knowledge provision***
(T14) Equal cost sharing	(T70) Data and information provision
(T15) Benefit key for cost contribution to common works	(T71) Experts to conduct assessments and studies
(T16) Repayable loans	(T72) Just in time notes, analysis and advice
(T17) Direct payments	(T82) Oversight experts
(T18) Compensation for O&M or construction of regulating infrastructure	***Project finance***
(T19) Royalty payments	(T83) Grants
Design studies	(T84) Loans and credits
(T11) Project-level environmental/social impact assessments	(T85) Project finance guarantees
	(T86) Public-private partnerships
	Facilitation/dialogue processes
	(T79) Convener
	(T80) Broker
	(T81) Weight of presence
	(T87) Project finance safeguards
Coordination framework	
Intention and commitment tools	***Engagement framework preparation and implementation***
(T42) Declarations	(T98) Co-signatory of an agreement
(T43) Memoranda of understanding or minutes of ministerial meetings	(T99) Assistance for drafting legal instruments
(T44) International treaties	(T100) Assistance for building institutions
(T45) Agreements of private law character	(T101) Assistance for preparing rules and procedures
(T46) Amendments and supplementary agreements	
Implementation and adjustment tools	
(T12) Multisector development plans	
(T39) Single sector operational/implementation plans	
(T40) Stakeholder participation and inclusion tools	
(T66) Negotiations	
Joint management mechanisms	
(T50) Advisory functions	
(T53) Inclusiveness functions	
(T54) Ad hoc mechanisms	
(T55) Joint technical committees	
(T58) Basin coordinating committees or councils	
Financing of joint management mechanisms	
(T61) Principle of equality allocations	
(T62) Indicator allocations	
(T63) Community integration tax	
(T64) Polluter fees	
(T65) Benefit-based user fees	

TABLE 2.3. Implementation and Compliance

Country tools	Third-Party tools
Implementation and compliance tools	
Information tools for management	***Neutral knowledge provision***
(T20) Standards for comparability and interoperability	(T82) Oversight experts
(T21) Procedures for data sharing and exchange	***Capacity building***
(T22) Guidelines on data and information disclosure	(T73) Tailored workshops and training programs
(T23) Geographic information systems	(T74) Twinning
(T24) Hydrological bulletins	(T75) Study tours
(T25) Annual and sustainability reports	(T88) Equipment, software and technology provision
(T26) Awareness raising materials	***Promoting compliance***
(T27) Indicators	(T89) Implementation trust funds
(T28) Joint monitoring systems	(T90) Payment and loan guarantees
(T29) Impact evaluation	(T91) Financing agreements
(T30) Forecasting and early warning systems	(T92) Procurement standards
(T31) Decision support systems	***Dispute settlement tools***
(T32) Decision making under uncertainty	(T93) Mediation
Monitoring and promoting compliance	(T94) Conciliation
(T33) Site visits	(T95) Appointment of a neutral expert or expert commission
(T34) Individual experts	(T96) Reference to an arbitration tribunal
(T35) Technical operators	(T97) Independent court
(T36) Technical entities	***Facilitation/dialogue processes***
Enforcing compliance	(T79) Convener
(T37) Compensation for noncompliance	(T80) Broker
(T38) Suspension of decision making and participation rights	
Payment for benefits/compensation for costs	
(T17) Direct payments	
(T18) Compensation for O&M or construction of regulating infrastructure	
(T19) Royalty payments	
Implementation and adjustment tools	
(T12) Multisector development plans	
(T13) Climate change adaptation plans	
(T39) Single sector operational/implementation plans	
(T40) Stakeholder participation and inclusion tools	
(T41) Provisions for extreme events and uncertainty	

table continues next page

TABLE 2.3. continued

Country tools	Third-Party tools
Coordination framework	
Intention and commitment tools	
(T43) Memoranda of understanding or minutes of ministerial meetings	
(T44) International treaties	
(T45) Agreements of private law character	
Dispute settlement	
(T66) Negotiations	
(T67) Filing a complaint	
(T68) Complaint review	
(T69) Arbitration tribunals	
Joint management mechanisms	
(T46) Amendments and supplementary agreements	
(T47) Minutes of joint management mechanisms or decision of parties to an agreement	
(T48) Periodic reviews	
(T49) Conference calls	
(T51) Executive functions	
(T52) Regulatory functions	
(T56) Single-issue entities	
(T57) Special purpose vehicles	
(T59) River basin organizations, authorities, or commissions	
(T60) Entities with "beyond-the-basin" mandates	

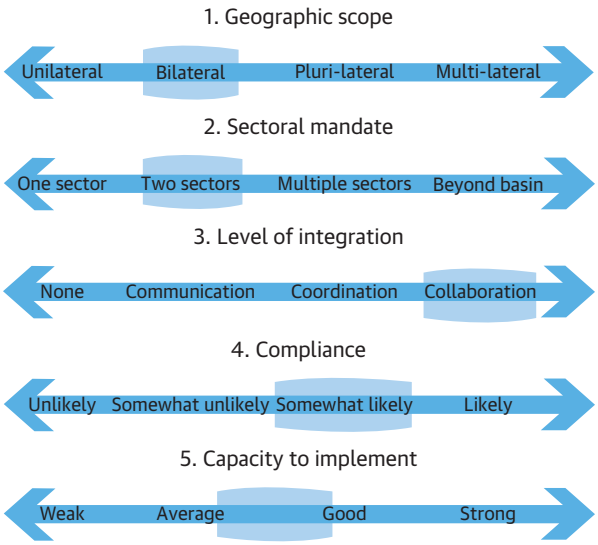
Note: O&M = operations and maintenance.

latter case, the planning country could try to seek financial contributions from others for the realization of the project.

Five dimensions should be considered when defining the characteristics and content of the tools chosen for a respective intervention: (1) geographic scope; (2) sectoral mandate; (3) level of integration; (4) likelihood of compliance; and (5) capacity to implement. Each dimension represents a spectrum of characteristics ranging from minimum to maximum scope. For graphical presentation purposes, these characteristics are depicted as four levels located along each spectrum (see figure 2.2). It is important to keep in mind that there are grey zones and intermediary levels that sit between the four levels presented for each dimension.

The dimensions on geographic scope, sectoral mandate, and the level of integration can guide in the decision on the scope of the engagement and thus on the content design of the tools that are being used. The dimensions relating to the likelihood of compliance and capacity to implement can guide in the choice of corresponding tools: in case countries are in doubt of compliance or there are high risks involved, countries

FIGURE 2.2. Dimensions and Spectra of Coordinated Basin Management



may want to employ independent monitoring or guarantees to mitigate for the risk of noncompliance; and in case of strong capacity to implement, technical assistance from third parties may not be needed.

The five dimensions can also guide adjustments in coordination (see "Adjustment Loop" in figure 2.1). Regular revision of these dimensions throughout the three stages of coordination will help with adaptation to changing circumstances or inform about changes that may be necessary because of new information. For example, project-related environmental impact assessments may reveal that a planned project may require coordination with additional, not yet considered, countries that will be affected by the intervention. Or countries engaged in coordinated development on parts of a transboundary river basin may realize

BOX 2.2. Dimensions of Coordinated Management

(1) Geographic Scope

The geographic scope dimension considers the number of countries, and, as applicable, also the social stakeholders that are involved in coordination and should be reached out to. For example, this would depend on how many countries are potentially affected by a project or are interested in cooperating. The levels range from unilateral to multilateral. A unilateral option means investment by one country without the involvement of any other country or interested third party. The spectrum continues up to plurilateral and multilateral engagements. The former means involvement of three or more parties, including basin-wide arrangements; the latter concerns involvement of third parties and countries beyond the basin.

(2) Sectoral Mandate

The sectoral dimension considers the areas countries and other interested parties seek to address with the engagement. It is generally determined by what is practical and needed for the effective management and implementation of the respective development intervention. At the minimum, operations are envisioned to cover one sector; for example, flood prevention. Moving along the spectrum of options, interventions could include multiple sectors involving two or more aspects of integrated basin management, such as navigation, irrigation, and electricity trade, as well as mandates that go "beyond the basin," such as regional economic integration or contribution to data sharing at the global level.

box continues next page

BOX 2.2. continued

(3) Level of Integration

The level of integration considers the depth of engagement the concerned countries wish to achieve. It broadly corresponds to the stages of the Cooperation Continuum (figure 1.4). It will determine the type of joint arrangement or mechanism to set up between two or more countries (and/or third parties). Communication means a simple exchange of information, either through one-sided notification by the country planning the operation or by two-way consultations or information exchange. The next level—coordination—means that plans regarding the intervention are adjusted and coordinated based on agreement. Collaboration can take multiple forms, such as the establishment of a joint institution for basin planning or of a special purpose vehicle for joint investment.

(4) Compliance

The compliance dimension considers situations in which specific actions have to be taken in order to provide benefits to others or to mitigate the risk of harm. The levels indicated on the spectrum are based on the likelihood-of-compliance perception of the involved countries and thus indicate their interest in the adoption and in the required strength of a compliance tool.

(5) Capacity to Implement

An important consideration for countries engaged in coordination is their own and their collaborating partners' capacity to implement. Some tools are designed to strengthen or complement existing capacity. The use of other tools will depend on the absorptive capacity or capacity to implement.

that coordination needs to be extended to additional parties because either their engagement is affected by activities by other riparian countries or because this opens opportunities for more beneficial deals and trade-offs.

Using the three-stage process framework described above and illustrated in figure 2.1, the next chapter presents how riparian countries in six different basins have effectively applied specific tools and in which way the five dimensions are reflected in the process.

Lake Saimaa, Vuoksi Basin. © cesa53rone/iStock.

Chapter 3
Application of the Framework and Lessons Learned

Countries have successfully engaged in coordinated basin management in a large number of the 286 transboundary basins of the world. The experiences that come from these examples of cooperation on transboundary water resources development highlight the uniqueness of each and every case—not one compares to the other. At the same time, they follow similar patterns: opportunity identification, design, and implementation, with dispute settlement and adjustments along the way of the process as needed.

The following sections summarize how this three-stage process (figure 2.1) has played out in the case of the six case studies that have been analyzed as part of the overall study, and which lessons can be derived from the application of the framework and the riparian coordination processes. The six case studies have been selected to present a variety of different interventions, water quality control, flow regulation for agricultural uses, flood risk, cascade management, and hydropower generation. They include basins with mature basin coordination processes that have been in place for decades and illustrate the iterative character of cooperation; they also include basins with relatively young cross-border coordination processes that highlight the challenges and sometimes elusiveness of early stage cooperation processes, such as in the case of water quality management in the Kura-Araks. Each of the case studies highlights how the involved countries have used different tools along the three-stage process of coordinated basin

develpment to address specific challenges in order to realize mutually beneficial solutions (see tables 3.1, 3.2, and 3.3 at the end of this chapter).

3.1 Identification of Opportunities and Risks

The Columbia Basin and the Kura-Araks Basin case studies illustrate how the riparian countries have made use of very different tools to identify the development potential of and risks to their shared basins. In the Columbia Basin, which covers 668,000 km^2 in the Pacific Northwest of North America, Canada and the United States used an existing coordination framework, the International Joint Commission (IJC) established based on the 1909 Boundary Waters Treaty, to identify the development potential of the basin. In 1944, the two governments asked the IJC to investigate and recommend a development plan for the Columbia Basin. The IJC then created a joint technical commission **(T55)**, the International Columbia River Engineering Board (ICREB), to analyze the use of the Columbia River Basin waters with respect to domestic water supply, navigation, efficient power production, flood control, reclamation, conservation of fish and wildlife, and other benefits. The joint investigations **(T8** and **T9)**, conducted between 1944 and 1959, showed that developing reservoirs in the upper part of the Columbia Basin and coordinating their operations with those of existing infrastructure in the United States had the potential to create significant benefits for flood control and power generation for both countries. The assessment ultimately led to the Columbia River Treaty (CRT), an international agreement **(T44)**, in which the countries agreed to coordinated basin management for hydroelectricity generation and flood control.

The country-to-country process used by Canada and the United States differs significantly from the process and tools that were used in the Kura-Araks Basin to identify opportunities for water quality management among Armenia, Georgia, and Azerbaijan, three of the five countries sharing the basin. Water quality is a key concern in the basin. Water pollution is mostly attributed to land-based sources, such as agriculture, industry, and mining, as well as the lack of operational and adequate treatment plants. The countries referred to third parties to assist with the water quality issues in the basin. Between 2011 and 2013, the three countries participated in a Transboundary Diagnostic Analysis (TDA) **(T3)** in the context of the United States Agency for International Development-Global Environment Facility (UNDP-GEF) project on Reducing Transboundary Degradation in the Kura-Araks Basin. The TDA is a tool developed by the GEF, involving joint fact-finding and objective (nonnegotiated) assessments showing the relative importance of causes and impacts of transboundary water problems. The TDA identified four main transboundary issues in the Kura-Araks Basin: variation and reduction of hydrological flow; deterioration of water quality; ecosystem degradation; and increased flooding and bank erosion. Information presented in the TDA was obtained from publicly accessible data sources (publications, statistical services), as well as from national experts in the project countries. The assessment provided the basis for the subsequent Kura-Araks Basin Strategic Action Program **(T12)**, which includes specific actions that can be adopted nationally, within a harmonized multinational context, to address the priority transboundary problems identified in the TDA. Parts of this program are currently being implemented by Georgia and Azerbaijan.

3.1.1 Lessons Learned

The lessons for the identification of development opportunities from these two and other case studies include the following:

- The development of an agreed hierarchy of interests is important. In the case of the Columbia, flood control or "vital needs" take precedence over power generation and then other interests.
- Information and data exchange can be a catalyst for confidence building.

TABLE 3.1. Identification of Opportunities and Risks

Kura-Araks (1)	Kura-Araks (2)	Columbia	Chu and Talas	Vuoksi	Douro	Rhône
International Treaties **(T44)**: Countries signed the 1927 protocol on the beneficial uses of boundary waters committing to equally share the boundary waters. ***Basin Coordinating Committees or Councils*** **(T58)**: Joint Boundary Water Commission established based on the 1927 protocol with ***advisory, executive and regulatory powers*** to manage the use of the waters **(T50-T52)** as well as to settle disputes through ***negotiations*** **(T66)**.	***Transboundary Diagnostic Analysis*** ***(TDA)*** **(T3)**: Completed as part of the United States Agency for International Development-Global Environment Facility (UNDP-GEF) *Reducing transboundary degradation in the Kura-Araks River Basin*. The TDA process included stakeholder consultations and identified deterioration of water quality as one of four main transboundary issues in the basin. ***Experts to Conduct Assessments and Studies*** **(T71)**: Water quality assessments were carried out through Third-Party assistance from UNECE, USAID, NATO, EU and Organization for Security and Cooperation in Europe (OSCE). ***Multisector Development Plans*** **(T12)**: UNDP and GEF provided technical assistance in creating a Strategic Action Program that aimed to facilitate a coordinated approach to transboundary river management and address the key issues identified by the updated TDA.	***Joint Technical Committees*** **(T55)**: In 1944 Canada and the US set up the International Columbia River Engineering Board (ICREB) to analyse use of the waters with respect to domestic water supply, navigation, efficient power, flood control, reclamation, conservation of fish and wildlife, and other benefits. ***Benefit Assessments*** **(T8)** and ***Multisector Investment Opportunity Analyses*** **(T9)**: Joint investigations, conducted between 1944 and 1959 showed that developing reservoirs in the upper part of the Columbia River Basin and coordinating their operations with those of existing infrastructure in the USA had the potential to create significant benefits for flood control and power generation for both countries.	***International Treaty*** **(T44)**: The agreement between the Government of the Kazakhstan and the Government of the Kyrgyz Republic on the use of water management facilities of intergovernmental status on the Rivers Chu and Talas, signed in 2000, governs the joint management and maintenance of the water facilities in these basins. ***River Basin Organizations, Authorities or Commissions*** **(T59)**: In 2005, the bilateral Commission on the Chu and Talas Rivers was established by Kazakhstan and Kyrgyz Republic to implement the objectives of the 2000 agreement; it has ***advisory, executive and regulatory powers*** to manage the water facilities **(T50-T52)**	***International Treaty*** **(T44)**: The two countries signed an agreement, the 1964 Frontier Watercourses Agreement, which includes all frontier waters shared between Finland and Russia, and provides the main substantive and procedural principles for transboundary water cooperation. ***River Basin Organizations, Authorities or Commissions*** **(T59)**: Based on the 1964 agreement, the countries established the Joint Finnish-Russian Watercourses Commission with ***advisory, executive and regulatory powers*** **(T50-T52)** to manage the use of the waters as well as to settle disputes through ***Negotiations*** **(T66)**.	***International Treaty*** **(T44)**: The 1927, 1964 and 1968 agreements between the two riparians were focused on hydropower generation and flow regulation. Currently, the 1998 Albufeira Convention establishes an annual flow regime for all major rivers, as well as priorities among economic activities, set-up of information exchange channels, water transfers, and sustainable use of water. ***River Basin Organizations, Authorities or Commissions*** **(T59)**: The Commission for the Application and Development of the Convention (CADC) is the primary arrangement for implementing the convention.	***International Treaty*** **(T44)**: National policies that are in line with the convention on the protection and use of transboundary watercourses and international lakes, the Aarhus Convention and the Espoo Convention, govern the management of the Rhône, as these treaties have been ratified by Switzerland and France. ***River Basin Organizations, Authorities or Commissions*** **(T59)**: The International Commission for the Protection of Lake Geneva is an intergovernmental body, which monitors the lake's water quality, coordinates water policies between the Swiss and French and informs the resident population.

TABLE 3.2. Design of Intervention

Kura-Araks (1)	Kura-Araks (2)	Columbia	Chu and Talas	Vuoksi	Douro	Rhône
Memorandum of Understanding (MoU) (T43): MoU and protocols agreed between 1962 and 1964 for the establishment of a joint dam on the Arpaçay/Akhuryan River. *International Treaties* (T44): Bilateral agreements signed in 1964 and 1973 to construct the dam and reservoir and commit to equally share the water. *Joint Technical Committee* (T55): An ad hoc joint technical committee established based on the 1964 Protocol on the Joint Construction of the Arpaçay/Akhuryan Dam, managed the building of the dam. It was also put in charge of preparing the annual operation schedule of the dam and overseeing its implementation.	*Multisector Development Plans* (T12): As the countries signed the European Neighborhood Policy Action Plan, they are under the obligation to cooperate regionally. *Assistance for Building Institutions* (T100) and *Preparing Rules and Procedures* (T101): The EU assists all three countries in designing national water policies. *Memorandum of Understanding* (T43) between Azerbaijan and Georgia stipulates that to protect and use the transboundary waters, the states should establish groups to exchange monitoring information. *International Treaties* (T44): Bilateral agreements are in place between Azerbaijan and Georgia, and Armenia and Georgia, that govern water quality issues.	*Compensation for Operation and Maintenance (O&M) or Construction of Regulating Infrastructure* (T18): The initial 30-year payment of the Canadian Entitlement was used to partially finance the construction of the Canadian Dams. *International Treaties* (T44): The Columbia River Treaty (CRT) optimizes flood control and power generation in both countries, after allowing for consumptive uses, including irrigation. Flexibility within the agreement accommodates other interests, such as fisheries and recreation. *Amendments and Supplementary Agreements* (T46): To fill and operate additional storage built in the Canadian Dams, an additional agreement, the 1984 Non-Treaty Storage Agreement, was required.	*Single Sector Operational Plans* (T39): The countries agree annually on the types and volumes of repair and maintenance work to be done on the water facilities covered by the 2000 Agreement. *Declarations* (T42) or *Minutes of Ministerial Meetings* (T43): The water sharing rules on the Chu and Talas Rivers were established under the 1983 Rules by the Soviet Union's All-Union Ministry of Melioration and Water Economy. The sharing of O&M costs is based on the 1998 Protocol signed by the national water authorities of the two countries. *International Treaties* (T44): The 2000 Agreement governs the joint management and maintenance of the water facilities on Chu and Talas Rivers.	*International Treaties* (44): The 1989 Vuoksi Agreement governs the management of the release of water from Lake Saimaa to the Vuoksi to prevent damages caused by high and low water flows on both sides of the border. In addition, the 1972 Hydropower Agreement specifies the daily regulation of the Vuoksi in a manner that is satisfactory to all the power stations.	*International Treaties* (T44): Under Article 2 of the 1927 Agreement, which specifically targets the Douro, about 50 percent of hydropower generation capacity is allocated to each country. In addition, the 1964 agreement introduced strict limitations on withdrawals and flow diversions in both the Douro and its main tributaries. *Public-Private Partnerships (P3)* (T86): Concession contracts between the riparians and electric companies entail a financial compensation from the company to the public water domain, rely on the existing juridical framework (both national and international), and are grounded on the historical flow record across the whole river basin.	*Negotiations* (T66): Between France and Switzerland to define the design process for the flughins procedure. *Environmental Impact Assessment* (T11) and *Stakeholder Consultations* (T40): Based on the Espoo Convention to identify an adequate flushing method. *International Treaty* (T44): It was decided to activate the Espoo Convention to frame the process of intervention design for sediment flushing.

TABLE 3.3. Implementation and Compliance

Kura-Araks (1)	Kura-Araks (2)	Columbia	Chu and Talas	Vuoksi	Douro	Rhône
Single Sector Operational or Implementation Plans **(T39)**: The commission makes a monthly management plan that includes decisions on the operation of the dam and its facilities, a water usage schedule, cleanliness of the dam reservoir and fish production in the dam lake. ***Periodic Review*** **(T48)**: Today, both the Armenian and Turkish sides have technical sub-committees that periodically gauge the other country's water usage. ***Site Visits*** **(T33)**: A joint inspection commission inspects the dam every three to five years. ***Negotiations*** **(T66)**: The commission is charged with negotiating disputes that arise between the two countries. If the Permanent Water Commission (PWC) cannot resolve the conflict, the governments are notified.	***Convener*** **(T79)** and ***Broker*** **(T80)**: A number of Third-Party projects have aimed to increase transboundary cooperation through data exchanges and information sharing. ***Multisector Development Plans*** **(T12)**: Armenia, Azerbaijan, and Georgia are committed to developing integrated river basin management plans and bringing their national water policies in line with the EU Water Framework Directive, which could provide a basis for future cooperation.	***Single Sector Operational or Implementation Plans*** **(T39)**: The assured operating plan (AOP) is drawn up every year and is used to calculate the Canadian Entitlement to downstream power benefits. ***Conference Calls*** **(T49)**: In the operation of the CRT, weekly alterations to the flow regime are determined by the entities through a weekly "conference call" to respond to unforeseen developments. ***Forecasting and Early Warning Systems*** **(T30)**: A hydro-meteorological monitoring system is in place. ***Direct Payments*** **(T17)**: Based on the CRT, Canada obtains half of the additional power benefits derived in the USA through the coordinated operations of Canadian Dams (Canadian Entitlement).	***Procedures for Data Sharing and Exchange*** **(T21)**: The working group on economics, monitoring and data exchange is in charge of the information support of the activities of the commission, as well engaging the public, and preparing publications and booklets about the commission's work. ***Multisector Development Plans*** **(T12)**: The working group on legal and institutional issues has prepared the Integrated Water Resources Management (IWRM) plans for the Chu and Talas Basins. ***Provisions for Extreme Events and Uncertainty*** **(T41)**: Under the 2000 Agreement, the Parties must notify each other in the event of an accident on the facilities caused by extreme weather events or technical malfunction in their operations.	***Operational or Implementation Plans*** **(T39)**: According to the Vuoksi Discharge Rule, a water release program must be discussed and approved by the Finnish-Russian Commission. ***Conference Calls*** **(T49)**: Officers and technical experts are in direct contact by phone, with the Finnish regional authority having a Russian-speaking expert at its disposal to smoothen the language barriers. ***Forecasting and Early Warning Systems*** **(T30)**: According to the Vuoksi Discharge Rule included in the Vuoksi Agreement, the process of adjusting the natural flow rate to increase or reduce the flow must be based on forecast predictions carried out by Finland.	***Operational or Implementation Plans*** **(T39)** and ***Technical Operators*** **(T35)**: The two hydropower concessionaires ensure the operational and daily management of the dams and reservoirs, ensure the permanent monitoring of stream flows and discharges, and communicate the information according to procedure to the respective water authorities. ***Procedures for Data Sharing and Exchange*** **(T21)**: The two riparians gather data from their respective river basin organizations, from the hydropower concessionary companies that operate the reservoirs and dams, and from other stakeholders whenever relevant.	***Procedures for Data Sharing and Exchange*** **(T21)** enable the hydropower operators to optimize electricity production to satisfy base-load and peak demands. ***International Treaty*** **(T44)**: The *Mésures d'execution* clarify how the convention related to the Emosson Dam will be implemented. It defines how the waters from the Arve River are returned to France. Agreements between the Canton of Geneva and Services Industriels de Genève (SIG) delegates the operation of lake levels and flow regime downstream of Lake Geneva to SIG.

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TABLE 3.3. continued

Kura-Araks (1)	Kura-Araks (2)	Columbia	Chu and Talas	Vuoksi	Douro	Rhône
International Treaties (T44): Bilateral agreement from 1973 specifies the rules for dam and lake management. *River Basin Organizations, Authorities or Commission* (T59): Joint entity, the PWC, established based on the 1973 agreement, to manage the rivers as well as dam operations.		*Compensation for Harm* (T37): During the construction of the Canadian Dams, any breach by Canada to commence full operation at specified dates would have resulted in a forfeiture in its Canadian Entitlement.	*Periodic Reviews* (T48): One of the regular agenda items of the Commission sessions is the review of potential amendments to the 2000 Agreement and the Statute of the Commission.	*Direct Payments* (T17): Based on the 1972 agreement, Russia must on a permanent basis compensate Finland the losses of 19.900 MWh per year caused by the Svetogorsk station by supplying free electricity to the Finnish hydropower company.	*Annual and Sustainability Reports* (T25): CADC delegations exchange informal monitoring reports on a trimestral basis, building up for annual reports that are approved in plenary sessions.	*Agreements of Private Law Character* (T45): Private law agreements implemented by the electricity companies aim to optimize hydropower production in accordance with electricity consumption peaks while allowing the use of the Rhône for other purposes such as cooling of nuclear power plants downstream. *Dispute Settlement Procedures* (T66–69): Are included in the convention relating to the Emosson Dam.
Executive Functions (T51): PWC established a sub-commission to carry out its decisions. *Technical Entities* (T36): A joint inspection commission carries out regular *Site Visits* (T33) and sub-committees exist on both sides to gauge the water usage of the other party.		*Complaint Review* (T68): The CRT established the Permanent Engineering Board (PEB) to provide an independent review of CRT implementation. *Appointment of an Expert Commission* (T95): If the PEB is not able to resolve differences the issue can be referred to the International Joint Commission (IJC) that governs transboundary water issues between the USA and Canada.	*Compensation for O&M or Construction of Regulating Infrastructure* (T18): The O&M costs for the facilities specified in the 2000 agreement would be shared on a pro rata basis in accordance with the water volume received by each party.	*Compensation for Harm* (T37): According to the 1964 and 1989 agreements, the Party that permits measures that cause loss or damage in the territory of the other is liable for reparations to the other Party. Finland has compensated Russia in the range of less than one million euros for hydropower losses due to exceptional overflows.	*Provisions for Extreme Events and Uncertainty* (T41): In emergency situations such as flood risk, direct telephone communications are used between the operational commands of the two hydropower companies to inform on river flows and dam discharges.	*Implementation Plan* (T39): Determined the coordination of water releases from the different reservoirs operated by the French and Swiss hydropower operators for the Verbois Dam.

table continues next page

TABLE 3.3. continued

Kura-Araks (1)	Kura-Araks (2)	Columbia	Chu and Talas	Vuoksi	Douro	Rhône
		Reference to an Arbitration Tribunal **(T96):** If the IJC does no render a decision, or within an agreed upon time, either country may submit the dispute to arbitration.	***Executive Functions*** **(T51)**: The secretariat is responsible for the implementation of the decisions of the commission and the heads of the Secretariat in Kazakhstan and the Kyrgyz Republic ensure the day-to-day operations of the Commission. ***Technical Entities*** **(T36)**: The secretariat has established working groups to deal with issues such as infrastructure safety, legal and institutional issues, water resources allocation, monitoring, data exchange and others.	***Executive Functions*** **(T51)** and ***Technical Entities*** **(T37)**: The Finnish-Russian Commission established working groups on IWRM, water quality, border control, and fisheries, which are the functional institutions that prepare Commission protocols.	***Amendments and Supplementary Agreements*** **(T46)**: The convention was revised in 2008 as per Article 31, and a trimester and weekly flow regime was added to the annual flows previously established. ***Agreements of Private Law Character*** **(T45)**: The 1927 and 1964 agreements largely delegate hydropower production and flow management to hydropower companies. Also, the private sector representatives from hydropower companies that operate the dams have consultative status at CADC meetings.	***Ad Hoc Mechanisms*** **(T54)**, including a ***Joint Technical Committee*** **(T55)**: Using these tools, the countries agreed on a revised sediment flushing methodology for future application.

- Negotiating using facts and clearly defined numerical values is important.
- Establishing new collaborative frameworks between co-riparian countries who find themselves in uneasy relationships is extremely difficult. Third parties can have an important role as facilitators.
- Coordinated management often requires contributions and commitments among different governance levels.
- Coordinated management can take several decades to build.

3.2 Design of Intervention

An analysis of the design processes for flow regulation in the Vuoksi Basin and the Chu and Talas Basins shows that the design stage can take more than a decade, depending on information requirements and the scope of the intervention. The two case studies describe the different design processes for coordination frameworks: one carried out directly between countries, one done with the involvement of third parties.

In the case of the Vuoksi the countries carefully studied the characteristics of the flow regime of the river over multiple years to consider ways in which the different interests of the involved parties could be met: flood risk management, protection of biodiversity, and drought management around Lake Saimaa to protect biodiversity, industries, and communities on the one hand, and hydropower generation on the other. The Vuoksi is a 150-km long transboundary river flowing from Finland to Russian Federation. It originates in Lake Saimaa, flows 13 km within Finland, and empties into Lake Ladoga in Russia. One of the most significant results of the cooperation between Finland and Russia (USSR) has been negotiations **(T66)** which led to the design and agreement of the Discharge Rule of Lake Saimaa and Vuoksi (1989) **(T44)**. The negotiation process took place within the framework of a joint commission **(T59)** established based on the early 1964 Frontier Watercourses Agreement **(T44)**. The Discharge Rule is a complex set of parameters determining operational rules **(T39)** for lake level regulation and hydropower production along the Vuoksi. Under the rule, water shall be released from the lake in such a manner that the water level of the lake and the flow into the Vuoksi River remain as far as possible within normal limits. Finland reports the adjustments made to the natural flow of the Vuoksi and any damages or benefits resulting from these adjustments to the joint commission. Finland also provides a final balance sheet of the damage or benefit, which is used as the basis for the consideration of possible compensations **(T17)** it pays to Russia for Russia's loss of hydropower production.

In the case of the Chu and Talas Basins, the hydropower and irrigation systems once managed by the Soviet Union became a two-country affair. With the dissolution of the Soviet Union, the Talas and Chu Rivers became transboundary waters between Kazakhstan and the Kyrgyz Republic. Within the basins, all regulation facilities (dams, reservoirs, canals) are in the mountains upstream of the Kyrgyz Republic, whereas the irrigation areas are predominantly downstream in the valleys and steppes in both the Kyrgyz Republic and Kazakhstan. Kazakhstan depends on the operation and proper maintenance of this infrastructure, which had been largely paid for by the Kyrgyz Republic. Fairness and equity concerns served as the basis for the two countries to establish a legal framework for the joint operation of water management infrastructure in the Basins in 2000 **(T44)**. The countries agreed that the operation and maintenance (O&M) costs for the facilities specified in the agreement would be shared on a pro rata basis in accordance with the water volume received by each party **(T18)**.

For the establishment of their joint management mechanism, called for in the agreement, the countries asked the international community for assistance.

The United Nations Economic Commission for Europe (UNECE) and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), in cooperation with the Organization for Security and Cooperation in Europe (OSCE), joined forces with the governments of Sweden, Estonia, and the United Kingdom, which provided financial assistance, to support the Kyrgyz Republic and Kazakhstan's request by: facilitating the drafting of the documents that would define the commission's status, functions, responsibilities and rights; and developing procedures and basic documents for co-funding of the repair, maintenance, and operation of multipurpose water facilities on both rivers governed the agreement **(T99-101)**. The commission includes a permanent secretariat as well as experts and working groups. It enables joint and transparent decision making on water allocation and maintenance costs by the two countries, as well as relevant information sharing, efficient implementation of joint projects, and prevention and rapid settlement of differences **(T59)**.

3.2.1 Lessons Learned

The lessons about intervention design from these two and other case studies include the following:

- Focus on broader benefit sharing and minimizing joint harm, and clearly defined compensation mechanisms.
- Preempt potential conflict. When creating a detailed agreement, consider all possible scenarios and their solutions in advance.
- Development partners are often called on to provide assistance to establish frameworks and for the drafting of documents to define institution status, functions, responsibilities and rights, and procedures; providing intermediation to reach consensus; providing information to stakeholders; and promoting broad public participation.

3.3 Implementation and Compliance

The Columbia Basin and the Douro Basin case studies highlight the importance of establishing durable coordination frameworks and compensation mechanisms to promote compliance. The riparian countries in both basins coordinate flow management along their shared rivers for hydropower production and other uses. Coordinated basin management is characterized by treaty-based cooperation that delegates implementation to a large part to public/private companies.

In the case of the Columbia River, the two riparian countries established a joint technical committee **(T55)**, the Permanent Engineering Board (PEB), to provide an independent review of the implementation of the CRT **(T44)**. The PEB collects statistics, ensures that the objectives of the CRT are met, and reports to the Canadian and United States federal governments annually **(T48)**. It consists of two persons from Canada (one federal and one provincial) and two from the United States. The PEB is not an arbitration board but can "find fact" with operations, meaning that it can determine a view on how operations are being conducted; that "fact" may be accepted in any further tribunal or ruling. Moreover, the PEB can assist in resolving any contentious issues through dialogue and facilitation **(T68)**. The PEB does not decide or make rules, but the governments generally respect its recommendations. The PEB created the PEB Engineering Committee to assess technical elements of CRT operations **(T55)**. In terms of operations and flow regulation, the CRT is implemented by the so-called "Entities," which are the British Columbia Hydro and Power Authority (BCH) in Canada, and both the Bonneville Power Administration (BPA) and the Northwest Division of the US Army Corps of Engineers (USACE) in the United States.

Cooperation between Spain and Portugal on their shared rivers is regulated by a series of international treaties **(T44)**. The 1927, 1964, and 1968 water agreements established a principle of allocating about

50 percent of hydropower generation potential to each country by earmarking particular sub-stretches and height differences for hydropower use. The 1927 and 1964 Agreements largely delegate hydropower production and flow management to the previously public (and progressively privatized) electricity companies, EDP and IBERDROLA **(T45).** The two hydropower concessionaires **(T35)** ensure the operational and daily management of the dams and reservoirs as well as the permanent monitoring of stream flows and discharges, and communicate the information according to procedure to the respective water authorities **(T39)**. For monitoring and disaster prevention purposes, semiautomatic communications are used by both EDP and IBERDROLA companies to inform the respective national water authorities on river flows and dam discharges (as required by the concession contracts) **(T41)**. The 1964 Agreement was the first that established a compensation mechanism as a means to ensure compliance with agreed limitations on withdrawals and flow diversions in both the Douro and its main tributaries **(T37)**. Building on this earlier agreement, the 1998 Albufeira Convention opens a door also for economic compensation in the event that private or public rights are affected as a consequence of noncompliance with the Convention. Only on one occasion did Portugal claim economic compensations for the damages incurred by alleged noncompliance with the agreed flow regimes in the Douro River in 2005. The compensation was quantified on the basis of the hydro-energy production losses downstream.

3.3.1 Lessons Learned

The lessons for the implementation and compliance stage from these two and other case studies include the following:

- Cooperation can take place effectively in the context of formal frameworks that ensure both clarity and continuity.
- Where international legal agreements exist, informal arrangements still play a key role in implementing effective cooperation mechanisms between parties. At the core of good cooperation are good personal relationships and mutual respect.
- For cooperation to occur, either explicitly or implicitly, there needs to be adequate communication between the parties. The lack of communication inhibits cooperation potential between the riparians and may compound preexisting tense relationships.
- Develop mechanisms for all parties to have as much internal flexibility in operating their portions of the cooperative system.
- An appropriate balance of incentives and penalties should be drawn up to help compliance and facilitate investment.
- Creation of an independent overview body can help ensure compliance with agreed terms and resolve any misunderstandings.
- Trusted and easily accessible information is important for sustaining cooperation.
- Private investment and commercial enterprises can strengthen focus on efficiency in operations and can bring new elements for innovation and creative development solutions.

3.4 Adjustment Loop

The preceding summaries of some of the key features of the case studies demonstrate that countries do adjust their cooperative engagements over time as needed. In the case of the Vuoksi, the riparian countries improved on the regulations governing flow regulation over time. This is manifested by subsequent agreements concluded between the riparian states, which build on earlier agreements **(T44; T46)**.

The same is true for the basins shared by Spain and Portugal and for the Columbia Basin. Building on the 1927 framework agreement on the management of shared river basins on the Iberian Peninsula, the subsequent treaties became more specific and introduced compensation mechanisms to promote compliance with the agreed rules of coordinated basin management. Since the CRT was established in 1964, various agreements have been adopted by Canada and the United States to deal with issues as they arise. In addition, these agreements provide for built-in adjustment mechanisms to respond to natural fluctuations in flow patterns. In the operation of the CRT, weekly alterations to the flow regime are determined by the entities through a weekly, Thursday-morning "conference call" to be able to respond to unforeseen developments. Monthly alterations to address seasonal changes in flow, snow pack, and flood forecasting are conducted through storage regulation, which is determined by the dam operators as part of the operating procedures under the CRT **(T46** and **T49)**.

In the Rhône Basin, France and Switzerland have reviewed and adjusted the sediment flushing modalities at Verbois Dam after complaints about harmful environmental impact of the earlier procedure. Upstream from the dam, Lake Geneva and the slowing down of water flows contribute to the deposit of sediment carried by the Rhône River. Just after Geneva, the junction with the Arve River brings additional sediment loads. These materials get trapped at Verbois. A moratorium on flushing was adopted in 2003 after complaints. French and Swiss authorities launched a joint technical committee to consider different scenarios and methodologies for the flushing procedure **(T55)**. In addition, stakeholder consultations took place **(T40)**. After the testing of revised flushing modalities in 2012, additional consultations and discussions were held to revise the method. Finally, a new mixed methodology combining upstream dredging and soft flushing and coordination of water releases from the different reservoirs operated by the French and Swiss hydropower operators for the Verbois Dam **(T39)** was successfully executed in May 2016.

3.4.1 Lessons Learned

The lessons about the importance of adjustments if and when needed from these two and other case studies include the following:

- Incorporating adaptability into decision-making and operational frameworks is critical for effectiveness in addressing changing situations and circumstances.
- Even long-established processes can be adjusted when external conditions change or when new information about negative impacts of these long-established processes becomes known.
- Cooperation is iterative. As countries engage over time, they adjust their coordinated basin management approaches to new circumstances or to enhance efficiency and effectiveness of implementation.

Hydropower generators. © leezsnow/iStock.

Part II Toolbox

Note on Part II

Part II presents the wide array of tools available to countries and development partners to identify, design, and implement coordinated basin development opportunities (table 4.1: Macro Table). Countries and development partners have successfully employed some of these tools; others are new tools that are in the testing stage; and others are ideas of tools that can be employed.

Given the large variety of tools and their constant development and improvement as countries engage in coordinated development in many basins around the world, the list may not have captured all available tools and their individual variations. The authors made the best attempt to present an as-complete list as possible; it should not be considered exhaustive. At the same time, there is overlap between tools used in the various stages of the basin development process (figure 4.1), as a number of tools are applicable to multiple stages. The overlap is intentional and cross-references are clearly indicated, where applicable.

Part II distinguishes between tools that are available to countries directly, meaning they can be employed by countries directly without the assistance of third parties; and those tools that are offered by third parties, such as technical assistance, financing, guarantees, and process facilitation.

FIGURE 4.1. Three-Stage Process of Coordinated Basin Development

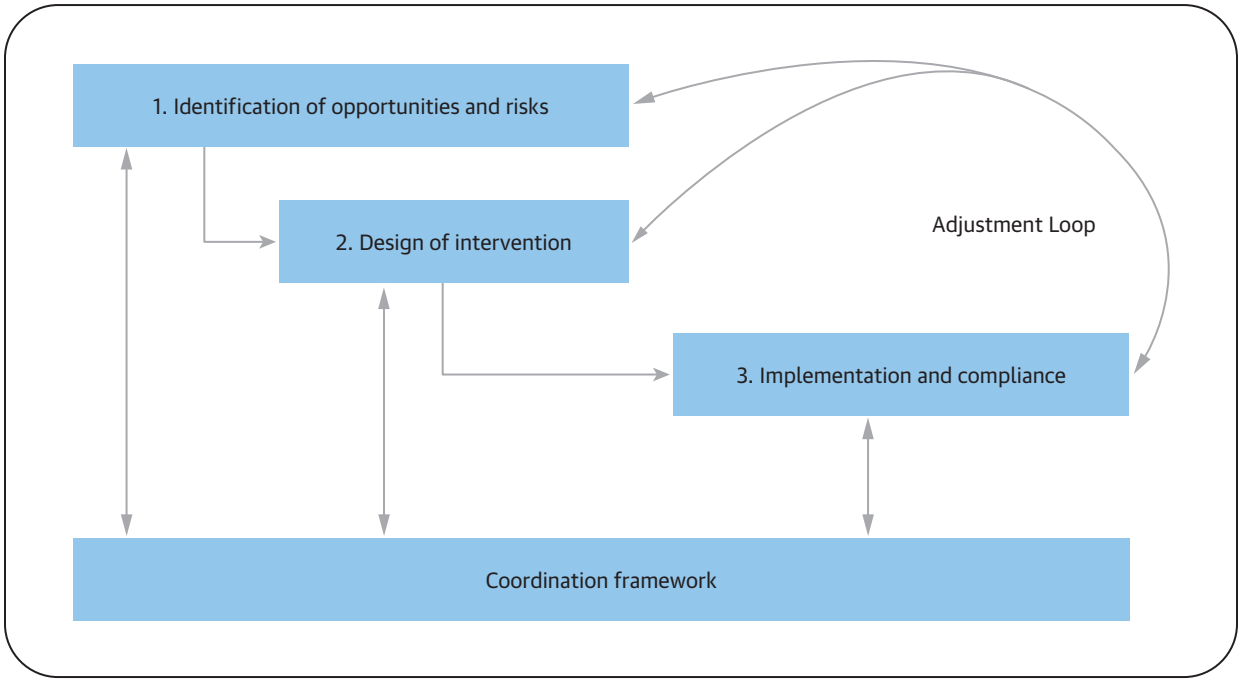

TABLE 4.1. Macro Table

Country tools	Third-Party tools
1. Identification of opportunities and risks tools	
1.1. Diagnostic tools	***1.1. Neutral knowledge provision***
(T1) Basin inventory	(T70) Data and information provision
(T2) Basin water audit	(T71) Experts to conduct assessments and studies
(T3) Transboundary diagnostic analysis	(T72) Just in time notes, analysis, and advice
(T4) Economic valuation of basin resources	***1.2. Capacity building***
(T5) Vulnerability mapping and risk assessment	(T73) Tailored workshops and training programs
(T6) Stakeholder analysis	(T74) Twinning
(T7) Nexus assessments	(T75) Study tours
(T8) Benefit assessments	***1.3. Financing cooperation***
(T9) Multisector investment opportunity analyses	(T76) Seed financing for joint management mechanisms
(T10) Project feasibility studies	(T77) Recipient executed grants
(T11) Strategic-level environmental/social impact assessments	(T78) Multidonor trust fund programs
1.2. Basin planning	***1.4. Facilitation/Dialogue Processes***
(T12) Multisector development plans	(T79) Convener
(T13) Climate change adaptation plans	(T80) Broker
	(T81) Weight of presence
2. Design of intervention tools	
2.1. Joint investments	***2.1. Neutral knowledge provision***
(T14) Equal cost sharing	(T70) Data and information provision
(T15) Benefit key for cost contribution to common works	(T71) Experts to conduct assessments and studies
(T16) Repayable loans	(T72) Just in time notes, analysis, and advice
(T17) Direct payments	(T82) Oversight experts
(T18) Compensation for O&M or construction of regulating infrastructure	***2.2. Project finance***
(T19) Royalty payments	(T83) Grants
2.2. Design studies	(T84) Loans and credits
(T11) Project-level environmental/social impact assessments	(T85) Project finance guarantees
	(T86) Public–private partnerships
	2.3. Facilitation/dialogue processes
	(T79) Convener
	(T80) Broker
	(T81) Weight of presence
	(T87) Project finance safeguards
3. Implementation and compliance tools	
3.1. Information tools for management	***3.1. Neutral knowledge provision***
(T20) Standards for comparability and interoperability	(T82) Oversight experts
(T21) Procedures for data sharing and exchange	

table continues next page

TABLE 4.1. continued

Country tools	Third-Party tools
(T22) Guidelines on data and information disclosure	***3.2. Capacity building***
(T23) Geographic information systems	(T73) Tailored workshops and training programs
(T24) Hydrological bulletins	(T74) Twinning
(T25) Annual and sustainability reports	(T75) Study tours
(T26) Awareness raising materials	(T88) Equipment, software, and technology provision
(T27) Indicators	***3.3. Promoting compliance***
(T28) Joint monitoring systems	(T89) Implementation trust funds
(T29) Impact evaluation	(T90) Payment and loan guarantees
(T30) Forecasting and early warning systems	(T91) Financing agreements
(T31) Decision support systems	(T92) Procurement standards
(T32) Decision making under uncertainty	***3.4. Dispute settlement tools***
3.2. Monitoring and promoting compliance	(T93) Mediation
(T33) Site visits	(T94) Conciliation
(T34) Individual experts	(T95) Appointment of a neutral expert or expert commission
(T35) Technical operators	(T96) Reference to an arbitration tribunal
(T36) Technical entities	(T97) Independent court
3.3. Enforcing compliance	***3.5. Facilitation/dialogue processes***
(T37) Compensation for noncompliance	(T79) Convener
(T38) Suspension of decision making and participation rights	(T80) Broker
3.4. Payment for benefits/compensation for costs	
(T17) Direct payments	
(T18) Compensation for O&M or construction of regulating infrastructure	
(T19) Royalty payments	
3.5. Implementation and adjustment tools	
(T12) Multisector development plans	
(T13) Climate change adaptation plans	
(T39) Single sector operational/implementation plans	
(T40) Stakeholder participation and inclusion tools	
(T41) Provisions for extreme events and uncertainty	
4. Coordination framework	
4.1. Intention and commitment tools	***4.1. Engagement framework preparation and implementation***
(T42) Declarations	(T98) Co-signatory of an agreement
(T43) Memoranda of understanding or minutes of ministerial meetings	(T99) Assistance for drafting legal instruments
(T44) International treaties	(T100) Assistance for building institutions
(T45) Agreements of private law character	(T101) Assistance for preparing rules and procedures
(T46) Amendments and supplementary agreements	

table continues next page

TABLE 4.1. continued

Country tools	Third-Party tools
4.2. Implementation and adjustment tools	
(T12) Multisector development plans	
(T13) Climate change adaptation plans	
(T39) Single sector operational/implementation plans	
(T40) Stakeholder participation and inclusion tools	
(T41) Provisions for extreme events and uncertainty	
(T46) Amendments and supplementary agreements	
(T47) Minutes of joint management mechanisms or decision of parties to an agreement	
(T48) Periodic reviews	
(T49) Conference calls	
4.3. Joint management mechanisms	
(T50) Advisory functions	
(T51) Executive functions	
(T52) Regulatory functions	
(T53) Inclusiveness functions	
(T54) Ad hoc mechanisms	
(T55) Joint technical committees	
(T56) Single-issue entities	
(T57) Special purpose vehicles	
(T58) Basin coordinating committees or councils	
(T59) River basin organizations, authorities, or commissions	
(T60) Entities with "beyond-the-basin" mandates	
4.4. Financing of joint management mechanisms	
(T61) Principle of equality allocations	
(T62) Indicator allocations	
(T63) Community integration tax	
(T64) Polluter fees	
(T65) Benefit-based user fees	
4.5. Dispute settlement	
(T66) Negotiations	
(T67) Filing a complaint	
(T68) Complaint review	
(T69) Arbitration tribunals	

List of Tools

(T51) Executive Functions

(T52) Regulatory Functions

(T53) Inclusiveness Functions

(T54) Ad hoc Mechanisms

(T55) Joint Technical Committees

(T56) Single-Issue Entities

(T57) Special Purpose Vehicles

(T58) Basin Coordinating Committees or Councils

(T59) River Basin Organizations, Authorities or Commissions

(T60) Entities with "Beyond-the-Basin" Mandates

(T61) Principle of Equality Allocations

(T62) Indicator Allocations

(T63) Community Integration Tax

(T64) Polluter Fees

(T65) Benefit-Based User Fees

(T66) Negotiations

(T67) Filing a Complaint

(T68) Complaint Review

(T69) Arbitration Tribunals

(T70) Data and Information Provision

(T71) Experts to Conduct Assessments and Studies

(T72) Just in Time Notes, Analysis, and Advice

(T73) Tailored Workshops and Training Programs

(T74) Twinning

(T75) Study Tours

(T76) Seed Financing for Joint Management Mechanisms

(T77) Recipient Executed Grants

(T78) Multidonor Trust Fund Programs

(T79) Convener

(T80) Broker

(T81) Weight of Presence

(T82) Oversight Experts

(T83) Grants

(T84) Loans and Credits

(T85) Project Finance Guarantees

(T86) Public-Private Partnerships

(T87) Project Finance Safeguards

(T88) Equipment, Software and Technology Provision

(T89) Implementation Trust Funds

(T90) Payment and Loan Guarantees

(T91) Financing Agreements

(T92) Procurement Standards

(T93) Mediation

(T94) Conciliation

(T95) Appointment of a Neutral Expert or Expert Commission

(T96) Reference to an Arbitration Tribunal

(T97) Independent Court

(T98) Co-Signatory of an Agreement

(T99) Assistance for Drafting Legal Instruments

(T100) Assistance for Building Institutions

(T101) Assistance for Preparing Rules and Procedures

List of Boxes

Mohale Dam, Lesotho. © mtcurado/iStock.

Chapter 4
Country Tools

This section presents tools that can be employed directly by and between riparian countries. These tools are based on the large body of international experience of countries in identifying, developing, and implementing operations with transboundary impacts. These tools have been successfully employed directly between and by countries to manage transboundary water resources jointly or in a coordinated manner in order to achieve mutual benefits and/or mitigate harm. They promote information exchange, predictability, and transparency, as well as the availability of financing for planned operations and compliance with agreed arrangements. The tools are grouped into the following four categories:

- Identification of Opportunities and Risks Tools
- Design of Intervention Tools
- Implementation and Compliance Tools
- Coordination Frameworks

4.1 Identification of Opportunities and Risks Tools

Accurate data and information on water and related natural resources is essential for informed decision making and policy formulation at the local, national, and transboundary levels. The tools presented in this category promote the availability of data and information for decision making and the identification of development opportunities. The regular exchange of data and information between riparian countries facilitates the establishment of a common knowledge base on shared water resources and basin planning. In addition, it can create confidence and trust among

the countries participating in the information exchange. Several information tools exist to assist with ensuring availability of accurate data and information to help basin-countries make better informed decisions. These tools are grouped under two subcategories: (a) Diagnostic Tools and (b) Basin Planning.

4.1.1 Diagnostic Tools

Diagnostic tools aim to provide information on the operating environment and a baseline for future basin planning and development. (a) Status assessment tools analyze the risks to and vulnerabilities of the basin and provide an overview of basin users and concerned stakeholders. (b) Opportunity assessments analyze the opportunities for development, potential benefits, as well as the possible costs and the risk of harm of the planned operations.

4.1.1.1 Status Assessments

There are multiple tools that can be employed by countries to gain a comprehensive understanding of the conditions of and future risks to the environment in which an operation would be placed in. These assessments can be carried out at the national level with publicly available data on the basin conditions beyond a country's border. However, in order to be able to appreciate the complete context of the environment in which transboundary impact may occur, it is advisable to undertake status assessments jointly with potentially affected countries. The joint creation of an agreed knowledge base on a basin or the transboundary area that would be affected by an operation can also build trust and confidence between the engaged parties, which can pave the way for future cooperation. Tools that have been employed successfully by countries include the following:

- ***Basin Inventory*** **(T1)** to identify information that is available and data gaps to be filled. (e.g., *Visual Atlas of Cooperation* between Afghanistan and Tajikistan concerning the resources of the Amu Darya Basin—**box 4.1**; and State of the Nile Basin *Report*—**box 4.2**).

BOX 4.1. Visual Atlas of Cooperation on the Amu Darya

In 2012, in a bilateral meeting between Afghanistan and Tajikistan to discuss common priorities for the management of their shared area of the Amu Darya Basin, participants identified a lack of available information on hydrology and the environment as an impediment to effectively address the region's hydrological and environmental issues. The countries agreed to develop a document, with contributions from each one of them, that provides an accessible, substantive background of the basin with the goal of supplementing available information and informing local policy makers, experts, donors, and the international community on the basin's common needs and priorities. The Visual Atlas of Cooperation of the Amu Darya consists of 100 photographs and 50 maps and graphics based on official sources and original research. The Atlas is designed to present information at the river basin level, as opposed to the national level, and portrays challenges from the regional rather than the country perspective. The Atlas was produced with the assistance of Zoi Environment Network, an international nonprofit organization, in association with United Nations Economic Commission for Europe (UNECE) and with funding from the Russian Federation.

See *Visial Atlas of Cooperation of the Amu Darya* at: https://issuu.com/zoienvironment/docs/atlas-20march2013-pressquality-web-.

BOX 4.2. State of the Nile Basin Report

The Nile Basin Initiative (NBI; an intergovernmental partnership of the Nile riparian countries) produces a report, State of the Nile Basin, every three years, targeted at policy makers in the Nile Basin countries, that follows the Driving-Force-Pressure-State-Impact-Response (DPSIR) causal framework for analyzing the health of the basin. According to this framework, there is a chain of causal links starting with "driving forces" (sector) through "pressures" (emissions, waste) to "states" (physical, chemical, biological) and "impacts" on ecosystems, human health, and functions, eventually leading to political "responses" (prioritization, target setting). Written by a team of NBI staff and based on information in the public domain, the first chapters present the current state of water and environmental resources in the basin, describe the causal driving forces and pressures, and enumerate the impacts of the pressures. The remaining chapters take a closer look at the important driving forces in the basin, such as demography, and issues surrounding agriculture, hydropower, inland transportation, and climate change.

See State of the Nile Basin report at: http://nileis.nilebasin.org/content/state-river-nile-basin-report.

BOX 4.3. OKACOM Water Audit Project

The Permanent Okavango River Basin Commission's (OKACOM) Cubango-Okavango River Basin Water Audit Project assessed the current status of water resources in the basin at various scales, as well as demand and supply trends; analyzed patterns of water-related entitlements of social groups; and assessed the functionality of water-related policies and institutions at different administrative levels. It also provided decision makers with a comprehensive set of policy options to increase capacity to cope with the growing pressures on water resources in the basin. Multidisciplinary teams of experts were appointed by OKACOM and FAO to carry out national-level studies (in consultation with the riparian countries' "Project Support Groups"), which fed into basin-level thematic studies and ultimately the synthesis audit report. The studies were carried out between November 2010 and December 2012.

See *OKACOM Water Audit Project Synthesis Report* at: http://www.fao.org/3/a-i3743e.pdf.

- ***Basin Water Audit*** **(T2)** to assess the current status and future trends in both water supply and demand (e.g., Permanent Okavango River Basin Commission's [*OKACOM*] *Water Audit Project*—**box 4.3**).
- ***Transboundary Diagnostic Analysis*** **(T3)** is a tool, developed by the Global Environment Facility (GEF), involving joint fact-finding and objective (nonnegotiated) assessment showing the relative importance of causes and impacts of transboundary water problems (e.g., Transboundary Diagnostic Analysis [TDA] of the Kura-Araks Basin—**box 4.4**).
- ***Economic Valuation of Basin Resources*** **(T4)** to help bridge the gap between science and policy making by communicating the importance of ecosystems in terms

BOX 4.4. Transboundary Diagnostic Analysis of the Kura-Araks

Between 2011 and 2013, Armenia, Azerbaijan, and Georgia participated in a Transboundary Diagnostic Analysis (TDA)—a component of the UNDP-GEF Reducing Transboundary Degradation in the Kura-Araks Basin Project. The TDA identified four main transboundary issues: variation and reduction of hydrological flow; deterioration of water quality; ecosystem degradation; and increased flooding and bank erosion. Information presented in the TDA was obtained from publicly accessible sources (publications, statistical services, as well as from national experts in the project countries). The TDA provides the basis for the Kura-Araks Basin Strategic Action Program (SAP), which will embody specific actions that can be adopted nationally, within a harmonized multinational context, to address the major priority transboundary problems identified in the TDA.

See *Kura-Araks* TDA report at: http://www.kura-aras.org/Updated_TDA.html.

BOX 4.5. Economic Valuation of the Okavango Basin

The economic valuation study in the Okavango Basin values direct and indirect contributions of basin resources (including ecosystem services) to the national economies in Angola, Botswana, Namibia, and South Africa; analyzes macroeconomic benefits of three specified water development scenarios and corresponding costs of possible losses in ecosystem services; and provides a sectoral analysis (tourism, agriculture, forestry, and ecosystem services) focusing on feasible development pathways corresponding to the specified water resources development scenarios.

See *Economic Value of the Okavango Delta* report at: http://www.the-eis.com/data/literature/Okavango%20Delta%20Valuation%20Study.pdf.

of their economic worth to a variety of sectors (e.g., Economic Valuation of the Okavango Basin—**box 4.5**).

- ***Vulnerability Mapping and Risk Assessment*** **(T5)** is generally done through modeling that combines variables of exposure and sensitivity to impacts caused by hydrological variability, weather extremes, and climate change in order to identify hotspots and areas at risk for emergency response and risk mitigation planning (e.g., Vulnerability Mapping of the Limpopo—**box 4.6**; Rhine Preliminary Flood Risk Assessment—**box 4.7**).
- ***Stakeholder Analysis*** **(T6)** to identify stakeholders affected by a development intervention, who should be consulted, as well as the relative influence of stakeholders on the planned project (e.g., Kura-Araks Stakeholder Analysis—**box 4.8**).

4.1.1.2 Opportunity Assessments

Opportunity assessments are employed to determine the development opportunities, as well as their benefits and costs, for the basin countries and to the basin. These assessments are often based on diagnostic or

BOX 4.6. Vulnerability Mapping of the Limpopo

The process of vulnerability mapping in the Limpopo Basin (Botswana, Mozambique, South Africa, and Zimbabwe) made use of a range of indicators, including biophysical, biological, and socioeconomic factors, and combines them with different weightings into one index. The indicators vary spatially, meaning that the final vulnerability index can be displayed as a map. Combined with a model of adaptive capacity, the maps provide insights into which adaptive responses are likely to have the highest impacts on livelihoods and the environment. Combined layers of exposure (such as exposure to cyclones and floods), sensitivity (such as crowding on agricultural land and water stress), and adaptive capacity (such as governance and economic wealth) present a composite picture of risk and vulnerability for the basin. Eight highly vulnerable areas were identified as resilience action areas across the basin.

See *Risk, Vulnerability & Resilience in the Limpopo River Basin* report at: https://www.climatelinks.org/sites/default/files/asset/document/Risk,%20Vulnerability%20and%20Resilience%20in%20the%20Limpopo%20River%20Basin%20-%20A%20Synthesis_0.pdf.

BOX 4.7. Rhine Preliminary Flood Risk Assessment

A preliminary assessment of flood risk was conducted in the Rhine Basin, where each Member State of the International Commission for the Protection of the Rhine (ICPR) was required to make a preliminary flood risk assessment for each river basin or sub-basin on their territory and to determine those areas in its territory presenting a potentially significant flood risk. The assessment included a delimitation of the catchments and sub-basins in the Rhine Basin, a description of flood events in the past, the probability of future floods, as well as an estimation of the potential negative consequences taking into account long-term development, such as effects of climate change on flood occurrence. For areas with a potentially significant flood risk, the Member States drafted flood hazard maps and risk maps (delivered to the ICPR Secretariat), which served as a basis to determine basin priorities for flood management. Member States are required to update the risk assessments every six years and submit the updated assessments to the ICPR Secretariat. The maps are aggregated into an online portal—the Rhine Atlas.

See *Rhine Atlas* at: http://geoportal.bafg.de/mapapps/resources/apps/ICPR_EN/index.html?lang=en.

status assessments. The opportunity assessments use best-available knowledge to inform investment decisions by one or multiple countries. Depending on the geographic and sectoral scope under consideration, whether they are carried out at the basin, country, or project level, there are a variety of tools that can be used, including:

- ***Nexus Assessments*** **(T7)** to identify intersectoral synergies and determine measures that could alleviate

BOX 4.8. Kura-Araks Stakeholder Analysis

The Kura-Araks Stakeholder Analysis involved both quantitative and qualitative surveys of stakeholders in the region. These complementary analyses provided insights into the concerns, priorities, and perceptions of stakeholder groups, and identified where tensions could emerge as a result of different expectations and priorities for water use within the basin. A team comprising a stakeholder analyst and local experts familiar with the riparian communities and with the local languages led the qualitative survey. About 150 people were consulted in this process, including farmers, homemakers, municipal and state officials, school teachers, public healthcare providers, municipal water management officials, and others. The quantitative survey was conducted among 36 stakeholder groups, translated into local languages and administered by local and national-level stakeholder consultants throughout the basin. In total, 512 surveys were collected and statistically analyzed for trends among and between groups. Areas of notably high and low priority concern or high levels of variation within groups were detailed and analyzed for the potential causality and significance of these trends. Issues that showed potential for conflict between groups were highlighted. This stakeholder analysis was utilized as part of the Kura-Araks TDA.

See *Kura-Araks* TDA report at: http://www.kura-aras.org/Updated_TDA.html.

tensions related to the multiple demands from riparian countries on shared resources, by increasing efficiency, identifying possible tradeoffs and building synergies (e.g., Nexus Assessment in the Sava Basin—**box 4.9**).

- ***Benefit Assessments*** **(T8)** and ***Multisector Investment Opportunity Analyses (MSIOA)*** **(T9)** assess water resources development options and benefits of cooperation among riparian countries (e.g., Quantifying the Benefits of Nile Cooperation—**box 4.10**; MSIOA of the Zambezi Basin—**box 4.11**).
- ***Project Feasibility Studies*** **(T10)** determine if a project is technically feasible, cost-effective and economically viable (e.g., Lesotho Highlands Water Project Feasibility—**box 4.12**).
- ***Strategic Environmental and Social Impact Assessments*** **(T11)** determine the potential environmental and social impact of policies, legislation, strategies, plans, and programs at the strategic level (e.g., Mekong Strategic Environmental Impact Assessment—**box 4.13**).

4.1.2 Basin Planning

In light of increasing water stress, early engagement in coordinated basin planning is important in order to determine a basin's development potential before it becomes a closing basin. This upstream planning is important to identify cooperation options before they become more difficult to implement due to increasing competition among users of the same resources.

Countries often jointly develop integrated basin development plans to plan for new uses and/or coordinate existing uses on a transboundary watercourse. Such plans are usually prepared following completion of necessary diagnostic assessments/studies (such as a TDA); they usually set out the goals, objectives, and programs for managing water resources for

BOX 4.9. Nexus Assessment in the Sava Basin

Assessments of the water-food-energy-ecosystem nexus have been carried out in select transboundary river basins under the United Nations Economic Commission for Europe (UNECE) Water Convention. The participatory nexus assessment process in the Sava Basin involved an intersectoral workshop for identification of the main intersectoral issues and possible solutions, detailed by a subsequent analysis, and followed by consultations of the various sectoral authorities in each country. The assessment report describes the characteristics of the water, food and land, as well as energy and ecosystem services in the basin. The assessment shows multiple linkages in the basin between the different basin resources and presents a broad range of beneficial response actions to strengthen transboundary cooperation on the integrated management of the different basin resources. According to the UNECE, the assessment exercise is contributing to further integration of water policy in the basin with other sector policies, and is furthering dialogue among key sectoral stakeholders to broaden stakeholder involvement in the International Sava River Basin Commission.

See *Reconciling Resource Uses in Transboundary Basins: Assessment of the Water-Food-Energy-Ecosystems Nexus in the Sava River Basin* report at: http://www.unece.org/index.php?id=45241.

BOX 4.10. Quantifying the Benefits of Nile Cooperation

The Nile Basin Initiative (NBI)-facilitated quantification of benefits analysis includes evidence of benefits of potential future cooperation in various sectors for the Nile Basin (agriculture, electricity, flood control, navigation, water security, peace, and stability) and subregions, compiled from other studies, reports, and ongoing NBI work. The analysis aims to reflect on clear, communicable case studies and scenarios that show benefits, including more effective quantification of these benefits as well as the costs of noncooperation in understandable terms. The analysis sets out a series of recommendations of new approaches and methods for quantifying the benefits of cooperation and the costs of noncooperation. The Transboundary Water Opportunity (TWO) Analysis, a flexible tool to support decision making at the basin level, was utilized. The TWO Analysis allows for the identification of assets (basin services) and potential uses of assets (benefits). Each combination of a service and a potential use is then evaluated according to the economic, social, and political costs and benefits so that different portfolios of development options can be compared. Ultimately, a combined matrix with all the potential assets and potential socioeconomic activities is compiled to easily compare and screen development options and decide on the preferred portfolio of options.

See *Quantifying the Benefits of Transboundary Water Cooperation in the Nile Basin* report at: http://nileis.nilebasin.org/system/files/Quantifying%20the%20Benefits%20of%20Cooperation.pdf.

See *Two Analysis* report at: http://internationalwatercooperation.org/wp-content/uploads/2015/02/Report23_TWO_Analysis.pdf.

BOX 4.11. Multisector Investment Opportunity Analysis of the Zambezi Basin

The overall objective of the Zambezi River Multisector Investment Opportunity Analysis (MSIOA) is to illustrate the benefits of cooperation among the riparian countries in the Zambezi Basin through a multisectoral economic evaluation of water resources development, management options, and scenarios—from both national and basin-wide perspectives. The analytical framework was designed in consultation with the eight riparian countries (Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe), Southern African Development Community Water Division (SADC-WD), and development partners in line with the Zambezi Action Plan Project 6, Phase II. A scenario analysis was carried out with the primary objective of determining and maximizing economic benefits while meeting water supply and environmental sustainability requirements. The scenarios are tested using a coupled hydroeconomic modeling system. The purpose of the modeling effort was to provide insight into the range of gains that would be expected from various infrastructure investments along the axes of full hydropower and irrigation development (while continuing to satisfy requirements for water supply and environmental sustainability). The five development scenarios that the report assessed were: (a) coordinated operation of existing hydropower facilities, either basin-wide or in clusters; (b) development of the hydropower sector as envisioned in plans for the Southern African Power Pool; (c) development of the irrigation sector through unilateral or cooperative implementation of projects identified by the riparian countries; (d) flood management, particularly in the Lower Zambezi and the Zambezi Delta; and (e) effects of other projects using the waters of the Zambezi River.

See *Zambezi River Basin MSIOA* report (World Bank 2010) at: https://openknowledge.worldbank.org/handle/10986/2959.

BOX 4.12. Lesotho Highlands Water Project Feasibility Assessment

In 1978, the governments of Lesotho and South Africa appointed a joint technical team, under the direction of a joint technical committee (JTC), to investigate the possibility of a water transfer project between the two countries. The first feasibility study suggested a project to transfer 35 m^3/s, with four dams, 100 km of transfer tunnels, and a hydropower component. Agreement was reached to study the project in more detail, with the cost of the study to be borne by both governments. In 1979, the JTC produced a report on the strength of which it was decided to proceed to a final feasibility study, where each country was to contribute half the cost of the study. The second feasibility study, completed in 1986, concluded that the project was feasible and recommended that the amount of water to be transferred be doubled to 70 m^3/s. In 2005, a Phase Two feasibility study was undertaken in two stages aimed at identifying further development options and investigating the preferred option in detail. This resulted in the recommendation of the Polihali Dam and transfer tunnel for implementation.

See *Lesotho Highlands Water Project* portal at: http://www.lhwp.org.ls/.

BOX 4.13. Mekong Strategic Environmental Assessment

To understand the long-term implications of the mainstream dam proposals in the Mekong Basin and to provide better understanding of the cumulative risks and opportunities to the Mekong River Commission (MRC) Member Countries, a Strategic Environmental Assessment (SEA) was conducted over a 14-month period (2009–10). The SEA addressed the broader issues within the mainstream development proposals. It also provided recommendations on how the proposed projects should be best pursued by Member Countries in relation to regional distribution of costs and benefits with respect to economic development, social equity and environmental protection among affected stakeholders. The SEA examined four strategic options that range from a 10-year deferral for mainstream hydropower development to pursuing a market-driven development. While conducting the SEA, the SEA consultant team engaged with government agencies, civil society, private sector developers, and development partners over its four phases: scoping; baseline assessment; opportunities and risks assessment; and avoidance, enhancement, and mitigation assessment. Each phase included the preparation and circulation of a set of reports as the basis for consultation and feedback.

See *SEA of Hydropower on the Mekong Mainstream* report at: http://icem.com.au/portfolio-items/strategic-environmental-assessment-of-hydropower-on-the-mekong-mainstream/.

BOX 4.14. Mekong River Commission Strategic Plan 2016–20

The Mekong River Commission (MRC) Strategic Plan 2016–20 set outs how the MRC will implement the updated IWRM-based Mekong Basin Development Strategy at the regional level and the institutional reform measures directed by the MRC Council in the Roadmap for Decentralization. It guides the actions of the MRC Secretariat in supporting MRC member countries to promote and coordinate sustainable development of the Mekong River Basin over the next five years. It also addresses the collaborative arrangements between the MRC, the implementing agencies in its member countries, dialogue partners (China and Myanmar), development partners, and wider stakeholder groups. This Plan presents a unified corporate plan for the organization, replacing the need for a multitude of MRC program documents, inception reports, project implementation plans, and the like. The Strategic Plan will be operationalized through five Annual Work Plans.

See *MRC Strategic Plan 2016–20* at: http://www.mrcmekong.org/assets/Publications/strategies-workprog/MRC-Stratigic-Plan-2016-2020.pdf.

a specific period. Examples of basin development plans include:

- ***Multisector Development Plans*** **(T12)** usually cover a wide geographic scope (basin or sub-basin level) and outline implementation steps for multiple parties, such as *River Basin Management Plans* or *Strategic Action Programs* (e.g., Mekong River Commission [MRC] Strategic Plan 2016-20—**box 4.14**; Okavango Strategic Action Program—**box 4.15**).

BOX 4.15. Okavango Strategic Action Program

The Okavango Basin SAP is a mid-term planning document designed for voluntary adherence by the Cubango-Okavango Basin States. The initial Transboundary Diagnostic Analysis identified four main areas of concern: variation and reduction of hydrological flow; changes in sediment dynamics; changes in water quality; and changes in the abundance and distribution of biota. In response to these challenges the Cubango-Okavango Basin States agreed on a set of six Integrated Management Objectives that guide implementation of the SAP: (a) the sustainable management of the basin is based on a shared basin-wide vision and jointly agreed decision framework; (b) decisions are based on solid scientific analysis of available data and information and improved basin knowledge through research programs designed to answer management questions; (c) focused environmental and socioeconomic monitoring programs to support management decisions and track long-term trends are established and strengthened, and the results are used in adaptive management strategies; (d) integrated planning criteria and objectives for sustainable development of water resources of the basin are agreed and established; (e) the livelihoods of the basin's people are improved; and (f) technical capacity in the basin and involvement of stakeholders in SAP and National Action Plan (NAP) implementation is improved. The SAP includes necessary baseline and additional actions to address the priority transboundary issues and to provide an essential monitoring and evaluation tool for implementation. Implementation of the SAP is the responsibility of the Basin States independently as components of their respective NAPs, and collectively as part of OKACOM. The SAP was developed over three years through a consultative process with a wide range of stakeholders from government departments, academic and scientific institutions, civil society, the private sector, and community representatives.

See *OKACOM SAP* report at: http://www.okacom.org/okacoms-work/strategic-action-program.

See *Angola, Botswana and Namibia NAPs* at: http://www.okacom.org/okacoms-work/national-action-plans-naps.

- ***Climate Change Adaptation Plans*** **(T13)** recognize the need to build flexibility into management plans and to strengthen resilience against uncertain, yet expected, climate change impacts (e.g., NBI Climate Change Strategy—**box 4.16**).

4.2 Design of Intervention Tools

Once mutually beneficial projects (or programmatic engagements) have been identified, the countries move to designing the intervention and determining the scope and objectives of cooperation, if and as appropriate. The optimal type of cooperation will vary for each hydrologic and investment opportunity. It is important for countries to identify the most effective level of engagement that helps them achieve their agreed objectives.

4.2.1 Joint Investments

Joint investments are usually payments for the generation of mutual benefits. These may cover the costs of construction, operation, and maintenance of infrastructure. The proportion of the benefits received usually determines the amount of payment.

BOX 4.16. NBI Climate Change Strategy

The NBI Climate Change Strategy was developed as stipulated in the Nile Basin Sustainability Framework under its Key Strategic Direction 4: "Climate Change Adaptation & Mitigation." The Climate Change Strategy forms an integral part of the landscape of NBI policies, strategies, and guidelines and complements national efforts of NBI member countries. The overall goal of the strategy is to enhance basin-wide resilience and climate compatible water resources management and development. Eight outputs are articulated in order to achieve this goal: (a) develop a Regional Knowledge Hub to share data, roster of experts, development of methodological and analytical tools, and improved predictions on impacts; (b) conduct basin-level analysis through synthesis of national climate risk, impact, and vulnerability assessments to inform joint transboundary climate response actions; (c) develop mechanisms to disseminate information consistently to target audiences; (d) facilitate cross-sectoral, multistakeholder dialogues on climate risks, impacts, and responses; (e) form strategic partnerships between NBI and relevant regional climate initiatives and research institutes; (f) implement a multilateral working group for adaptation planning and management; (g) identify and implement low carbon solutions and climate proof all major investment projects in the basin; and (h) establish a transboundary climate finance mechanism and create a best-practice manual on climate finance. The strategy envisions a five-year horizon for the implementation plan that will be created by the NBI by building on the goal, objectives, outcomes, and outputs outlined in the strategy.

See *NBI Climate Change Strategy* at: http://nileis.nilebasin.org/system/files/23.10.13%20climate%20change%20strategy.pdf.

Joint investments are usually combined with the establishment of joint management mechanisms (see "Coordination Frameworks"). Examples of joint investment tools include the following:

- ***Equal Cost Sharing* (T14)** is typical for hydropower investments on contiguous river stretches where the border runs through the river or is not determined, and hydropower generation potential used thus cannot easily be identified as originating from the territory of one or the other riparin country (e.g., Itaipu Binacional—**box 4.17**).
- ***Benefit Key for Cost Contribution to Common Works* (T15)** is a tool unique to cooperation in the Senegal Basin, where member countries co-own various infrastructure assets that generate irrigation, hydropower, and navigation benefits. Associated rights and obligations, including O&M payment obligations, are based on equality of rights and equitable sharing of the benefits from these common works (see **box 4.18**).

BOX 4.17. Itaipu Equal Cost Sharing

The two national electric companies, Administración Nacional de Electricidad (ANDE) of Paraguay and Electrobras of Brazil, each agreed to contribute half of the initial US$100 million capital stock of Itaipu Binacional. See **box 4.19**.

BOX 4.18. Joint Investments in the Senegal Basin

The *Organisation de mise en valeur du Fleuve* Sénégal (OMVS) member states enjoy shared ownership of their common works in the Senegal River Basin, including dams, power stations, high-voltage lines, and navigation facilities. Rights and obligations are based on equality of rights and equitable sharing of the benefits from joint works. Joint works are managed through specially established agencies, including Société de Gestion du Barrage de Manantali (SOGEM) and Société de Gestion et D'Exploitation du Barrage de Diama (SOGED), which are accountable to the OMVS. SOGEM has the exclusive right of production, transport and sale of the electricity produced by the Manantali Dam and related infrastructure. The principles and mechanisms of tariffs and commercialization of energy and services provided by SOGEM have to be agreed among the Member States of OMVS, SOGEM, and the national energy agencies. SOGED has the exclusive right to sell water withdrawal rights for all uses other than electricity production and to provide services in connection to the works that are assigned to its control by intermediary. The principles and mechanisms of tariffs and commercialization of water and services carried out by SOGED have to be agreed on by the Member States of OMVS. Member States contribute to investment, O&M costs proportionally based on the benefits they draw from the infrastructure. The cost/benefit repartition "key" as follows (table B4.18.1) can be and is renegotiated when circumstances change.

TABLE B4.18.1. OMVS Cost/Benefit Repartition Key

Country	Basin share (%)	Contribution to cost of the reservoirs (%)	Benefit shares (%)		
			A.2 Hydropower	A.3 Irrigation	Navigation
Mali	54	35	52–55	11	80
Mauritania	26	23	15	31	12
Senegal	10	42	33–30	58	8

See *Benefit Sharing in International Rivers: Findings from the Senegal River Basin, the Columbia River Basin, and the Lesotho Highlands Water Project* report at: http://documents.worldbank.org/curated/en/159191468193140438/Benefit-sharing-in-international-rivers-findings-from-the-Senegal-river-basin-the-Columbia-river-basin-and-the-Lesotho-highlands-water-project.

- ***Repayable Loans*** **(T16)** have been used by relatively economically more powerful riparian countries to help finance infrastructure that generates mutual benefits in or together with relatively poorer riparian countries. These loans can be linked to repayments through, for example, sale of hydroelectricity generated at favorable terms or with first-buyer rights to the country that provided the loan (e.g., Itaipu Repayments—**box 4.19**; Bhutan-India Hydropower Generation Financing—**box 4.20**).
- ***Direct Payments*** **(T17)** for benefits received independent of compensation for costs (e.g., The "Canadian Entitlement" established by the Columbia River Treaty [CRT]—**box 4.21**).
- ***Compensation for O&M or Construction of Regulating Infrastructure*** **(T18)** is a direct payment for benefits received that is calculated based on the costs incurred by the other country in the generation of the benefits or otherwise (e.g., O&M payments for regulating infrastructure in the Chu-Talas Basins—**box 4.22**).

BOX 4.19. Itaipu Repayments

The two national electric companies, Administración Nacional de Electricidad (ANDE) of Paraguay and Electrobras of Brazil, each agreed to contribute half of the initial US$100 million capital stock of Itaipu Binacional. Brazil provided Paraguay's half, US$50 million, in a loan arrangement with terms of a 6 percent interest rate, repayable by Paraguay over 50 years.

The 1973 Itaipu Treaty confirmed the exclusive right of each country to purchase unused electricity from each other; neither is allowed to sell the energy to a third party. (Each country was required to specify what proportion of its share its domestic market would require over a period of 20 years.) Whereas Paraguay uses about 5–10 percent of the electricity from Itaipu, Brazil consumes around 90–95 percent. Paraguay has been selling its unused share of the generated electricity to Brazil for a fixed price to Eletrobras. Brazil pays Paraguay an annual lump sum in compensation for the use of Paraguay's share of the generated power. The selling price was fixed by Itaipu Binacional on the basis of an agreed upon formula combining production costs; partial appropriation of the capital stock, finance charges, and other costs for the loans raised by Itaipu Binacional; royalties for the two countries for the use of the electricity; and administrative costs. According to the original Treaty, no changes in the financial arrangements would be permitted until 2023.

Paraguay was concerned about the low payment it was receiving from Brazil's electric company, Electrobras, for unconsumed energy. Electrobras received energy at cost from Paraguay, rather than market price (the price was fixed on the basis of an agreed upon formula) and then sold it with high profit margins in Brazil. The Treaty was renegotiated in 2008/2009, when, under a new president, Paraguay proposed a series of measures to make the sales and compensation agreement more equitable. The agreed terms were: (a) Brazil would pay Paraguay US$360 million annually for imported Itaipu electricity, up from about US$120 million; (b) Brazil would "consider" the possibility of selling electricity to third countries, together with Paraguay, after 2023; (c) Brazil would allow Paraguay "gradual direct sale of energy to the Brazilian market"; (d) Brazil would finance a nonreimbursable loan to enable Itaipu Binacional to construct a 350 km, 500 kV transmission line costing US$450 million to take power to Asunción; (e) Paraguay and Brazil would govern Itaipu Binacional together (under a co-administration agreement); and (f) the Paraguayan Comptroller General would audit all Itaipu debt and financial reports would be made more transparent.

See *Lessons from Paraguay's 14,000 MW Itaipu Project vis-à-vis Nepal's 6,720 MW Pancheshwar Project* article at: https://www.nepjol.info/index.php/HN/article/view/7098.

See *Assessment of RBO-Level Mechanisms for Sustainable Hydropower Development and Management* report at: https://www.giz.de/fachexpertise/downloads/giz2012-en-mrc-assessment-rbo-level-mechansims-hydopower-development.pdf.

BOX 4.20. Bhutan–India Hydropower Generation Financing

In 1974, following a series of feasibility studies, Bhutan and India signed an agreement for the implementation of the Chukha Hydel project. Constructed and commissioned by the established Chukha Hydel Project Authority, the project was fully funded by India, in a 60 percent grant and 40 percent loan arrangement, with an interest rate of 5 percent payable over 15 years, in equated installments. After four years of infrastructure development, including roads and residences, the main civil works of the project started in 1979. Chukha became fully operational in 1988 and now falls under the auspices of Druk Green Power Corporation. India absorbed the construction risk and market risk by agreeing to provide the required capital and construct the project in a turnkey arrangement. India off-takes the excess supply of electricity from Chukha over the Bhutanese domestic consumption at a mutually agreed upon price, subject to periodic revisions for inflation and cost escalation.

Chukha's power generation had been meeting Bhutan's electricity requirements and the surplus was exported to India. In the initial years of operation, about 90 percent of power was exported. By 2006, with increased domestic demand, annual export had decreased to about 80 percent. Power is exported to India through the Power Trading Corporation of India Limited. In Bhutan, the Chukha Hydel Project Authority sells power to the Bhutan Power Corporation, which in turn distributes it to domestic consumers.

As of 2008, Bhutan had received well over US$600 million in cumulative revenue from the project. By 2007, India had recovered its capital investment, along with its opportunity cost, through the receipt of loan payments and the share of hydroelectricity rent generated at the project because of lower import prices. Taking into account the economic costs and economic benefits, Bhutan and India end up sharing the net economic gains in a proportion of 48:52.

See *Risk Sharing in Hydropower Development: Case Study of the Chukha Hydel Project in Bhuta*n article at: http://wp.iwaponline.com/content/15/S1/109.

BOX 4.21. The Canadian Entitlement (CE) under the Columbia River Treaty (CRT)

The CRT has provided substantial flood control and power generation benefits to both countries. One main component of the CRT called for Canada to develop reservoirs in the higher reaches of the Columbia River Basin (CRB) sufficient to provide 15.5 million acre-feet (Maf) of water storage. According to the agreement, Canada built three dams in its territory: Duncan, Arrow/Keenleyside, and Mica. The United States and Canada share equally in the computed power benefits that occur in the United States as a consequence of upstream regulation from Canada's CRT projects. The downstream benefits are calculated based on the assured operating plan (AOP) for Canadian facilities five years in advance of each operating year. Increased power benefits are calculated based on "projected" optimal operation, not actual operation. This means that, while the United States may operate its facilities for nonpower uses, the CE for downstream power benefits remains unaffected.

box continues next page

BOX 4.21. continued

The CE, received in the form of financial payments and/or energy, is valued between US$120 million to US$300 million annually depending on power market prices—about 4000 GWh per annum. The increased power benefits associated with Canadian storage are "First Added," meaning that the benefit of Canadian storage is recognized in the benefit computations before recognizing storage built in the United States after the CRT was signed (including Libby Dam). The First Added status helps maintain the financial value of Canadian storage under the CRT. Canada sold the first 30 years of the CE to a consortium of utilities in the United States for US$254 million and used the money to finance the construction of the three CRT dams.

In addition, Canada received a "one time" payment of US$64.4 million at the outset in exchange for the annual operation of 8.45 MAF of storage for flood control until 2024.

See *Columbia Basin Case Study* in Altingoz et al. 2018.

BOX 4.22. Chu-Talas Storage Infrastructure O&M Payments

Once the Chu and Talas Basins became transboundary post-1991, the Kyrgyz Republic was tasked with paying the costs for maintenance and operation of the water reservoirs on its territory, which significantly contributed to Kazakh irrigation areas. In the 2000 Agreement on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas the two countries agreed that the O&M costs for the facilities specified in the Agreement would be shared on a pro rata basis in accordance with the water volume received by each party. The parties assume an individual share in compensation of O&M costs on water distribution facilities of interstate use and other coordinated activities proportionally to received water amount. To ensure safe and reliable operation of water distribution facilities of interstate use, the parties agreed to establish a permanent commission to arrange the working regimes and the range of necessary expenses for O&M.

The O&M costs of water infrastructure are covered from the state budgets of the two countries proportionally to water volumes supplied to each of them. The share of funding of the Parties is determined according to the *Methodology for Determination of Shared Co-financing of Adjacent Countries for the Operation of Water Management Facilities of Interstate Use in the Basins of Chu and Talas Rivers*. The methodology is based on calculations taking into account available fixed assets (assets, book value, norms, and required expenses for O&M and rehabilitation works), composition of operational staff, required salary fund and overhead costs, as well as operational costs needed for energy and materials. Calculation of costs for maintenance of the facilities is made annually and is approved at the sessions of the Commission.

See *Chu and Talas Basins Case Study* in Altingoz et al. 2018.

- ***Royalty Payments*** **(T19)** for the right to continued use of an asset for services provided (e.g., Royalty payments for water transfer under the Lesotho Highlands Water Project [LHWP]—**box 4.23**).

4.2.2 Design Studies

*Cross-referenced with **(T11)**.

Countries can decide to contract and supervise project and program design studies jointly. Each project design study needs to be accompanied by a project level Environmental and Social Impact Assessment (ESIA), which should include the assessment of potential transboundary impact. The development of such a study, even if done unilaterally, can be used for communication between co-riparian countries. In case there is a risk of transboundary impact, communication between countries can lead to adjustments in project design of planned operations to take interests of affected stakeholders into account.

- ***Project-level Environmental and Social Impact Assessments*** **(T11)** determine the potential

BOX 4.23. Royalty Payments under the Lesotho Highlands Water Project

The Lesotho Highlands Water Project (LHWP) is a multiphase hydropower scheme between Lesotho and Republic of South Africa (RSA) to: (a) transfer water from the catchments of the Senqu and Orange Rivers in Lesotho to meet the growing demand for water in the major industrial and population centers in RSA; (b) generate hydropower for Lesotho; (c) provide the opportunity to undertake ancillary developments such as the provision of water for irrigation and potable water supply; and (d) promote the general development of the remote and underdeveloped mountain regions of Lesotho, while ensuring that comprehensive measures are taken to counteract any adverse effects the project might have on the local population and their environment. Under the LHWP Treaty, RSA is responsible for all costs of the LHWP related to the transfer of water (including construction, O&M, and social and environmental mitigation measures) regardless of the project's performance; RSA is responsible for all costs of the LHWP related to the transfer of water; and Lesotho is responsible for hydropower costs and/or ancillary development.

As soon as the first water would be delivered, the Treaty provides that "[RSA] undertakes to share with Lesotho, by way of royalty payments, on the basis of 56 percent on the part of Lesotho and 44 percent on the part of South Africa, the net benefit." The net benefit is computed as the difference between the present value of the LHWP and a similar alternative project—the Orange-Vaal Transfer Scheme (OVTS), a project to pump water from the lower Orange River inside RSA. The royalty payments paid by RSA to Lesotho have a fixed and variable component. The fixed component is calculated on the benefits gained from the investment difference between the LHWP and OVTS. It is payable monthly by RSA to Lesotho up to 2045 (a 50-year period from the beginning of payments). The calculation of the variable component is based on the difference in electricity costs attributable to the O&M of the LHWP and OVTS. The variable component is converted into unit rates and the amount paid per month depends on the quantity of water delivered during that month. Variable royalties will be paid by RSA to Lesotho in perpetuity as long as water is delivered.

See *Lesotho Highlands Water Project* portal at: http://www.lhwp.org.ls/.

environmental and social impact of an individual project, including transboundary impact.

4.3 Implementation and Compliance Tools

4.3.1 Information Tools for Management

Data and information sharing tools aim to ensure that knowledge on the status of and changes in the basin continues to be available after initial diagnostic assessments. Regularity of information exchange and comparability of data is important to inform future planning and management so that adjustments can be made as needed. This category of tools also considers the importance of information sharing and awareness raising among local stakeholders, both with respect to the status of the basin and to the activities of water management institutions. This supports confidence building and establishment of an enabling environment for operations.

4.3.1.1 Standards and Procedures for Information Exchange

Standards and procedures for information exchange ensure comparability of information and regularity of exchange. Ideally, the standards and procedures would determine the time intervals and quality and content of information and data to be shared, as well as identify the entity or individual responsible for the information exchange. A higher level of detail tends to provide greater reliability of data exchange. The available tools include:

- ***Standards for Comparability and Interoperability*** **(T20)** provide for agreed terminology and standards for data collection and processing (e.g., System of Environmental-Economic Accounting for Water, the Glossary of Shared Water Resources [English-Arabic], and the International Glossary of Hydrology—**box 4.24**).

BOX 4.24. Standards for Comparability/Interoperability

System of Environmental-Economic Accounting for Water (SEEA)

The SEEA 2012-Central Framework is a framework that contains internationally agreed standard concepts to produce internationally comparable statistics to monitor interactions between the economy and the environment, and the stocks and changes in stocks of environmental assets. Using a wide range of information, the SEEA Central Framework enables source data to be compared and contrasted and allows for the development of aggregates, indicators and trends across a broad spectrum of environmental and economic issues. The Central Framework covers measurement in three main areas: (a) the physical flows of materials and energy within the economy and between the economy and the environment; (b) the stocks of environmental assets and changes in these stocks; and (c) economic activity and transactions related to the environment. Measurement in these areas is translated into a series of accounts and tables. The concepts and definitions that constitute the SEEA Central Framework are designed to be applicable across all countries, regardless of their level of economic and statistical development, their economic structure, or the composition of their environment.

See *SEEA* at: https://seea.un.org/.

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BOX 4.24. continued

Glossary of Shared Water Resources **(English-Arabic)**

Water resource specialists from Economic and Social Commission for Western Asia (ESCWA) member countries, who must negotiate agreements with non-Arabic-speaking countries, need Arabic language translations and explanations of such terminology. The Glossary of Shared Water Resources is a 2012 glossary prepared by the UN ESCWA is designed to create an English-Arabic common terminology to harmonize understanding of the technical, socioeconomic, environmental, institutional, and legal issues pertaining to joint management of shared water resources.

See Glossary of Shared Water Resources at:

http://www.zaragoza.es/contenidos/medioambiente/onu/943-eng-ara.pdf.

International Glossary of Hydrology

The World Meteorological Organization and UNESCO prepares the International Glossary of Hydrology. The international glossary facilitates comparability and communication on international research related to hydrology. A shared terminology is essential for joint action at the international level. A third edition was prepared in 2012, which builds on the pioneering efforts of the WMO Working Group on Terminology established in 1961, which evolved into the joint WMO/UNESCO Panel on Terminology in 1967 (first edition in 1974, second edition in 1992).

See *International Glossary of Hydrology* at: http://unesdoc.unesco.org/images/0022/002218/221862M.pdf.

- ***Procedures for Data Sharing and Exchange*** **(T21)** specify the type of data and information to be shared, as well as source, frequency, format, standards, quality assurance, and the method of transfer; roles and responsibilities of involved institutions; timeframes for supplying the agreed data and information; and ownership and access rights to shared data and information (e.g., Procedures for Data Exchange in the Zambezi—**box 4.25**).
- ***Guidelines on Data and Information Disclosure*** **(T22)** ensure provision of information to affected stakeholders, to facilitate transparency, confidence, and dialogue. By encouraging dialogue on policies and operations, data sharing among stakeholders may result in an increase in flow of information also back to joint institutions (e.g., MRC Data/Information Disclosure Guidelines—**box 4.26**).

4.3.1.2 Information Exchange and Dissemination Tools

There is a wide range of technical methods to make information accessible to water managers, decision makers, and other users. This section includes only an illustrative sub-set of these tools. Information and data can be made accessible through the following tools:

- ***Geographic Information Systems*** **(T23)** can visualize multiple layers of data and information as maps,

BOX 4.25. Procedures for Data Exchange in the Zambezi

In 2016 the Zambezi Watercourse Commission (ZAMCOM) Council adopted rules and procedures to give effect to the provisions on data sharing in the ZAMCOM Agreement and the Southern African Development Community (SADC) Protocol on Shared Watercourses. The rules and procedures "ensure that relevant and quality assured data and information are shared timely between the Member States in order to facilitate that the Member States—through ZAMCOM—will be able to take informed decisions in relation to the planning and management of the shared water resources in the Zambezi watercourse."

See *Rules and Procedures for Sharing of Data and Information Related to the Management and Development of the Zambezi Watercourse* at: http://zambezicommission.org/newsite/wp-content/uploads/2016/07/16.03.29-Rules_ProceduresForDataSharing_Adopted-by-Council_FinalEditing_Ver10_FINAL.pdf.

BOX 4.26. Mekong River Commission Data/Information Disclosure Guidelines

The Mekong River Commission (MRC) Disclosure Guidelines set out the administrative rules and regulations on access to data, information, and knowledge held by the MRC Secretariat. The three access categories delineated under the guidelines are: unrestricted, available to the public; restricted, may be released to a specific audience following appropriate approvals; and confidential, not for release beyond the author and addresses nor to the public. The guidelines delineate several items within each category, which is not exhaustive but is intended to provide transparency on classification criteria and guidance on how to supplement the same.

See *MRC Disclosure Guidelines* at: http://www.mrcmekong.org/assets/Publications/policies/MRC-Disclosure-Guidelines-RevisedVer-May2015-final.pdf.

tables, or graphics (e.g., The Danube Geographic Information System [DanubeGIS]—**box 4.27**).

- ***Hydrological Bulletins*** **(T24)** are one way of presenting and disseminating hydrological information; they are usually published in regular intervals on monthly, seasonal, or annual basis (e.g., International Boundary and Water Commission [IBWC] Technical Bulletins—**box 4.28**; Niger Basin Authority [NBA] Water Bulletins—**box 4.29**)
- ***Annual and Sustainability Reports*** **(T25)** published by institutions or projects to report on progress and to provide transparency and accountability (e.g., Lesotho Highlands Development Authority [LHDA], NBI, *Organisation de mise en valeur du Fleuve Sénégal* [OMVS], Itaipu Binacional—**box 4.30**).

BOX 4.27. The DanubeGIS

The DanubeGIS is a tool for integrating and storing the International Commission for the Protection of the Danube River (ICPDR) Contracting Parties' relevant data resources in a harmonized format, and serves as a common basis for data usage in the ICPDR. The geographical area covered by the DanubeGIS is the territory of the Danube River Basin District, shared by 19 countries, of which 14 are ICPDR Contracting parties. The national members of the Information Management & GIS Expert Group (IMGIS EG) coordinate data collection in their countries and provide those datasets to the DanubeGIS. The DanubeGIS is built to provide a Danube Basin-wide platform to support the ICPDR in its reporting tasks, such as the implementation of the EU Water Framework Directive and of the EU Flood Directive. The GIS target groups are mainly experts working either with the ICPDR or in projects related to water management. This includes the 23 observers to the ICPDR, research institutions, universities, other stakeholders, and the general public. Users who are interested in more in-depth work with the available data can sign-up for a user account to reveal more expert system features. An advanced web map viewer allows those users to compose maps by combining any individual layers. In addition to Web Map Service, the Web Feature Service allows download of the datasets in various formats, including Geography Markup Language (an open interchange format for geographic data) and shape files.

See *DanubeGIS* portal at: https://www.danubegis.org/maps.

BOX 4.28. International Boundary and Water Commission Technical Bulletins

Collated stream gaging records and records of water storage, of rainfall and evaporation stations, and of water quality measurements are published annually in International Boundary and Water Commission (IBWC) Bulletins titled Flow of the Rio Grande and Tributaries and Related Data. The Mexican and the United States Sections of the IBWC jointly prepare the Bulletins. The IBWC also produces water accounting reports, including daily Rio Grande flow condition/reservoir reports (which show daily flow conditions of the United States IBWC Rio Grande gaging stations), and weekly five-year cycle data sheets, which show minimum Mexican deliveries to the United States (350,000 acre-feet of water each year, on average, over a five-year cycle).

See *IBWC Water Bulletins* at: https://www.ibwc.gov/Water_Data/water_bulletins.html.

BOX 4.29. Niger Basin Authority Water Bulletins

The Niger Basin Authority (NBA) distributes hydrological information on the Niger Basin monthly. The bulletin includes basin statistics and hydrographs of the main gaging stations in the basin. The bulletin is available on the NBA's website.

See *NBA Monthly Bulletin* example at: http://www.abn.ne/images/documents/Bulletins/2017/bulletin_janvier_2017.pdf.

BOX 4.30. LHDA, NBI, OMVS, and Itaipu Annual and Sustainability Reports

Project and Institution Annual Reports

Lesotho Highlands Development Authority (LHDA)

See *LHDA Annual Report* example at: http://www.lhda.org.ls/lhda/reports/Annual%20Reports/LHDA_2010_11.pdf.

NBI

See *NBI Corporate Report* example at: http://www.nilebasin.org/index.php/media-center/documents-publications/22-nbi-2015-corporate-report/file.

Project and Institution Newsletters

Water Waves by the Lesotho Highland Development Authority

See *Water Waves* example at: http://www.lhwp.org.ls/phase2/documents/newsletter/Water%20Waves%20October%202016%20PE.pdf.

OMVS Le Journal Senegal Basin

See *Le Journal Senegal Basin* example at: http://www.portail-omvs.org/sites/default/files/publications/files/omvs_oct_2013_ndeg8.pdf.

Project Sustainability Reports

Itaipu Binacional

See *Itaipu Binacional Sustainability Report* example at: https://www.itaipu.gov.br/pdfviewer.html?file=RS2015_English_VF_141216.pdf&titulo=Itaipu%20Sustainability%20Report%202015.

- ***Awareness Raising Materials*** **(T26)** may include press kits, leaflets, maps, postcards, posters, and various multimedia to promote public awareness of basin threats, development challenges, outcomes, and opportunities for participation. These materials can be used to generate a sense of belonging of people to the basin ecosystem and motivate contributions to basin development and protection from the basin population (e.g., Kunene River Awareness Kit [RAK]—**box 4.31**; The Danube Box—**box 4.32**).

4.3.1.3 Monitoring, Forecasting, and Decision Support Tools

Countries can only manage what they can measure. Information is vital for sound water resources management. Monitoring of the status of shared water resources

BOX 4.31. Kunene River Awareness Kit

The Kunene RAK is a bilingual (English and Portuguese) online and CD-ROM-based tool designed to support capacity development in the Permanent Joint Technical Committee (PJTC) and raise awareness of transboundary issues in Southern Africa, particularly in Angola and Namibia. The structure of the Kunene RAK (funded by the German Federal Ministry for Economic Cooperation and Development) was defined through participatory processes involving stakeholders from the two countries. Included within the Kunene RAK are self-learning resources supported by interactive visualization tools, maps, and documents. The intended audience is the broad spectrum of stakeholders in the Kunene, including government agencies, NGOs, education institutions, and the international community.

See *Kunene RAK* at: http://www.kunene.riverawarenesskit.com/KUNENERAK_COM/INDEX.HTM.

BOX 4.32. The Danube Box

The Danube Box is a comprehensive educational tool for teachers and educators working with children between the ages of 9 and 12. The educational package, published by International Commission for the Protection of the Danube River (ICPDR), contains images, exercise sheets, role-playing games, quizzes, playing cards, plans for indoor and outdoor activities, cultural appendices (stories, legends, and recipes from the Danube countries), along with factual and scientific knowledge on ecology, geography, wildlife, cultural diversity, and everyday life in the past and today in the Danube countries. The idea of the Danube Box was developed within the framework of the "Green Danube Partnership," which has existed among Coca-Cola, Coca-Cola Hellenic, and the ICPDR since 2005. The Danube Box is in use in Austria, Germany, Hungary, Bulgaria, and Romania. National versions are being planned for other countries.

See *Danube Box* online version at: http://www.danubebox.org/.

provides information on long-term trends and short-term changes in a basin. This in turn strengthens forecasting capacity and early detection of extreme hydrologic events, such as floods or the on-setting of droughts, and inform adjustments to be made during implementation. Tools that assist with monitoring, forecasting and decision support include the following:

- ***Indicators*** **(T27)** are essential tools for monitoring change with respect to water availability, quality, ecosystem health, water demand and supply parameters, and socioeconomic conditions in the basin and at the global level (e.g., Global Environment Facility [GEF] Transboundary Waters Assessment Program [TWAP] Indicator-Based Assessment, CAP-NET Indicators, and the UNEP-DHI Indicator Builder—**box 4.33;** UN World Water Assessment Program [WWAP] Gender Disaggregated Indicators—**box 4.34**).
- ***Joint Monitoring Systems*** **(T28)** are usually based on agreement on the data and information to be shared, frequency and responsible institutions. They can be web-based, providing 24/7 access to water managers, or may otherwise be maintained as electronic or paper-based systems (e.g., Danube TransNational Monitoring Network [TNMN]—**box 4.35**).

BOX 4.33. Indicators

The GEF TWAP assessment uses indicators of "stressors," which fall under five key themes: water quantity (environmental water stress, human water stress, agricultural water stress); water quality (nutrient pollution, wastewater pollution); ecosystems (wetland disconnectivity, ecosystem impacts from dams, threat to fish, extinction risk); governance (legal framework, hydropolitical tension, enabling environment); and socioeconomics (economic dependence on water resources; societal well-being, exposure to floods and droughts) to provide a comprehensive picture of the state of transboundary river basins today. The TWAP portal enables a user to select from a number of indicators to analyze relative risks in a particular basin and basin country unit (the portion of each basin belonging to a respective country).

See *GEF TWAP River Basins* portal at: http://twap-rivers.org/indicators/.

CAP-NET has compiled indicators to measure progress on Integrated Water Resource Management.

See *CAP-NET Indicators: Implementing Integrated Water Resources Management at River Basin Level* at: http://www.cap-net.org/documents/2008/09/indicators-implementing-integrated-water-resources-management-at-river-basin-level.pdf.

UNEP-DHI has developed an online tool that enables users to explore and create indicator frameworks to support management and decision making for improved water resources management. It offers a comprehensive built-in indicator framework that users can modify and build on, as well as a growing library of indicators for creation of new, customized indicator frameworks.

See *UNEP-DHI Water Indicator Builder* at: http://www.waterindicatorbuilder.com/home.

BOX 4.34. World Water Assessment Program's Sex Disaggregated Indicators

The World Water Assessment Program's (WWAP's) Toolkit on Sex-Disaggregated Water Data is comprised of four tools: a list of high-priority water indicators identified by an international expert group for which gender-disaggregated data is especially needed; specific methodologies for collecting and assessing such data; a set of guidelines for "in-the-field" data gathering with specific insights for different world regions; and a questionnaire for practitioners on gender-disaggregated interviews and data collection. The comprehensive list of priority gender-sensitive indicators fall under five broad topics: water governance; safe drinking water, sanitation, and hygiene; decision making and knowledge production; transboundary water resources management; and water for income generation for industry and agriculture. More specifically, the indicators relate to women's water empowerment and participation in water decision making, income generation, and unaccounted for water-related working hours.

See *Sex-Disaggregated Indicators for Water Assessment, Monitoring and Reporting* report at: http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/SC/pdf/Sex_disaggregated_indicators_for_water_assessment_monito.pdf.

BOX 4.35. Danube TransNational Monitoring Network (TNMN)

The TNMN is based on national surface water monitoring networks and includes 77 monitoring locations. The monitoring locations are located just upstream or downstream of an international border; located upstream of confluences between the Danube and main tributaries or main tributaries and larger sub-tributaries; located downstream of the biggest point sources; or located according to control of water use for drinking water supply. Chemical sampling is conducted 12 times per year and biological sampling is conducted twice per year. The TNMN publishes an annual yearbook of that year's collected data and is made available on the International Commission for the Protection of the Danube River (ICPDR) website. The procedure of TNMN data collection is organized at the national level. The National Data Managers are responsible for data acquisition from TNMN laboratories as well as for data checking, conversion into an agreed data exchange file format, and sending it to the TNMN data management center. The center performs a secondary check of the data and uploads the data into the central TNMN database.

See *TNMN Yearbooks* at: http://www.icpdr.org/main/publications/tnmn-yearbooks.

- ***Impact Evaluation*** **(T29)** measures the effectiveness of operations or installed measures. Evaluations can be used to monitor effectiveness of implementation and lessons can be used to adjust existing operations or design new interventions (e.g., Rhine Effects of Measures on Flood Risk Assessment—**box 4.36**).
- ***Forecasting and Early Warning Systems*** **(T30)** are usually based on data transferred from hydrometeorological measurement stations along the river and in the basin, or from publicly accessible meteorological data to mitigate impact of extreme events. Long-term trend assessments through indicator monitoring provide data for long-term forecasting (e.g., European Flood Awareness System and Columbia Basin Forecasting—**box 4.37**).
- ***Decision Support Systems*** **(T31)** are usually, but not necessarily, computerized systems to assist in day-to-day operational and long-term strategic

BOX 4.36. Effects of Measures on Flood Risk Assessment

The Rhine Effects of Measures on Flood Risk Assessment is an innovative and flexible instrument can be used to generate information about the effects and effectiveness of flood risk management measures on the reduction of flood risk at a river basin/tributary level, by, for example, assessing every six years the impacts of actions taken under flood risk management plans. In short, the main instrument consists of three interacting calculation modules resulting in an overall flood risk assessment. The damage assessment module tool calculates the damage using land use data, the extension of flood areas, hydraulic data, asset values, and damage functions. The risk assessment module tool calculates the risk by combining/multiplying the damage potential with the flood probability. The flood probability can be changed by the implementation of measures (such as dike relocation). The measure impact module tool quantifies the damage reduction on economic activity and infrastructure, human health and the environment, and cultural heritage. A flood risk change module tool combines the tools into a single instrument assessing the risk change/reduction resulting from implementation of measures.

See *Tool and Assessment Method for Determining Flood Risk Evolution or Reduction* technical report at: https://www.iksr.org/uploads/media/237en_01.pdf.

BOX 4.37. European Flood Awareness System and Columbia Basin Forecasting

European Flood Awareness System

The European Flood Awareness System (EFAS), a European Commission initiative, is the first operational European system for monitoring and forecasting floods across Europe. The aim of EFAS is to gain time for preparedness measures before major flood events strike, particularly for transnational river basins both in the Member States as well as on a regional level. It provides complementary, early flood warning information up to 10 days in advance to the National/Regional Hydrological Services and the European Response and Coordination Centre (ERCC). EFAS uses multiple, deterministic, medium-range weather

box continues next page

BOX 4.37. continued

forecasts as well as two sets of ensemble prediction systems (EPS) as inputs. The Operational EFAS consists of four centers including:

- **EFAS Computational** center—European Centre for Medium-Range Weather Forecasts (UK) executes forecasts and hosts the EFAS-Information System platform.
- **EFAS Dissemination** center—Swedish Meteorological and Hydrological Institute, Rijkswaterstaat (NL), and Slovak HydroMeteorological Institute analyze EFAS on a daily basis and disseminate information to the partners and the ERCC.
- **EFAS Hydrological data collection** center—REDIAM (ES) and ELIMCO (ES) collect historic and real-time discharge and water level data across Europe.
- **EFAS Meteorological data collection** center—KISTERS AG and Deutscher Wetterdienst collect historic and real-time meteorological data across Europe.

See *EFAS* portal at: https://www.efas.eu/.

Columbia Basin Forecasting

In the Columbia Basin, the hydrometeorological monitoring system includes real-time measurements for snow courses, precipitation stations and stream gauges, temperature gauges, as well as current reservoir levels, storage calculations, and inflow conditions for water balancing and ensuring flood space availability in reservoirs. The information is processed for seasonal, medium range (10 days), and short range (1–10 days) forecasting. Available hydrometeorological data from any part of the basin required by either Entity (implementers of the CRT; BC Hydro in Canada, and, jointly, the Bonneville Power Administration and the US Army Corps of Engineers in the United States) is provided by the other Entity on request via an online data system set up through the CRT Hydrometeorological Committee.

See *Columbia Basin: History of the Hydromet System* article at: https://www.usbr.gov/pn/hydromet/hydromet_hist.html.

decision making (e.g., Nile Basin Decision Support System [DSS]—**box 4.38**).

- ***Decision Making under Uncertainty*** **(T32)** tools assist with investment decisions with respect to projects that have a long time span and will thus be subject to changing conditions; for example, due to climate change impacts (e.g., The Decision Tree—**box 4.39**).

4.3.2 Monitoring and Promoting Compliance

The issue of compliance is central to the design and implementation of projects with transboundary impact and any agreements concluded between riparian countries that are related to these. Monitoring and compliance mechanisms help provide confidence to all involved stakeholders that implementation and

BOX 4.38. Nile Basin Decision Support System

The Nile Basin decision support system (DSS) is a water resources modeling and decision-making software framework that offers tools for storage, processing, interpretation, and visualization of water and related data; a suite of models for simulating river-lake-reservoir systems; a toolset for analyses of water resources problems and evaluation of alternative scenarios; a suite of tools for generating information needed for decision making; and toolsets for collaborative decision making in water resources. The Nile Basin DSS has been applied on a number of project cases at the national and transboundary levels. To ensure the long-term sustainability of the DSS, the NBI has established a water resources management unit at the NBI Secretariat. This unit is responsible for the operational application (at regional level), maintenance, capacity development, and further development of the DSS to respond to emerging needs.

See *Nile Basin DSS* portal at: http://nbdss.nilebasin.org/support/home.

BOX 4.39. The Decision Tree

The Decision Tree offers a cost-effective, scientifically sound, replicable, and transparent method for demonstrating the robustness of a development project in the face of the risks posed by climate change, natural hazards, and other factors. The Decision Tree focuses first on identifying a project's vulnerabilities. It offers a systematic step-by-step way to decide what level of analysis is appropriate to the project's attributes—a project leader moves through only as many phases as are appropriate to the project. The overall procedure includes a feedback loop that addresses monitoring and evaluation, both of which are essential in a changing climate. The Decision Tree was demonstrated and applied to hydropower planning in Nepal—in the proposed Upper Arun Hydropower Project (UAHP) and to the Kosi Basin, through a closely related decision-making under uncertainty (DMU) approach. Both analyses are among the first of their kind to systematically incorporate both climate and non–climate-related uncertainties when assessing proposed water infrastructure. The Decision Tree application led to design changes to climate proof the UAHP. The applications also provide the starting point for a potentially broader geographic and sectoral analysis using the Decision Tree framework, which could be conducted in the future to assess, for example, national-scale energy sector planning in the face of climate change and other important uncertainties.

See *Confronting Climate Uncertainty in Water Resources Planning and Project Design: The* Decision Tree *Framework* report at: http://documents.worldbank.org/curated/en/516801467986326382/pdf/99180-PUB-Box393189B-PUBLIC-PUBDATE-8-19-15-DOI-10-1596-978-1-4648-0477-9-EPI-210477.pdf.

operation of a project are carried out as agreed. Often, the inclusion of such tools and mechanisms in international agreements that are concluded between countries to set down the rules of engagement for the implementation of a development intervention are the key to final agreement on and adoption of the document.

Monitoring mechanisms and transparency can help build trust and confidence among riparian countries. Countries may engage individuals or monitoring teams to check on compliance with agreements in regular intervals or on a permanent basis. Tools that have been employed include:

- ***Site Visits*** **(T33)** carried out ad hoc or in regular intervals in the territories of the respective other country/countries can be used to monitor, for example, flow allocations or agreed construction or operating standards (e.g., Farakka Barrage—**box 4.40**; Permanent Indus Commission—**box 4.41**).
- ***Individual Experts*** **(T34)** based in the territory of the respective other country can be used to permanently monitor compliance with, for example, agreed flow and operation schedules. They may also be used to carry out site visits (e.g., Resident Egyptian Engineer at Owen Falls Dam—**box 4.42**).
- ***Technical Operators*** **(T35)** that jointly operate infrastructure, as well as the joint management mechanism in general, contribute to transparency of activities and thus promote compliance (e.g., Itaipu Control Room Team—**box 4.43**).

BOX 4.40. Farakka Barrage

The 1996 Treaty on Sharing of the Ganges Waters at Farakka between Bangladesh and India is an agreement to share surface waters at the Farakka Barrage near their mutual border. Under Article IV the Treaty created a Joint Committee of representatives nominated by the two governments who are tasked with setting up suitable teams to observe and record at Farakka the daily flows below Farakka Barrage and in the Feeder canal in India, as well as Hardinge Bridge point in Bangladesh. Thus, the daily flows are monitored and recorded in both countries along the Ganges River.

See *1996 Treaty on Sharing of the Ganges Waters at Farakka between Bangladesh and India* at: http://extwprlegs1.fao.org/docs/pdf/bi-17351.pdf.

BOX 4.41. Permanent Indus Commission

The Permanent Indus Commission, set up under the 1960 Indus Waters Treaty between India and Pakistan, is required to undertake a General Tour of Inspection once every five years to gather relevant data connected to the various developments and works on the Indus river and tributaries. It is also charged with conducting tours of inspection of any works or sites when requested to do so by either Commissioner.

See *1960 Indus Waters Treaty* at: http://siteresources.worldbank.org/INTSOUTHASIA/Resources/223497-1105737253588/IndusWatersTreaty1960.pdf.

BOX 4.42. Owen Falls Resident Egyptian Engineer

Construction of the Owen Falls Dam (Nalubaale Dam) on the White Nile, near Lake Victoria in Uganda, started in 1949. Its three governing documents provided for the Arab Republic of Egypt to participate in the construction of the dam. Dam operation would control the flow of Nile waters and produce hydropower for Uganda. The Uganda Electricity Board was made responsible for the construction, administration, and maintenance of the dam, while discharges through the dam would be regulated on the instructions of the Resident Egyptian Engineer at the site, in accordance with arrangements to be made between the Egyptian Ministry of Public Works and the Ugandan Authorities "pursuant to provisions of agreements to be concluded between the two Governments." This was to ensure compliance with downstream interests in sustained water discharge during the construction phase and operation of the dam. An "Agreed Curve" (outlined in the Exchange of Notes) dictates how much water should be released from Lake Victoria. This mathematical formula was developed to retain the original (natural) pre-dam relationship between lake level and outflow. Dam operators adjust the outflow based on the water balance of the lake computed every 10 days.

See *1949 Exchange of Notes Regarding Construction of the Owen Falls Dam* at: http://gis.nacse.org/tfdd/tfdddocs/142ENG.pdf.

BOX 4.43. Itaipu Control Room Team

The Itaipu Treaty established Itaipu Binacional, an entity co-owned by Brazil and Paraguay. As a corporation endowed with legal, administrative, and financial capacities, as well as technical responsibility, it was tasked with building and operating the Itaipu Dam. The Itaipu Binacional Executive Board of Directors (12 members) is appointed by Brazil and Paraguay through their respective national utilities, Electrobras and Administración Nacional de Electricidad (ANDE). The Supervisory Board is made up of representatives from national governments and the utilities in equal number from both countries. An Itaipu Binacional publication (2012) states, "All company management decisions are the product of understanding and consensus between representatives from both governments, Electrobras and ANDE. The dam control room is operated 24 hours per day in six-hour shifts by a binational team. The control room is equipped with a computerized control and supervision system that acquires automatic electric and hydraulic information from power plant equipment. The binational team is instantly informed of any abnormal operating conditions."

See *Itaipu Binacional* portal at: https://www.itaipu.gov.br/en.

- ***Technical Entities* (T36)** that monitor the status of shared water resources and the basin more generally collect a range of information that raises the visibility of environmental and social changes in the basin. The results of their assessments or data collection may draw the attention of parties to the negative consequences of noncompliance; for instance, in the case of noncompliance with water quality standards or agreed environmental flows (e.g., NBA and AGRHYMET—**box 4.44;** Ecosystem Monitoring through the ICPR—**box 4.45**).

4.3.3 Enforcing Compliance

Even in the extreme situations of violation of agreed-upon terms, sanctions to ensure compliance with these agreements can be difficult to implement in practice. Raising the costs of noncompliance may assist enforcement. Various tools exist that raise the costs of noncompliance and may therefore make noncompliance unattractive. These tools are often included in coordination frameworks (e.g., international agreements):

- ***Compensation for Noncompliance* (T37)** has been included by a number of countries in their respective basin management related agreements and has taken place on a case-by-case basis in case of accidents. It has also been included as a general rule in the existing global water conventions (e.g., Compensation Mechanisms in the Iberian Basins—**box 4.46**).
- ***Suspension of Decision Making and Participation Rights* (T38)** in the context of joint management mechanisms could potentially be used as sanctions for noncompliance with agreements, including for nonpayment of membership contributions. (The authors are not aware of any existing international treaties that would provide for such sanctions in the context of transboundary water resources management.)

BOX 4.44. Niger Basin Authority and AGRHYMET

The Niger River Basin covers an area of about 2,270,000 km² in ten countries in West and Central Africa. Two regional bodies, the Niger Basin Authority (NBA) and the Agrometeorology, Hydrology, Meteorology Regional Center (AGRHYMET) provide the framework for cooperation among the riparian countries toward improving water resource management in the basin. The NBA's mandate includes the monitoring of the conditions of the basin, done, in practice, through the NBA's Observatory of the Environment. Member States must exchange information, consult each other on planned measures, and notify each other (through the Executive Secretariat) in the event that any proposed measure may have "significant adverse effects" on Member States. The AGRHYMET Regional Center, a specialized institute of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), focuses on data collection and information dissemination relating to food security, water resource management, desertification control, and climate change impacts. In order to improve natural resource management and agricultural production in the Member States, AGRHYMET and NBA conduct experimental hydrological forecasts in the Niger Basin and AGRHYMET delivers the seasonal West African hydrological forecast.

See *NBA* portal at: http://www.abn.ne/index.php?lang=en.

See *AGRHYMET Regional Centre* portal at: http://www.agrhymet.ne/eng/.

BOX 4.45. Monitoring through the International Commission for the Protection of the Rhine

The 1999 Convention on the Protection of the Rhine provides a framework for sustainably developing the Rhine ecosystem and ensuring Rhine water is sufficient for drinking and preventing floods, among other objectives. The International Commission for the Protection of the Rhine (ICPR) prepares international measuring programs and studies of the Rhine; makes proposals for individual measures and programs of measures, where appropriate; and coordinates the Member States' warning and alert plans for the river. Under Article 5(1) of the Convention, the Contracting Parties agreed to cooperate and inform one another of actions taken in their respective territory to protect the Rhine. In addition, under Article 5(2), the Contracting Parties committed to implement international monitoring programs and studies of the Rhine ecosystem in their respective territories and to inform the ICPR of the results. The ICPR gathers information on water pollution levels from more than 50 monitoring stations along the Rhine based on a detailed framework to which Member States have agreed. This allows the ICPR and its Member States to trace the intrusion of pollutants into the Rhine, observe changes in the river's pollution levels, and ultimately determine whether their efforts to reduce river pollution have been impactful. Contracting Parties must immediately inform the ICPR and other potentially affected Contracting Parties when there is an accident that threatens the water quality of the Rhine or in the event of imminent flooding.

See *ICPR* portal at: https://www.iksr.org/?L=3.

BOX 4.46. Compensation Mechanisms in the Iberian Basins

Cooperation between Spain and Portugal on international watercourses is regulated by a series of legal instruments dating back to the end of the 19th century. Earlier agreements (1864 and 1912) have focused on the border delimitation and on exploring the navigational conditions of the main rivers; while later agreements (e.g., the 1927 Agreement on the Douro River) focus on hydropower generation. The 1964 Agreement was the first that established a compensation mechanism as a means to ensure compliance with agreed limitations on withdrawals and flow diversions in both the Douro River and its main tributaries.

The 1998 Albufeira Convention establishes an annual flow regime for all major transboundary rivers (Minho, Lima, Douro, Tejo, and Guadiana), defining mandatory flow volumes in sections upstream of the border, for Spain, and on the respective estuary or mouth for Portugal (only for the southern and more arid Tejo and Guadiana River Basins). Its Article 24 opens a door also for economic compensation in case private or public rights are affected as a consequence of noncompliance with the Convention. The agreed flow regime was also the object of an Additional Protocol to the Convention, which determines the minimum volumes allocated for each river basin, as well as the conditions for defining an exception regime, usually associated with drought periods.

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BOX 4.46. continued

Only on one occasion, in 2005, did Portugal claim economic compensations for the damages incurred by Spain's noncompliance with the agreed flow regimes in the Douro River. The compensation was quantified on the basis of the hydroenergy production losses downstream. However, the compensation never took place because Spain claimed exceptional circumstances as a consequence of the drought, which entails limiting water uses to "essential uses." In practice, noncompliance with the agreed flow regimes are usually compensated with programed releases. This was the case in the hydrological year 2005-06 when Spain did not comply with minimum flows in the Guadiana River, and in the hydrological year 2008-09 when Spain did not comply with minimum flows in the Tejo River.

See *Douro Basin Case Study* in Altingoz et al. 2018.

4.3.4 Payment for Benefits/Compensation for Costs

*Cross-referenced with **(T17-19)** and **(boxes 4.21-4.23).**

Countries may use direct payments to compensate the respective other country for the costs incurred in generating the benefit for them. These payments have been and are used on some occasions to finance the construction of the benefit-generating infrastructure or its O&M costs. The respective tools include:

- ***Direct Payments*** **(T17)** for benefits received independent of compensation for costs (e.g., The "Canadian Entitlement" established by the CRT—**box 4.21**).
- ***Compensation for O&M or Construction of Regulating Infrastructure*** **(T18)** is a direct payment for benefits received that is calculated based on the costs incurred by the other country in the generation of the benefits or otherwise (e.g., O&M payments for regulating infrastructure in the Chu-Talas Basins—**box 4.22**).
- ***Royalty Payments*** **(T19)** for the right to continued use of an asset for services provided (e.g., Royalty payments for water transfer from Republic of South Africa [RSA] to Lesotho—**box 4.23**).

4.3.5 Implementation and Adjustment Tools

*Cross-referenced with **(T12-13)** and **(boxes 4.14-4.16).**

Countries often jointly develop implementation and operational plans for single sector or multisector basin management or operations, or for new uses on a transboundary watercourse. Such plans, or blueprints, are prepared following completion of necessary diagnostic assessments/studies; they usually set out the goals, objectives, and programs for managing water resources for a specific period. Tools for implementation and adjustment include:

- ***Multisector Development Plans*** **(T12)** usually cover a wide geographic scope and outline implementation steps for multiple parties, such as **River basin management plans or Strategic Action Programs** (e.g., MRC Strategic Plan 2016-20—**box 4.14**; Okavango Strategic Action Program—**box 4.15**).
- ***Climate Change Adaptation Plans*** **(T13)** recognize the need to build flexibility into management plans and to strengthen resilience against uncertain, yet expected, climate change impacts (e.g., NBI Climate Change Strategy—**box 4.16**).

- ***Single Sector Operational/Implementation Plans* (T39)** are concluded between parties in regular intervals to manage specific operations (e.g., Flow Release Determinations in the Columbia Basin—**box 4.47**).
- ***Stakeholder Participation and Inclusion Tools* (T40)** recognize the value of involving all relevant stakeholders in managing the development of shared water resources, and giving potentially vulnerable groups a voice (e.g., Orange-Senqu River Commission (ORASECOM) Roadmap towards Stakeholder Participation—**box 4.48**; Gender Policy and Strategy of the MRC—**box 4.49**).
- ***Provisions for Extreme Events and Uncertainty* (T41)** are included in some international treaties to provide for implementation flexibility in case of unexpected events (e.g., Farakka Agreement Extreme Event Provisions **box 4.50**).

See also ***Negotiations* (T66)** and **(box 4.71)**.

BOX 4.47. Flow Release Determinations in the Columbia

The key planning tool to guide the operations of the dam facilities in the Columbia is the assured operating plan (AOP), which is drawn up every year for the sixth successive year (five years ahead of time). It is drawn with the specific goal of achieving optimum power benefits within the specified flood control protection under the Columbia River Treaty (CRT). The AOP is used to calculate the Canadian Entitlement to downstream power benefits. Once signed, the AOP becomes the default operating plan. Optimum operating rules are determined annually and included in the AOP based on the firm and secondary (nonfirm) energy and capacity.

See *AOP* example at: http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p266001coll1/id/3269.

The CRT requires the USA Entity to develop a flood control operating plan (FCOP) in consultation with Canada, which is then used to develop the AOP. This plan prescribes the maximum reservoir levels at various points over the course of the year for four dams, and includes flood control storage reservation diagrams (Flood Control Curves) and associated criteria for each of the dams. The FCOP addresses both local flood control issues (immediately downstream of facilities) and system flood control requirements (as indicated at the Dalles in the lower Columbia River) to avoid damaging water levels throughout the system. The first FCOP was prepared in 1968, and major revisions were completed in 1972, 1999, and 2003.

See *FCOP* example at: http://www.nwd-wc.usace.army.mil/cafe/forecast/FCOP/FCOP2003.pdf.

A detailed operating plan (DOP) is based on the AOP. The Entities may prepare an annual DOP that may achieve more advantageous operations for benefits than would result under the AOP. The DOP must be accepted by mutual agreement, or the AOP for that particular year is applied. The DOP may include mutually agreed upon nonpower and non–flood-control benefits (such as fisheries). These deviations from the AOP can be drawn up into supplementary agreements if they become consistent over the years. In this manner, the flow regime associated with the operations can undergo modifications providing they do not undermine flood control.

See *DOP* example at: http://www.nwd-wc.usace.army.mil/PB/PEB_08/docs/dop/08DOP.pdf.

BOX 4.48. Orange-Senqu River Commission Roadmap towards Stakeholder Participation

In 2005 the Water Ministers of the four riparian countries instructed the ORASECOM to develop a strategy for stakeholder participation in the Orange-Senqu River. This process ultimately resulted in a "Roadmap," which is envisioned as providing guidance on the series of actions that would need to be taken to progressively involve stakeholders in the development of a final strategy—the goal being that eventually "Orange-Senqu River Basin stakeholders actively and effectively participate with ORASECOM in the co-management and sustainable development of the Basin and its resources for enhanced livelihoods." In order to reach this goal, the key focus areas of the Roadmap are to (a) facilitate effective horizontal and vertical communication and information exchange between all relevant role-players; (b) develop and strengthen institutional mechanisms for stakeholder participation in the management of the river basin; (c) build and strengthen capacity in basin forums, institutions, and stakeholders for effective participation in decision making and planning; and (d) clearly define and establish functioning channels of institutional interaction, including a Steering Committee, a Program Coordination Unit and a Technical Advisory Group at the Secretariat, and National Coordination Structures at the riparian level. A "Framework of Action" outlines the various activities to be undertaken and how they contribute to the achievement of the overall vision and the objectives of stakeholder participation for ORASECOM. As some of the activities are to be performed by a range of partners, the "Terms of Engagement" for development partners embarking on transboundary stakeholder projects in the basin are also set out in the Roadmap.

See *ORASECOM Roadmap toward Stakeholder Participation* report at: http://www.orangesenqurak.com/UserFiles/File/ORASECOM/ORASECOM%20Road%20Map%20for%20staleholder%20participation_version%205_April%202007.pdf.

BOX 4.49. Gender Policy and Strategy of the Mekong River Commission

The objective of the Commitment on Gender Mainstreaming in Water Resources Development in the Lower Mekong Basin gender policy and strategy, which was approved by the four member countries of the Mekong River Commission (MRC) in 1998, is to mainstream gender perspectives in all MRC development efforts to ensure that all MRC development programs benefit both men and women, and are carried out with the equal participation of men and women at all levels. To carry out its objectives, the strategy lays out six main components: (a) formulate gender sensitive policies; (b) obtain commitment and support of top level MRC officials and managers; (c) raise awareness of gender issues in organizational culture through training courses and events for all staff; (d) build capacity in gender and development through trainings on gender planning and analysis and coordination of formal education in gender research; (e) institutionalize gender responsive organizational structure and procedures including establishment of a steering committee for the Secretariat and gender focal points for line agencies, collection of sex disaggregated data, and

box continues next page

BOX 4.49. continued

implementation of gender responsive manuals and guidelines; and (f) disseminate necessary tools for implementing gender responsive development practices in all riparian languages.

See *MRC Commitment to Gender Mainstreaming* in Water Resources Development in the Lower Mekong Basin report at: http://www.mrcmekong.org/assets/Publications/policies/MRC-Gender-SP-05-Jan-2013-Eng.pdf.

BOX 4.50. Farakka Agreement Extreme Event Provisions

The 1996 Treaty on Sharing of the Ganges Waters at Farakka, which determines the level of flows in the Ganges River at the Farakka Barrage, demonstrates a detailed method of prescribing resource allocation of water under varying situations. The barrage, constructed in 1975, diverts water from the Ganges into the Hooghly River to supply water for navigational use in Kolkata. The allocations are based on 75 percent of the mean annual flow measured between 1949 and 1988. This allows for some buffering in terms of variation in the hydraulic regime. The schedule to the Agreement details allocations to both India and Bangladesh for ten periods between January 1 and May 1, and these allocations are reduced in proportion to the flow, should it fall below these levels. However, the portion allocated to Bangladesh should not fall below 80 percent of its average allocation. If the flow of the Ganges falls below a specified level, Article 2(iii) of the Schedule mandates "immediate consultations to make adjustments on an emergency basis, in accordance with the principles of equity, fair play and no harm to either party."

See *1996 Treaty on Sharing of the Ganges Waters at Farakka between Bangladesh and India* at: http://extwprlegs1.fao.org/docs/pdf/bi-17351.pdf.

4.4 Coordination Frameworks

Coordination frameworks define the rules, modes, and mechanisms of managing transboundary basins and the implementation of development interventions within these basins. These frameworks may provide prescriptive parameters for resource development and management and/or may define and identify the rights and obligations of water users. They can ensure the continuous integrity and stability of a regime (through governance structures, mechanisms for monitoring, evaluating and facilitating compliance, and dispute settlement). And they can allow for modifications of the existing regime in order to be able to adapt to changing needs and circumstances.

International practice is rich with examples of coordination frameworks. There are a plethora of multilateral and bilateral transboundary arrangements providing for joint project development and water management. Their content can range in scope from a localized issue-specific focus (e.g., building a navigation lock) to

basin-wide integrated management. Coordination framework tools are presented here under five subcategories: (a) Intention and Commitment Tools; (b) Implementation and Adjustment Tools; (c) Joint Management Mechanisms; (d) Financing Joint Management Mechanisms; and (e) Dispute Settlement.

4.4.1 Intention and Commitment Tools

These tools are the initial expression of intention and commitments by countries (or other stakeholders) with respect to basin or water resources management. The level of formality and binding nature of these coordination frameworks depends on the form in which they have been adopted; for example, under international law, a Declaration by Heads of State carries less legal formality than an international treaty. The level of formality of the instrument the countries choose usually depends on the level of detail and how much binding effect they want to give to their commitment. A Declaration typically includes general intention statements whereas international treaties or commercial agreements will define specific rights and obligations. Tools through which countries express their intention and commitments to implement a development activity or manage basin resources include:

- ***Declarations*** **(T42)** are usually adopted by Heads of State or Government or other authorized decision makers expressing aspirational goals and intention to act. In most cases they are done by at least two countries; however, they may also be issued unilaterally (e.g., Nukus Declaration—**box 4.51**).
- ***Memoranda of Understanding (MoU) or Minutes of Ministerial Meetings*** **(T43)** are usually drawn up when countries wish to record in writing the terms of an agreement between them without drawing up a formal international treaty. While not formal international treaties, these instruments may carry significant moral or political weight (e.g., MoU on Sharing of Flood Data on the Brahmaputra—**box 4.52**). (Note: Some international treaties carry the title "Memorandum of Understanding." The legal binding force is determined by the process through which an agreement is concluded. At the same time, minutes of ministerial meetings can be given legal binding force if drawn up within the context of the implementation of a treaty, where such treaty determines that these minutes will have legally binding character [see **box 4.56**].)
- ***International Treaties*** **(T44)** set out the parties' mutual legal rights and obligations and are governed by international law. International treaties carry many different titles (Convention, Agreement, Exchange of Notes, or even Memorandum of Understanding); it is the process of ratification that

BOX 4.51. Nukus Declaration

The 1995 Nukus Declaration aimed at improving rational utilization of land and water in the Areal Sea Basin and securing sufficient river flows for preserving the rapidly disappearing Aral Sea. The Aral Sea Basin countries declared their intention to "recognize earlier signed agreements in force, contracts and other statutory acts regulating mutual relations between them on water resources in the Aral Sea Basin and accept them to steady performance." Underpinning institutional arrangements, including the Executive Committee of the International Fund for the Aral Sea, the Nukus Declaration is an example of a joint declaration at the highest political level.

See *1995 Nukus Declaration* at: https://www.internationalwaterlaw.org/documents/regionaldocs/nukus_declaration_eng.pdf.

BOX 4.52. Brahmaputra Flood Control/Data Sharing Memoranda of Understanding

India and China reached Memoranda of Understanding (MOUs) on flood control and hydrological data sharing regarding the Brahmaputra Basin in 2002. China agreed to provide flood season hydrological data (water level, discharge, and rainfall) to India at three stations located on the river from June 1 to October 15 every year. The MOU expired in 2007. Similar five-year MOUs were reached in 2008 and 2013. In 2013, China agreed to provide an additional 15 days of hydrological data (May 15 to October 15) each year on the river to India. The parties agreed to "further strengthen cooperation on transboundary rivers, cooperate through the existing Expert Level Mechanism on provision of flood-season hydrological data and emergency management, and exchange views on other issues of mutual interest." Both sides recognized that transboundary rivers and related natural resources and the environment are "assets of immense value to the socioeconomic development of all riparian countries" and that the "cooperation on trans-border rivers will further enhance mutual strategic trust and communication as well as strengthen the strategic and cooperative partnership." A revised implementation plan (containing technical details of provision of information, data transmission methods and cost settlement) was executed in June 2014. A similar MoU has been agreed also between China and Bangladesh.

See *2013 Memorandum of Understanding Between the Ministry of Water Resources, the Republic of India and the Ministry of Water Resources, the People's Republic of China on Strengthening Cooperation on Trans-border Rivers* at: http://mea.gov.in/bilateral-documents.htm?dtl/22368.

determines its legal nature, not the title. More than 400 international treaties concerning transboundary freshwaters have been concluded since 1820 (UNEP Atlas of International Freshwater Agreements, 2002), and they regulate anything from agreement on a small diversion project to the establishment of basin management principles and institutions (e.g., Indus Waters Treaty—**box 4.53**; Columbia River Treaty—**box 4.54**).

- ***Agreements of Private Law Character*** **(T45)** are typically concluded to specify commitments at the project level; for example to distribute the benefits of an operation, such as in the case of power purchase agreements; or to establish special purpose vehicles to develop and operate a project. They may be concluded between public and private parties (e.g., Bhutan/India Power Purchase Agreements—**box 4.55**).
- ***Amendments and Supplementary Agreements*** **(T46)** can be used to change original terms of agreements in case they have not provided for flexibility to adjust to changing circumstances otherwise. For example, the 1995 Mekong Cooperation Agreement provides for updating and altering the Agreement at any time through amendments that are agreed to by all parties.

4.4.2 Implementation and Adjustment Tools

*Cross-referenced with **(T12-13, 39-41)** and **(boxes 4.14-4.16, 4.47-4.50)**.

- ***Multisector Development Plans*** **(T12)** usually cover a wide geographic scope and outline implementation steps for multiple parties, such as river basin management plans or Strategic Action Programs (e.g., MRC Strategic Plan 2016-20—**box 4.14**; Okavango Strategic Action Program—**box 4.15**).

BOX 4.53. Indus Waters Treaty

The partition of the Indian subcontinent in 1947 raised new questions regarding the rights of India and Pakistan to the shared waters of the Indus basin. Negotiations led to the Indus Waters Treaty (IWT) in 1960. (The World Bank is a signatory of certain parts of the IWT.) The IWT divided the water use rights on six rivers comprising the Indus River system between the two parties. India was allocated the Eastern Rivers (the Sutlej, the Beas, and the Ravi), and Pakistan the Western Rivers (the Indus, the Jhelum, and the Chenab). Each country was allowed certain uses in the rivers allocated to the other, subject to certain qualifications. The IWT also established the Permanent Indus Commission, constituted to oversee treaty implementation. Under the IWT, the two Commissioners for Indus Waters shall meet regularly at least once per year (and when requested by either Commissioner), alternatively in India and Pakistan, in order to establish and maintain cooperative arrangements for treaty implementation; promote cooperation between the Parties in the development of the waters of the Indus system; and to make every effort to settle any question that may arise between the Parties concerning the Treaty.

See *1960 Indus Waters Treaty* at: http://siteresources.worldbank.org/INTSOUTHASIA/Resources/223497-1105737253588/IndusWatersTreaty1960.pdf.

BOX 4.54. Columbia River Treaty

The Columbia River Treaty (CRT) was ratified in 1964 to operate the water resources of the Columbia River Basin (CRB) "in a manner that will make the largest contribution to the economic progress of both countries." After allowing for consumptive uses, including irrigation, the CRT focuses on flood control and power generation, the presumption being that cooperation in these areas would generate the "greatest benefit to each country" (CRT Preamble). The CRT called for Canada to develop reservoirs in the higher reaches of the CRB, sufficient to provide 15.5 million acre-feet of water storage. In compliance, Canada built three dams (in Canada): Duncan, Arrow/Keenleyside and Mica. The CRT further permitted the United States to construct, in the United States, the Libby Dam and the associated Koocanusa reservoir, which extends into Canada. Management of Columbia River flows by Canadian dams enables a number of dams downstream in the United States to generate more usable energy than they would otherwise, creating significant downstream power benefits. Under the CRT, these downstream power benefits are shared between the two countries. Flexibility within the agreement accommodates other interests of the Parties, such as fisheries and recreation.

See *Columbia Basin Case Study* in Altingoz et al. (2018).

BOX 4.55. Bhutan/India Power Purchase Agreements

The first major hydroelectric investment in Bhutan, a bilateral agreement between India and Bhutan in 1974, was the Chukha Hydel project. The Chukha plant connects to the Indian grid at Birpara in West Bengal. The Chukha Hydel project is based on a power purchase agreement (PPA) that is advantageous to both Bhutan and India. India absorbed the construction risk and market risk by agreeing to provide the required capital, construct the project in a turnkey arrangement, and off-take the excess supply of electricity from Chukha over the domestic consumption at a mutually agreed upon price, subject to periodic revisions for inflation and cost escalation. It would not have been possible for Bhutan alone to bear the financial risk. India provided the technology and financing and bore the completion risks and received, in turn, a low-cost reliable source of hydropower for its eastern electricity region. Under the contractual arrangement: India would provide the total investment on the project, 60 percent as grant and 40 percent as a loan to Bhutan; Bhutan would be required to repay the loan at a 5 percent interest rate in twelve equal installments, repayment beginning three years after the completion of the project. Bhutan would provide free land, timber, and firewood for the project and will not impose taxes on construction materials and capital goods procured for the project; employment at the project would be restricted to nationals of Bhutan and India. If necessary, low skilled staffs and laborers could be imported from a third country. Taking into consideration the time-series data of the previous 20 years, both Bhutan and India agreed upon prices for firm and secondary energy. In 1988 rupees, the selling price of firm energy would be Rs 0.27/kWh and secondary energy Rs 0.135/kWh. Out of its total generation, only 832 million kWh per year is to be considered as firm energy. Electricity derived from the project is to be supplied only to Bhutan and India. For 99 years India would buy all the electricity generated from the project in excess of Bhutan's requirements. The two governments, after the end of each four-year period, would revise the sale price of electricity to India.

See *Risk Sharing in Hydropower Development: Case Study of the Chukha Hydel Project in Bhutan* article at: http://wp.iwaponline.com/content/15/S1/109.

- ***Climate Change Adaptation Plans*** **(T13)** recognize the need to build flexibility into management plans and to strengthen resilience against uncertain, yet expected, climate change impacts (e.g., NBI Climate Change Strategy—**box 4.16**).
- ***Single Sector Operational/Implementation Plans*** **(T39)** are concluded between parties in regular intervals to manage specific operations (e.g., Flow Release Determinations in the Columbia Basin—**box 4.47**).
- ***Stakeholder Participation and Inclusion Tools*** **(T40)** recognize the value of involving all relevant stakeholders in managing the development of shared water resources, and giving potentially vulnerable groups a voice (e.g., Orange-Senqu River Commission [ORASECOM] Roadmap toward Stakeholder Participation—**box 4.48**; Gender Policy and Strategy of the MRC—**box 4.49**).
- ***Provisions for Extreme Events and Uncertainty*** **(T41)** are included in some international treaties to provide for implementation flexibility in case of unexpected events (e.g., Farakka Agreement Extreme Event Provisions **box 4.50**).

Flexibility tools facilitate course adjustments along the way toward realization of initial commitments or of implementation plans. Many adjustment tools concern the implementation of international treaties over time because, given the formal process of their conclusion, they tend to have a long lifespan, unless otherwise provided. Other adjustment tools may be used, for instance, to make ad hoc adjustments to operational plans in case of unexpected events. The different tools addressing flexibility include:

- ***Amendments and Supplementary Agreements*** **(T46)** can be used to change original terms in case international agreements have not provided for flexibility to adjust to changing circumstances otherwise. For example, the 1995 Mekong Cooperation Agreement provides for updating and altering the Agreement at any time through amendments that are agreed to by all parties.
- ***Minutes of Joint Management Mechanisms or Decision of Parties to an Agreement*** **(T47)** can be used to establish additional and more detailed legally binding rules for implementation of commitments, if this is provided for in the treaty (e.g., IBWC Minutes—**box 4.56**).
- ***Periodic Reviews*** **(T48)** of agreements are a useful tool to review and adjust commitments with respect to their underlying conditions. International treaties sometimes provide for their regular review (e.g., Periodic Review of the Mahakali and Farakka Agreements—**box 4.57**).
- ***Conference Calls*** **(T49)** or other means of informal communications allow for ad hoc adjustment of operational plans to unforeseen developments (e.g., Columbia River Conference Calls—**box 4.58**).

4.4.3 Joint Management Mechanisms

Countries often refer to the establishment of some type of joint mechanism to manage and develop their shared water resources. Joint management mechanisms are a specific form of coordination framework. They are presented here as a separate tool because of the rich experience and wide variety of structures successfully set up among riparian countries in many basins.

As each transboundary waters situation has unique characteristics and riparian countries pursue different objectives, in each specific case, the appropriate structure and mandate has to be identified for the respective

BOX 4.56. Minutes of the International Boundary and Water Commission—Mexico/USA

With the International Boundary and Water Commission's (IBWC) use of Minutes, changes in underlying circumstances, such as sociopolitical situation, climate, and environmental change, can be addressed as needed. Significant decisions can thus reflect current and contemporary values while fundamentally maintaining the spirit and intent of the original arrangement. For example, Minutes have been used to adjust water allocations, as well as to address salinity issues that have arisen since the signing of the 1944 Treaty on the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande. They have also been used to adjust the set delivery schedules of water allocated to Mexico, for example, due to infrastructure damage associated with an earthquake in April 2010. The ability of the IBWC to adapt, amend, and extend the institutional arrangement between the countries is a powerful tool to develop a resilient form of cooperation.

See *Minutes Between the United States and Mexican Sections of the IBWC* at: https://www.ibwc.gov/Treaties_Minutes/Minutes.html.

BOX 4.57. Periodic Review of the Mahakali and Farakka Agreements

Art. 12 of the 1996 Mahakali Treaty between Nepal and India provides that a review of the agreement will be conducted "by both parties at ten year intervals or earlier as required by either party and make amendments thereto, if necessary."

In the 1996 Treaty on Sharing of the Ganges Waters at Farakka, Art. X states that "[t]he sharing arrangement under this Treaty shall be reviewed by the two Governments at five year intervals or earlier, as required by either party and needed adjustments, based on principles of equity, fairness, and no harm to either party made thereto, if necessary. It would be open to either party to seek the first review after two years to assess the impact and working of the sharing arrangement as contained in this Treaty."

See *1996 Mahakali Treaty* at: https://www.internationalwaterlaw.org/documents/regionaldocs/Mahakali_Treaty-1996.pdf.

See *1996 Treaty on Sharing of the Ganges Waters at Farakka between Bangladesh and India* at: http://extwprlegs1.fao.org/docs/pdf/bi-17351.pdf.

BOX 4.58. Columbia Conference Calls

Since the CRT was ratified in 1964, various agreements have been made between Canada and the United States to deal with issues as they arise. In the operation of the CRT, weekly alterations to the flow regime are determined by the entities through a weekly "conference call" (Thursday morning) to respond to unforeseen developments. The Treaty Flow Agreement is set for the following week starting Saturday morning. The Agreement is typically finalized by noon on Fridays. Within-week flow alterations may be accommodated as mutually agreed, but these are generally rare. Monthly alterations to address seasonal changes in flow, snow pack, and flood forecasting are conducted through treaty storage regulation, which is also determined by the dam operators as part of the operating procedures under the CRT.

See *Columbia Basin Case Study* in Altingoz et al. 2018.

joint mechanism. The five-dimensions analysis (see part I: Summary Report—"Dimensions of Coordinated Basin Management" section in chapter 2) can be used for design considerations, such as choosing the appropriate geographic scope of a mechanism. For example, two-countries planning a joint investment in a river basin that is shared by multiple countries may opt for bilateral project-specific mechanisms or may opt to embed the operation in a multilateral or basin-wide mechanism. The nature of the planned development intervention will determine the breadth of the sectoral mandate and level of integration adopted for the mechanism, as well as the capacity and skills that need to be available within the mechanism. As required by the participating parties, a joint mechanism may also have compliance and dispute settlement functions.

It is common that joint mechanisms evolve overtime if they render substantial services to the participating countries. For example, the joint mechanism established by riparian countries of the River Rhine evolved from being focused on water quality to being responsible, among others, for flood management, ecosystem conservation and to consider impacts of its activities on navigation. Joint management mechanisms also provide permanent platforms for dialogue that allow for deepening of cooperation between riparian countries. Depending on the purpose for which a joint mechanisms is being set up, the nature of the agreement based upon which it is set up may be different. They can be set up by any of the intention and commitment tools presented above (see "Intention and Commitment Tools" section), with international treaties being the most common.

Joint management mechanisms have different characteristics in terms of membership (bilateral to multilateral), sectoral mandates, functions and powers, as well as lifespan and level of integration. Here, the following two categories of characteristics are presented in more detail: (a) Functions and Powers; and (b) Temporal Range and Level of Integration.

4.4.3.1 Functions and Powers

Functions and powers include advisory, executive, regulatory and inclusiveness roles. A joint mechanism may be vested with only one or a number of these roles at the same time, depending on its objective and purpose.

- ***Advisory Functions*** **(T50)** are usually adopted for joint mechanisms with technical mandates. They inform decision making through recommendations or preparation of plans for adoption by their member countries. Their roles can also extend to consultative, coordinating and policy making subfunctions (e.g., Lake Victoria Basin Commission [LVBC]—**box 4.59**).

BOX 4.59. Lake Victoria Basin Commission

The LVBC was established in 2003 under the principle of subsidiarity within the Nile River Basin as a specialized apex institution of the East African Community (EAC) (a regional intergovernmental organization comprised of Kenya, Uganda, Tanzania, Rwanda, and Burundi). The establishment of the LVBC developed from the EAC's Lake Victoria Development Program, a mechanism that began in 2001 to coordinate various interventions in the Lake Victoria Basin region and to turn the basin into an economic growth zone. The broad functions of the LVBC are to promote, facilitate and coordinate activities toward sustainable development and poverty eradication in the Lake Victoria Basin. The Secretariat of the LVBC is charged with coordinating all activities within the scope of the LVBC Protocol. The Secretariat's advisory functions include: initiating the coordination and harmonization of policies and strategies related to the development of the LVBC; encouraging information and data sharing; convening meetings of the Sectoral Committees and other working groups; promoting research on sustainable development of the basin; and mobilizing resources to implement projects and programs.

See *LVBC* portal at: https://www.lvbcom.org/.

- ***Executive Functions*** **(T51)** include the mandate to implement activities and the powers to manage financial resources on behalf of and for the benefit of the member countries. Joint mechanisms with executive functions would typically carry out diagnostic studies; preparation of feasibility studies; inspection and control; construction; O&M; and/or financing of projects (e.g., The NBI—**box 4.60**).
- ***Regulatory Functions*** **(T52)** include the authority to control, monitor and report on the implementation of administration decisions; and prescribe or proscribe actions concerning, for example, issues of water allocation and water pollution. They may also be involved in law and policy making, and their decisions in these matters may take effect directly or after acceptance by members (e.g., Lake Chad Basin Commission—**box 4.61**; IBWC—**box 4.62**).
- ***Inclusiveness Functions*** **(T53)** can be attributed to joint mechanisms to ensure that the widest possible range of stakeholders are consulted or may participate in the development of management tools or decision-making. For example, stakeholder consultations and participation are important elements in the management of the Great Lakes of North America and of Lake Tanganyika.

4.4.3.2 Temporal Range and Level of Integration

More and closer cooperation is not necessarily always better; the mechanism framework should be adapted to the nature of the planned activity, the specific

BOX 4.60. NBI

The NBI Secretariat (Nile-SEC) is the executive and technical arm of the NBI. It is responsible for the overall corporate direction as well as serving as the 'lead center' for two programs: Basin Cooperation and Water Resources Management.

The Eastern Nile Technical Regional Office (ENTRO) for the Eastern Nile Subsidiary Action Program (ENSAP) supports the Eastern Nile Council of Ministers and the ENSAP Team in preparing cooperative water resources investment programs and projects, strengthening institutions and providing secretariat support. ENTRO exercises its executive mandate through projects, including the Ethiopia Sudan Transmission Interconnection Project, which aims to connect the power grids of Ethiopia and Sudan to facilitate cross-border energy trade; the Eastern Nile Planning Model project, which focuses on gathering the knowledge, data, and information from both the ENSAP projects and country-specific information, and flood preparedness and early warning systems.

The Nile Equatorial Lakes Subsidiary Action Program Coordination Unit is the executive and technical arm of the Nile Equatorial Lakes Subsidiary Action Program (NELSAP), an institution jointly owned by Burundi, the Democratic Republic of Congo, the Arab Republic of Egypt, Ethiopia, Kenya, Rwanda, Republic of South Sudan, Sudan, Tanzania, and Uganda. NELSAP oversees the implementation of jointly identified projects and promotes cooperative inter-country and in-country investment projects related to the common use of the Nile Basin's water resources.

See *NBI* portal at: http://www.nilebasin.org/.

BOX 4.61. Lake Chad Basin Commission

The Lake Chad Basin Commission (established in 1964 by Cameroon, Chad, Niger, and Nigeria) has several executive and regulatory powers: (a) it prepares general regulations in order to implement the principles set forth in foundational documents and to ensure their effective application; (b) it follows the progress of the execution of surveys and works in the Lake Chad Basin as envisaged in the Convention, and keeps members informed at least once per year through systematic and periodic reports that each Member State submits to it; (c) it draws up common rules regarding navigation and transport; (d) it draws up staff regulations and ensures their application; and (e) it supervises the implementation of the provisions of the Convention and any documents annexed to it.

See *Lake Chad Basin Commission Basic Documents* at: https://www.cblt.org/sites/default/files/documentbase_eng.pdf.

BOX 4.62. International Boundary and Water Commission

Established originally in 1889, the International Boundary and Water Commission (IBWC) is responsible for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise in their application. The IBWC is an international body composed of the United States Section and the Mexican Section, each headed by an Engineer-Commissioner appointed by his/her respective president. The executive and regulatory powers of the IBWC encompass the following rights and obligations: "distribution between the two countries of the waters of the Rio Grande and of the Colorado River; regulation and conservation of the waters of the Rio Grande for their use by the two countries by joint construction, operation, and maintenance of international storage dams and reservoirs and plants for generating hydroelectric energy at the dams; regulation of the Colorado River waters allocated to Mexico; protection of lands along the river from floods by levee and floodway projects; solution of border sanitation and other border water quality problems; preservation of the Rio Grande and Colorado River as the international boundary; and demarcation of the land boundary."

See *IBWC* portal at: https://www.ibwc.gov/home.html.

characteristics of the individual basin and the needs and interests of the participating parties. Effective coordination can be reached, for example, through a joint mechanism limited to information gathering and exchange mechanism without the need to take joint action through a permanent institution that performs advisory functions, policy development, implementation and monitoring and dispute settlement. The following nonexhaustive list provides a range of possible institutional structures, with different intended lifespans and levels of integration. A combination of the various structures listed may be equally appropriate.

(As with intention and commitment tools, the title chosen to name the institution is much less important than its actual mandate and powers.)

- ***Ad hoc Mechanisms*** **(T54)** can be established to deal with unexpected emergencies, to carry out specific tasks or reviews, or to advise on a pressing technical matter. As an example, Annex IV of the Danube River Protection Convention envisages the establishment of standing and ad hoc expert groups, which can help devise effective responses to changing circumstances, such as climate change.
- ***Joint Technical Committees (JTC)*** **(T55)** are usually set up to analyze and advise on the solution for a specific technical challenge. It could, for instance, include engineers and scientists to gather information in each country, identify data gaps, serve as a repository, and evaluate available basin data. A JTC may transform into a permanent body following agreement to sustainably gather, share and maintain information and data about the basin and relevant projects in each country. A JTC was, for instance, set up to develop the LHWP (see **box 4.63**).
- ***Single-issue Entities*** **(T56)** may be established permanently to manage a single basin-related issue area, such as the Lake Victoria Fisheries Organization.[1]
- ***Special Purpose Vehicles*** **(T57)** or joint entities to manage single projects can be used for the planning, implementation and management of joint investments or otherwise co-financed operations. They are often endowed with legal personality, administrative and financial capacity, and technical responsibility for the entire operation, such as in the La Plata Basin, where Itaipu Binacional (Brazil and Paraguay) and Entidad Binacional Yacyretá (Argentina and Paraguay) were created to oversee large hydropower projects on contiguous stretches of the Paraná River.
- ***Basin Coordinating Committees or Councils*** **(T58)** are working groups comprising of ministers or senior representatives of main water-related agencies that meet in regular intervals. These can be established at basin, sub-basin and/or national level serving or complementing joint mechanisms at a higher level or they may be established as part of a Basin Authority. They can be advisors or decision makers on basin planning, allocation of resources and financial matters.
- ***River Basin Organizations, Authorities, or Commissions*** **(T59)** usually have a permanent secretariat that includes experts with multidisciplinary technical expertise, depending on the breadth of sectoral

BOX 4.63. LHWP Joint Technical Committee

In 1966, South Africa officially proposed the Lesotho Highland Water Project (LHWP) to Lesotho and a joint technical committee (JTC) was eventually formed in 1978, comprising experts from both countries. The JTC was mandated to gather information and undertake studies to investigate the feasibility of the LHWP. The studies were completed by 1986 and advocated a four-phased project that would capture the excess flows of the upper Senqu catchment and transfer the water from a series of storage dams via tunnels to South Africa, while generating hydroelectricity for Lesotho. The studies resulted in the a 1986 treaty between Lesotho and South Africa to implement the LHWP.

See *LHWP* portal at: http://www.lhwp.org.ls/.

mandate and advisory functions, as well as a higher level policy- or decision-making body at the ministerial or heads of state level. They are often mandated to be the repository of shared basin data, to develop basin management and investment plans, to raise and/or manage funds for development projects and/or to implement such projects (e.g., NBA—**box 4.64**; Chu-Talas Commission—**box 4.65**).

- ***Entities with "Beyond-the-Basin" Mandates*** **(T60)** exist in some cases where the watershed is also used as a geographic zone for economic integration not directly related to basin and water resources management. Examples include the Amazon Cooperation Treaty Organization,[2] the now defunct Kagera Basin Organization, and the Mano River Union, which was originally established in 1973 as a customs union aimed at strengthening the capacity to integrate all aspects of economic and social life among riparian countries.

4.4.4 Financing of Joint Management Mechanisms

There are multiple ways in which countries finance the creation of mutual benefits and compensation for costs; as well as for providing the necessary budgetary requirements for joint management mechanisms. These tools are presented here under two categories: (a) Membership Contributions (Transfers); and (b) Taxes and Tariffs (User Fees).

A joint management mechanism should have a sustainable and appropriate financing system in place to effectively implement its mandate. For permanent institutions, such as river basin organizations (RBOs), financing systems should aim to foster budget autonomy in the institution's daily operations to make them effective platforms for collaboration. A number of tools can be utilized to ensure that mechanisms have adequate resources to fulfill their functions; the financing needs in the basin and for projects are met; and that desired development targets can be achieved.

BOX 4.64. Niger Basin Authority

The Niger River Basin (NBA) covers an area of about 2,270,000 km^2 in ten countries in West and Central Africa. The 1980 *Convention Creating the Niger Basin Authority* (Niger, Benin, Chad, Guinea, Côte d'Ivoire, Mali, Nigeria, Cameroon, and Burkina Faso are Member States), as successor to the original River Niger Commission, defines the basic scope and mandate of the NBA. The legal framework was established to promote cooperation between the Member States and to ensure integrated development in all areas as part of development of its resources, particularly in energy, water, agriculture, forestry, transportation, communication, and industry. The NBA exercises its legal authority through the established Executive Secretariat, the Council of Ministers and a Summit of Heads of State and Government. The NBA functions primarily as an organization to promote cooperation among the member countries to ensure integrated development in all fields through integrated development of the basin resources.

See *Convention Creating the Niger Basin Authority* at: https://treaties.un.org/doc/Publication/UNTS/Volume%201346/volume-1346-A-22675-English.pdf.

See *NBA* portal at: http://www.abn.ne/index.php?option=com_content&view=frontpage&Itemid=1&lang=en.

BOX 4.65. Chu-Talas Commission

In the 2000 *Agreement on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas,* signed by both governments in 2000, the parties agreed that the operation and maintenance costs for the facilities specified in the Agreement would be shared on a pro rata basis in accordance with the water volume received by each party. They further agreed to the establishment of a permanent commission "to ensure safe and reliable operation of water distribution facilities of interstate use" and "to arrange the working regimes and the range of necessary expenses for operation and maintenance" (Article 5). The Chu-Talas Commission offers a mutually beneficial mechanism for the Kyrgyz Republic and Kazakhstan to share responsibility for the water infrastructure used by both countries.

The main tasks of the Commission are: (a) coordination and organization of activities to implement the 2000 Agreement; (b) comprehensive assessment and forecasting of the condition of transboundary water facilities of interstate use; (c) approval of norms and procedures for water use and allocation, assessment, and accounting of water resources; (d) approval of water-use quotas, operational regimes of water facilities of interstate use, and conditions for adjusting of those quotas and regimes, depending on actual availability of water resources and water-user demand; (e) approval of shares to fund actions enabling the required safety level for the infrastructure of interstate use; (f) establishment of procedures and organization of participatory actions during emergency situations, and coordination of measures regarding safe discharge of floodwaters and combating floods and mudflows; (g) organization of the sharing of hydrology prognosis, as well as information on the current status of the water management situation and other relevant information; (h) approval and coordination of implementation of monitoring programs for water resources and water facilities in the Chu and Talas Basins; and (i) organization of joint research, design, and other activities aimed at the development of water use in the Chu and Talas Basins.

The two countries appoint the members of the Commission. The Commission has a permanent executive body, the secretariat, whose main tasks are prescribed in regulations covering preparation of the meetings of the Commission, administrative and organizational management, development of annual reports, and coordinating the Commission's four working groups, which cover (a) legal and institutional issues; (b) allocation of water resources; (c) hydrotechnical works and reconstruction of facilities; and (d) economics, environment, monitoring, and data exchange. The Commission meets at least twice per year.

See *Chu and Talas Basins Case Study* in Altingoz et al. 2018.

The financing of management mechanisms can be carried out through three basic sources of sustainable revenue, which can be categorized as the "3Ts": Transfers, Taxes, and Tariffs. Transfers are payments in the form of grants, financial or in-kind contributions from external sources (see also chapter 5: Third-Party Tools), and/or member country contributions/membership fee payments; taxes are funds raised by governments through the tax base and subsequently diverted to the water sector; and tariffs are defined here as user fees.

4.4.4.1 Membership Contributions (Transfers)

Membership contributions can be calculated based on a wide range of allocation keys. Allocation keys should be organized through a regulatory or contractual

framework between the parties and/or the joint management mechanism that determines criteria based on which the contributions are then calculated, including for example:

- ***Principle of Equality Allocations*** **(T61):** each country makes an equal contribution (e.g., in a basin shared by five countries, each participating country contributes at a 20 percent rate); (e.g., Permanent Okavango River Basin Water Commission [OKACOM]—**box 4.66**).
- ***Indicator Allocations*** **(T62):** party contributions are determined based on economic or basin-related criteria. Indicator examples include:
  - **Ability to Pay:** allows party contributions to be based on their ability to pay, calculated, for example, based on gross domestic product (GDP) or GDP per capita (e.g., International Commission for the Protection of the Danube River [ICPDR]—**box 4.67**).
  - **Basin Area:** allows for party contributions to be derived from the relative share of the total basin

BOX 4.66. Equal Contribution Cost Sharing in OKACOM

Each OKACOM Member State (Angola, Botswana, Namibia) is responsible for covering the costs incurred by its delegation and related advisors in attending OKACOM meetings. In addition, Member States that host a particular OKACOM meeting are responsible for all costs associated with securing a venue for the meeting, distributing an agenda, and recording and distributing the meeting minutes. Otherwise, all other costs incurred or liabilities accepted by OKACOM in the performance of its duties are shared equally among the Member States, unless otherwise agreed by OKACOM. Reports prepared by OKACOM are to include estimates of the costs involved in implementing the Commission's recommendations, and may also include proposals for the apportionment of these implementation costs among the Member States.

See *OKACOM* portal at: http://www.okacom.org/.

BOX 4.67. Economic Capacity Cost Sharing in the International Commission for the Protection of the Danube River

The International Commission for the Protection of the Danube River's (ICPDR's) founding agreement foresees equal shares for member contributions. However, in the infancy of ICPDR it was decided that a new allocation with differing member contribution percentages would be installed. This categorization takes into account member's capacity to pay in order to accommodate the financial situations of new members. It regrouped the ICPDR's sixteen member countries into four categories according to their national budget (with the goal of equal contribution cost sharing over the long term). The share each category contributes toward the ICPDR budget is renegotiated annually. The European Commission bears a constant share of 2.5 percent of the overall ICPDR budget. In 2012, for example, member contributions ranged between US$37,000 (Category D) and US$129,000 (Category A). Table B4.67.1 presents the 2012 ICPDR member contribution category groupings.

box continues next page

BOX 4.67. continued

TABLE B4.67.1. ICPDR Member Contribution Categories

Country category	Countries
A	Austria, Czech Republic, Germany, Hungary, Slovak Republic, Slovenia; Bulgaria and Romania from 2008
B	Croatia, Serbia; Bulgaria, and Romania before 2008
C	Bosnia/Herzegovina, Ukraine
D	Montenegro; Moldova (exception since 2011)
E	EU—2.5% (constant)

See *Financial Sustainability of International River Basin Organizations* report at: http://www.transboundarywaters.orst.edu/publications/publications/GIZ%202014%20Financing%20International%20River%20Basin%20Organizations.pdf.

area in a country. The financial contribution by a party could either be positively or negatively correlated to the basin area within a party's territory.

- **Flow Contributions:** allow for party contributions derived from the relative share of the total flow volume resulting from direct rainfall or runoff within a country. Contributions can be either positively or negatively correlated to flow volumes and can also depend on the relative location of the party vis-à-vis the basin.
- **Multiple-Indicator Weighted Contribution** (e.g., MRC—**box 4.68**)

4.4.4.2 Taxes and Tariffs (User Fees)

Although taxes and tariffs are used by some countries and joint management mechanisms to cover the operational budget of the latter, the use of these tools is still rare in contrast to transfers. The choice of a financing system based on taxes can be established separately in each member country or directly at the basin organization level. The small number of examples of joint management mechanisms financed through these tools illustrates that levying taxes or tariffs to support transboundary water management services is a complex undertaking. Real-world and hypothetical examples include:

- ***Community Integration Tax* (T63)** is an example where the RBO relies on the tax regime that finances the regional economic community to which it belongs (e.g., International Commission of Congo, Oubangui and Sangha River Basins [CICOS]—**box 4.69**).
- ***Polluter Fees* (T64)** are a tariff based on the polluter pays principle or compensation for damage to the water resources. The financing of a joint basin management mechanism through polluter fees could be structure both for point source pollution, affecting only some water users, or non-point source pollution charging all users.
- ***Benefit-Based User Fees* (T65)** includes for example the payment for hydropower generation benefits obtained by users (e.g., Water purchase agreements

BOX 4.68. Indicator-Based Contributions to the Mekong River Commission

The Mekong River Commission (MRC) started out through an equal contribution cost sharing scheme among the four member countries. Equal member contributions as of 2000 (US$195,000 per country) were used as a baseline to calculate gradual payment increases. The annual increase is based on a key composed of four indicators accounting for benefits and one accounting for economic capacity. The indicators are weighted individually, in reverse order for flow and normal order for all other indicators, and then added, which provides a percentage by which each member's contribution is increased. The calculations are shown in the following tables. Table B4.68.1 presents the indicators and corresponding country data/measurements. Table B4.68.2 presents the weighted indicators and corresponding percentage of annual increase of contribution by member states.

TABLE B4.68.1. MRC Indicator-Based Cost Contributions: Country Data/Measurements

Indicator	Cambodia	Lao PDR	Thailand	Vietnam
1—Catchment area (km^2)	155,000	202,000	1184,000	65,000
2—Average flow (m^3/s)	2,860	5,270	2,560	1,660
3—Irrigated area (million ha)	0,161	0,075	1,414	1,512
4—Population (million)	9.30	4.70	23.2	19.8
5—Per capita GDP (US$) (1997)	252	259	876	287

TABLE B4.68.2. MRC Indicator-Based Cost Contributions: Weighted Indicators and Corresponding Percentage of Annual Increase in Contributions

A.4 Weighted indicator	Cambodia	Lao PDR	Thailand	Vietnam	Total
1. Catchment area (km^2)	2	4	3	1	10
2. Average flow (m^3/s) (reverse order)	2	1	3	4	10
3. Irrigated area (million ha)	2	1	3	4	10
4. Population (million)	2	1	4	3	10
5. Per capita GDP (US$) (1997)	1	2	4	3	10
Total	9	9	17	15	50
% of annual increase of contribution	18	18	34	30	100

See *Financial Sustainability of International River Basin Organizations* report at: http://www.transboundarywaters.orst.edu/publications/publications/GIZ%202014%20Financing%20International%20River%20Basin%20Organizations.pdf.

BOX 4.69. CICOS Community Integration Tax

The Heads of State and Government of the Central African Economic and Monetary Community (CEMAC) adopted an autonomous financing mechanism, the Community Integration Tax (CIT), which is applied at a 1 percent rate of the customs value of goods imported from third countries for consumption in all countries of the community. The custom collectors transfer the revenue from this tax to an account opened in the branches of the Bank of Central African States. Cameroon, the Central African Republic and the Republic of Congo, who are members of CEMAC, contribute to the International Commission of Congo, Oubangui and Sangha River Basins (CICOS) budget through the CIT, which now accounts for 70 percent of CICOS' financing. The Democratic Republic of Congo, which is not a member of CEMAC, contributes the remaining 30 percent directly.

See *The Handbook for Integrated Water Resources Management in Transboundary Basins of Rivers, Lakes and Aquifers* report at: http://www.gwp.org/globalassets/global/toolbox/references/the-handbook-for-integrated-water-resources-management-in-transboundary-basins-of-rivers-lakes-and-aquifers-inbo-gwp-2012-english.pdf.

BOX 4.70. Financing Kariba Dam Rehabilitation

The Zambezi River Authority (ZRA) is a financially autonomous organization that generates operating revenue through water tariffs charged to the Zambian and Zimbabwean power utilities (ZESCO and ZPC) for water used in the generation of electricity. The ZRA is not itself an electricity utility. The ZRA revenue formula agreed by all the parties is intended to provide the ZRA with sufficient revenues to carry out its mandated functions. The tariff structure includes two parts: a fixed monthly element, and a volumetric charge, also billed monthly. The formula is reviewed every three years, with tariffs adjusted annually according to the Consumer Price Index of the United States. Through the revenue formulae the ZRA was able to raise US$275 million toward the cost of the Kariba Dam Rehabilitation Project.

See *ZRA* portal at: http://www.zaraho.org.zm/.

between national power utilities and the Zambezi River Authority [ZRA]—**box 4.70**).

4.4.5 Dispute Settlement

Dispute settlement tools can be used to determine questions of interpretation of and compliance with an agreement, agree on solutions to restore compliance, determine compensation payments, or to find an agreed alternative to compliance with earlier agreements. Many transboundary water agreements contain dispute settlement provisions. In case of a dispute, it is helpful if parties can refer back to prior-agreed dispute settlement procedures or mechanisms, as it may be difficult to agree *a posteriori* once the dispute has arisen.

Dispute settlement provisions usually involve a multi-step approach where the final step is usually dispute resolution by the binding decision of a third party, such as an independent/impartial expert, court, or tribunal. Various informal and formally agreed dispute settlement tools exist:

- ***Negotiations*** **(T66)** tend to be the dispute settlement tool that is first deployed by countries (or other stakeholders) to settle any differences they may have. It is also usually the first step in a multistep approach to dispute settlement outlined in international treaties (e.g., Kosi River Treaty Renegotiation—**box 4.71**).
- ***Filing a Complaint*** **(T67)** with the other party or with a joint management mechanism is often the first step in formalized dispute settlement procedures. This is for instance the case in the Mekong River Basin where the Joint Committee is tasked with addressing and resolving any issues and differences that may arise on matters within the purview of the Mekong Agreement.
- ***Complaint Review*** **(T68)** by a joint entity or management mechanism (e.g., Columbia Permanent Engineering Board [PEB]—**box 4.72**; Joint Committee Review under the Farakka Treaty—**box 4.73**; Permanent Indus Commission Procedures for Dispute Settlement—**box 4.74**).
- ***Arbitration Tribunals*** **(T69)** are usually set up based on agreement between the parties, who would each nominate arbitrators (individually) as well as the chair (usually jointly). They may involve third parties as arbitrators or to assist with appointment of the tribunal in case parties cannot agree (e.g., Arbitral Procedures for the LHWP—**box 4.75**).

BOX 4.71. Kosi River Treaty Renegotiation

Because Nepal contended that the 1954 Kosi River Treaty was skewed in terms of the benefits that accrued to the two countries and that the scheme resulted in furthering India's interests without paying proper attention to the well-being of the Nepalese people, the parties renegotiated the controversial provisions. The 1966 *Revised Agreement between the Government of Nepal and the Government of India on The Kosi Project* (Revised Agreement) provided, among other provisions, that: (a) any construction and other undertaking by India in connection with the project must be planned and carried out in consultation with Nepal, and those works and undertakings would be implemented only after securing approval from Nepal; (b) all lands acquired by Nepal would be leased to India for a period of 199 years from the date of the signing of the Revised Agreement at an annual nominal rate (the Original Agreement had conferred on India the "ownership" of all lands acquired by Nepal and subsequently transferred to India for the purpose of the project) and Nepalese sovereign rights and territorial jurisdiction, including the application and enforcement of the laws of Nepal on and in respect of the leased land, would continue unimpaired by such lease; (c) Nepal would have every right to withdraw water for irrigation, or for any other purpose, from the Kosi River Basin; and (d) India would pay royalties to Nepal for the generation of power or the use of stone, timber, and gravel obtained from Nepalese territory and used for construction, maintenance of the barrage, and other project-related activities.

See *Conflict and Cooperation on South Asia's International Rivers: A Legal Perspective* report at: https://openknowledge.worldbank.org/handle/10986/15171.

BOX 4.72. Columbia Permanent Engineering Board

The CRT established the Permanent Engineering Board (PEB) to provide an independent review of CRT implementation. The PEB collects statistics, ensures that the objectives of the CRT are met, and reports to the Canadian and the United States federal governments annually. It consists of two persons from Canada (one federal and one provincial) and two from the United States. The PEB is not an arbitration board but can "find fact" with operations, meaning that it can determine a view on how operations are being conducted; that "fact" may be accepted in any further tribunal or ruling. Moreover, the PEB can assist in resolving any contentious issues through dialogue and facilitation. The PEB does not decide or make rules, but the governments generally respect its recommendations. The PEB created the PEB Engineering Committee to assess technical elements of CRT operations.

See *Columbia Basin Case Study* in Altingoz et al. 2018.

BOX 4.73. Joint Committee Review under the Farakka Treaty

The 1996 Treaty on Sharing of the Ganges Waters at Farakka established a Joint Committee (comprising an equal number of representatives from both countries and answerable to the previously established Indo-Bangladesh Joint Rivers Commission). It is responsible for examining any difficulty arising out of treaty implementation. Under the Treaty, a dispute between the countries is to be referred to the "Indo-Bangladesh Joint Rivers Commission" if the Joint Committee is unable to resolve it. If there is disagreement on adjustments following a review, India shall release "water at a rate not less than 90 percent of Bangladesh's share according to the formula [...] until such time as mutually agreed flows are decided upon."

See *1996 Treaty on Sharing of the Ganges Waters at Farakka between Bangladesh and India* at: http://extwprlegs1.fao.org/docs/pdf/bi-17351.pdf.

BOX 4.74. Permanent Indus Commission Procedures for Dispute Settlement

The Indus Waters Treaty (IWT) sets procedures for the settlement of differences and disputes. Article IX, "Settlement of Differences and Disputes," provides that the Permanent Indus Commission first examines any question concerning the interpretation or application of the Treaty.

See *1960 Indus Waters Treaty* at: http://siteresources.worldbank.org/INTSOUTHASIA/Resources/223497-1105737253588/IndusWatersTreaty1960.pdf.

BOX 4.75. Arbitral Procedures for the Lesotho Highlands Water Project

Under Article 16 of the 1986 Treaty pertaining to the Utilization of the Waters of the Senqu/Orange River System, the project's implementing institutions, Lesotho Highlands Development Authority (LHDA), the Trans-Caledon Tunnel Authority (TCTA), and Lesotho Highlands Water Commission (LHWC) "shall pay due regard to the overriding consideration that any dispute shall be resolved in a spirit of conciliation and that any impairment of the implementation, operation, and maintenance of the Project shall be avoided." There are four levels of dispute resolution under the Lesotho Highlands Water Project (LHWP), two of which are internal. In the event of a dispute arising, LHDA or TCTA may request the LHWC to conduct and present an investigation. The LHWC may recommend the proper action to be taken at the end of its investigation or may recommend recourse to more formal procedures. The second dispute resolution level is a more formal meeting among the three institutions backed by a report prepared by LHDA and/or TCTA, or possibly by LHWC. Informal discussions among the institutions have tended to enable agreements by consensus. Third, if a dispute is not resolved by means of the above actions, it shall be made the subject of negotiation between the governments. If negotiation does not resolve the dispute, an Arbitral Tribunal is called on to issue a final and binding decision. An Arbitral Tribunal would comprise three persons with legal background, one appointed by each of the two countries and the third appointed by the other two selected arbitrators. Only two cases have gone beyond the second dispute-resolution level.

See *Treaty on the Lesotho Highlands Water Project Between the Government of the Kingdom of Lesotho and the Government of the Republic of South Africa* at: http://www.fao.org/docrep/w7414b/w7414b0w.htm.

Differing levels of dispute resolution exist across successful transboundary agreements but almost all culminate in some binding decision process. Generally, the parties pay for the cost of the process and the final decision is considered an international obligation of the states involved. Noncompliance with a final decision would not extinguish the obligation and the decision could be subject to diplomatic, economic, and financial consequences.

As mentioned in the description of the arbitration tool, dispute settlement frequently involves third parties who are asked to participate as neutrals. This case and other Third-Party involvement in dispute settlement procedures is described in more detail under Third-Party Engagement Tools in chapter 5.

Notes

1. See Lake Victoria Fisheries Commission portal at: http://www.fao.org/fishery/rfb/lvfo/en.
2. See ACTO portal at: http://otca.info/portal/.

Brahmaputra River Basin. © Jason Yu/iStock.

Chapter 5
Third-Party Engagement Tools

In addition to the tools that have been successfully employed directly between and by countries to manage transboundary water resources in a coordinated manner to achieve mutual benefits, third parties can offer a set of tools and services to client countries. Countries may request the involvement of partners for technical advice, to close financing gaps, for co-investment, or to facilitate coordination with other riparian countries. Requests may also include support for the promotion of compliance with international principles of transboundary water resources management and with specific agreements concluded with other riparian countries. Typical third parties assisting with transboundary water resources management are bilateral and multilateral donor agencies, international financial institutions (IFIs), private sector entities, and civil society organizations.

Third parties can bring multiple services to the table, including know-how and additional financial resources. Third-Party involvement can promote compliance by providing "weight of presence." The presence of a neutral party can create space for dialogue, helping with the identification of benefits and reducing the risk of harmful action by involved countries, for instance in situations where such risk exists based on a pure "national-action rationale." Their involvement can serve to encourage compliance and bring impartiality to monitoring implementation.

5.1 Identification of Opportunities and Risks Tools

Technical assistance (TA) brings in expertise from the outside for transfer of knowledge and skills. TA can provide wide-ranging knowledge and skills to identify

development opportunities and projects and their related impacts, prepare basin plans, or help countries build accountable and efficient institutions to sustainably manage their shared water resources.

Development partners can help countries to "do better for less" by bringing global or other experience to the table. TA providers can assist in improving implementation efficiency, effectiveness and sustainability. TA can include financing of experts that can provide impartial advice, data and analysis to shape new policies and programs. It can be provided directly by third parties or third parties can provide finance to countries so they can engage technical experts for their needs. The contributions that can be made through TA tools are grouped here under the following four subcategories: (a) Neutral Knowledge Provision; (b) Capacity Building; (c) Financing Cooperation; and (d) Facilitation/Dialogue Processes.

5.1.1 Neutral Knowledge Provision

Third-Party TA providers not only bring new knowledge or global experience; when they come in as advisers they can be valuable in providing a neutral, trusted knowledge base. Third parties can support the preparation of new studies or updates of old studies that identify basin-wide biophysical, economic, environmental, and social characteristics; or provide modeling expertise to examine various development scenarios, including, for instance, future water availability, use, and expected demand and supply, and changing features of a basin, as well as the cumulative impacts of investments, land use strategies, and impacts of climate variability and change. Neutral knowledge provision tools include:

- ***Data and Information Provision (T70)*** to provide neutral and trusted/reliable data to countries and verify data integrity (e.g., International Union for the Conservation of Nature's [IUCN's] Building River Dialogue and Governance [BRIDGE] program, which, among others, develops and manages an information and data portal/platform for the 3S Basins in the Mekong Region—**box 5.1**).
- ***Experts to Conduct Assessments and Studies* (T71)**, which can provide cutting edge advice on new projects or development plans and communicate best practices from the international experience. Development agencies and other actors frequently provide direct advice or engage experts to conduct studies to assist countries with basin development questions. Many of these assessments and studies are being made publicly accessible so that a wider group of stakeholders can benefit from the knowledge and insights gained through these assessments (e.g., World Bank Open Knowledge Repository [OKR]—**box 5.2**).
- ***Just in Time Notes, Analysis, and Advice* (T72)** to assist countries with on-demand analysis and recommendations to achieve policy reform or other change, or for transboundary dialogue or negotiations.

5.1.2 Capacity Building

Human resources development and institutional capacity building can focus on development of technical knowledge for sound river basin management and understanding, negotiations skills, or project implementation skills (financial management, procurement, etc.). Experience demonstrates that lack of cooperation at the basin-level is often due to limited capacity and, therefore, reluctance to engage with potentially more skilled neighboring countries. Capacity building can help "level the playing field," including through training on transboundary water governance and hydro-diplomacy to enable more effective and balanced negotiations; technical capacity building on hydrometeorological instrumentation, river basin modeling, and water quality monitoring and analysis, and so forth. This can be delivered through various tools:

- ***Tailored Workshops and Training Programs* (T73)** to provide intensive technical learning on specific topics. Such programs could include participation from one or multiple basin countries. The latter can, as a side effect, facilitate the building of trust and result

BOX 5.1. International Union for the Conservation of Nature Building River Dialogue and Governance Program

Building River Dialogue and Governance (BRIDGE) is an International Union for the Conservation of Nature (IUCN) initiative (supported by the Swiss Agency for Development and Cooperation) that focuses on enhancing water governance capacities in nine transboundary basins in three regions across the globe. Emphasizing stakeholder learnings and consensus building, BRIDGE aims to catalyze transboundary cooperation for equitable and sustainable water resources development.

In the Mekong region, BRIDGE activities are carried out in the Sekong, Sesan, and Sre Pok River Basins. Each activity is tailored to meet three main objectives: (a) establishing frameworks for institutional arrangements and trans-boundary collaborations; (b) enriching and fortifying knowledge sharing platforms; and (c) enhancing leadership and governance capacities. A key component of the 3S is the facilitation of dialogue and technical exchanges through the use of data and information derived from the basin. As part of these activities, a Sekong Basin Profile study was developed, including water quality sampling and analysis and results from field visits on the Sekong River Basin. Because water quality has been a crucial issue in the area due to the impacts of development, having reliable water quality data was critical for negotiation with provincial and national line agencies. The study also captured the demographic, economic, and political characteristics of the basin, making data and information available for officials and stakeholders. Regionally, BRIDGE facilitated coordination with the Centre for Development and Environment to source GIS maps for Sekong Basin Profile, leading to the development of working maps incorporating GIS layers at provincial and district scales. These maps have been made available through a 3S basin website developed and managed by BRIDGE. The site focuses on data and information, linking project documents and 3S basin data to provincial, national, and regional stakeholders.

See *BRIDGE* portal at: http://www.3sbasin.org/.

BOX 5.2. World Bank Open Knowledge Repository

The World Bank is the largest single source of development knowledge. The Open Knowledge Repository (OKR) is the World Bank's open access repository for its research outputs and knowledge products. The OKR now allows users to quickly access World Bank research and knowledge products according to the Global Practices and Cross-Cutting Solution Areas. Through the OKR, the World Bank collects, disseminates, and permanently preserves its intellectual property in digital form. The OKR contains more than 16,000 research and knowledge products including published books, editions of the World Development Report, Policy Research Working Papers, Economic and Sector Work studies, journal articles, and independent evaluation studies.

See *OKR* portal at: https://openknowledge.worldbank.org/.

in a semidialogue process, helping countries identify and work through their common and diverging interests (e.g., Joint Rivers Commission [JRC], Bangladesh Capacity Strengthening Program—**box 5.3;** and Capacity Building for Cooperation on Dam Safety for the Kyrgyz Republic and Kazakhstan [United Nations Economic Commission for Europe {UNECE}]—**box 5.4**).

- ***Twinning*** **(T74)** is a process that pairs an organizational entity with a similar but more mature/experienced ("twin") entity in another country to transfer

BOX 5.3. Joint Rivers Commission, Bangladesh Capacity Strengthening Program

In February 2015, the World Bank received a request from the Ministry of Water Resources, Bangladesh, for training of officials from the Joint Rivers Commission (JRC), Bangladesh, and other government ministries, in transboundary waters governance and hydrodiplomacy to build professional and institutional capacity to better work with its Brahmaputra and Ganges River co-riparian countries. In response to this request, the World Bank's South Asia Water Initiative (SAWI) supported the government in designing a two-year capacity strengthening program that would see government officials attend external trainings at international institutions. Participants were nominated by the participating government agencies based on a match between technical and decision-making position and the scope of the training.

See *SAWI* portal at: http://www.worldbank.org/en/aprograms/sawi.

BOX 5.4. Capacity Building for Cooperation on Dam Safety for the Kyrgyz Republic and Kazakhstan

In Central Asia, concern over the safety of more than 100 large dams and other water control facilities, located mostly on transboundary rivers, led to a United Nations Economic Commission for Europe (UNECE) project called "Dam safety in Central Asia: capacity building for regional cooperation." The project aimed to prompt the countries concerned, first, to consider setting up or revising national dam safety regulatory frameworks to achieve their harmonization, and second, to pursue regional cooperation for information exchange and notification in case of accidents or emergency situations with dams." Through the expertise provided by this project, the Kyrgyz Republic included regulations on emergencies and dam safety in its Water Code and Kazakhstan amended its Water Code to include issues of dam safety. Currently, the project is in its third phase and focuses on issues such as (a) training on the safe operation of hydro-technical installations: capacity building of officials and experts as well as of support to development of national training programs; and (b) regional cooperation: support to development of harmonized technical documentation, exchange of relevant data and information, early warning systems to ensure preparedness in the case of increased risks for accidents and others.

See *Capacity Building for Cooperation on Dam Safety in Central Asia* article at: https://www.unece.org/fileadmin/DAM/publications/oes/WaterSeriesNo.5_E.pdf.

relevant operational knowledge, including managerial, financial, and technical skills and systems. Twinning can help organizations be more strategic in their initiatives as well as in use of funds and staff (e.g., Global Environment Facility [GEF] IW:LEARN project twinning program—**box 5.5**).

- ***Study Tours* (T75)** are exposure visits to learn from good practice elsewhere. They can be used to gain ideas on how to address specific basin development challenges. Participants can include officials and/or technical specialists from single or multiple technical sectors, ministries, or countries sharing a basin. Tours can showcase good practices in aspects of basin management and can also facilitate participant dialogue to identify areas of collaboration (e.g., South Asia Water Initiative [SAWI] study tour to the Yellow River in China—**box 5.6**).

BOX 5.5. Global Environment Facility Twinning Program

The Global Environment Facility's (GEF) IW:LEARN project has facilitated about 30 twinnings involving 156 beneficiaries from 36 GEF projects. Twinnings have successfully built capacity of project and government staff to achieve improved project implementation and results, natural resource management, and higher success of project sustainability. For example, a 2013 survey of GEF IW:LEARN found that 75 percent of GEF project managers identified twinnings as a key tool in helping them overcome project management barriers.

See *GEF IW:LEARN Twinning* portal at: http://iwlearn.net/learning/twinning/how-to.

BOX 5.6. South Asia Water Initiative Study Tour to the Yellow River

Technical specialists from Brahmaputra Basin riparian countries, Bangladesh, Bhutan, and India, and Myanmar participated in a one-week study tour to the Yellow River in China in April 2014 to witness a successful approach to a basin-level IWRM program. The similarity of management challenges between the Brahmaputra Basin and the Yellow River Basin offered a valuable opportunity for learning on regional cooperation in flood and sediment management, hydropower, and water allocation. The tour facilitated better understanding of the economic benefits of improved water resources management and the processes to realize them. The participants visited the Yellow River Water Resources Commission in Zhengzhou City and the Xiaolangdi Multipurpose Dam, and held meetings with various officials from the Ministry of Water Resources in Beijing. Lessons for the Brahmaputra context included: achievements in water resources management in China are based on robust policies and institutions; integrated measures for water resources management and regulation are needed to achieve sustainable water resources; watershed management with social and economic incentives is essential for basin-wide management; Yellow River flood management required hard and soft investments, and hard infrastructure is coupled with basin-wide information and technology to improve the effectiveness of flood management.

See *Managing Brahmaputra: Lessons from the Yellow River* report at: http://documents.worldbank.org/curated/en/831641467990347830/pdf/103356-BRI-China-Study-Tour-Net-Story-PUBLIC.pdf.

5.1.3 Financing Cooperation

In addition to membership contributions, multiple joint basin management mechanisms have been established with or partially rely on grant funding from development partners for their activities. These resources are made available either directly to the organization or indirectly, when their use is administered by the development partner. Tools for Third-Party finance include:

- ***Seed Financing for Joint Management Mechanisms*** **(T76)** is provided by development agencies or civil society organizations to assist with the establishment of joint mechanisms. These funds are typically administered by bilateral partners to provide TA until a joint management mechanism is set up with legal personality to administer funds or to provide institutional capacity building. Financing can be provided for anything from office furniture to staff training and operational expenses during the initial phase until the organization is in the position to collect and administer membership fees from the countries (e.g., Seed Financing for Permanent Okavango River Basin Commission [OKACOM]—**box 5.7**).
- ***Recipient-Executed Grants*** **(T77)** are provided directly to basin management institutions for their administration. They can be provided to finance basin-management-related activities, such as the preparation of basin plans or basin management models, as well as to support capacity building and institutional strengthening. Bilateral and multilateral development agencies and international financial institutions typically provide such grant financing[1] (e.g., Nile Basin Initiative [NBI] for the Nile Cooperation for Results [NCORE] Project—**box 5.8**).
- ***Multidonor Trust Funded Programs*** **(T78)** to promote cooperation and integrated management of transboundary water resources exist for multiple regions and at the global level (i.e., International Waters window of the GEF). They have become an important grant funding source for RBOs and also for the financing of transboundary water management projects. These programs pool the funds from multiple sources (bilateral and multilateral donors, foundations, and private sector) and coordinate the interests of partners for larger impact. Transaction costs are lowered for river basin agencies because they deal with a single point of contact under a common administrative and reporting framework (e.g., Cooperation on International Waters in Africa [CIWA]; SAWI; Central Asia Energy and Water Development Program [CAEWDP]; African

BOX 5.7. Seed Financing for Permanent Okavango River Basin Commission

Permanent Okavango River Basin Commission (OKACOM) signed an agreement with the Government of Sweden whereby Sweden pledged to provide US$2.2 million to help establish the OKACOM Secretariat and to fund its first three years of operation. Through the Swedish International Development Agency (SIDA), Sweden also supported the activities of the Secretariat for further years. This funding would decrease as OKACOM Member State funding increased over that time period toward financial autonomy and sustainability.

See *SIDA's Support to OKACOM* article at: http://www.okacom.org/okacoms-work/partners-and-projects/partners/international-cooperating-partners/sida/sida-and-okacom.

BOX 5.8. Nile Cooperation for Results Project

The Nile River Basin is a vital natural resource and economic lifeline for its 237 million inhabitants, in eleven riparian countries (Burundi, the Democratic Republic of Congo [DRC], the Arab Republic of Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Republic of South Sudan, Sudan, Tanzania, and Uganda). The basin is characterized by a largely untapped potential for development, but with uneven rates of poverty and economic growth. Four of the Nile riparian countries are among the world's ten poorest, with per capita incomes in the range of US$100–200 per year.

Each Nile riparian country has ambitious national development plans for poverty alleviation that encompass development of the river's resources. If unilateral plans are implemented without consideration of the larger river basin context, there is a risk that some of the national investments in water-related sectors could be suboptimal, harm neighboring states, or foreclose future development opportunities. Conversely, coordinated development and management of joint infrastructure could increase the returns on investment in the basin.

Recognizing the need for a coordinated approach to basin-wide planning and development, riparian countries formed the Nile Basin Initiative (NBI) in 1999 as an intergovernmental entity committed to fostering cooperation, water resources management and water resources development. The World Bank supported the establishment of the NBI and the two related sub-basin organizations, the Eastern Nile Technical Regional Office (ENTRO) and the Nile Equatorial Lakes Subsidiary Action Plan Coordination Unit initially with seed financing and later through recipient-executed institutional development grants since 1999. As a result, the NBI has grown to an established regional institution. Participating countries have established a norm of jointly evaluating and approving the preparation of projects of transboundary significance identified by the NBI. Since 2013, with support from the Nile Cooperation for Results (NCORE), the NBI pivoted its focus from institutional strengthening towards consolidation and delivery—compiling previous work and applying newly built capacity to enable stronger service delivery. The NCORE is financed through a recipient-executed grant through the Cooperation in International Waters in Africa Multidonor Trust Fund.

See *NCORE Project* at: http://projects.worldbank.org/P162304?lang=en.

Water Facility [AWF]—**box 5.9;** Nile Basin Trust Fund [NBTF]—**box 5.10;** Indus Basin Development Fund—**box 5.11**).

5.1.4 Facilitation/Dialogue Processes

The sharing and management of common pool resources, such as transboundary freshwater resources, can be challenging as it requires coordination of multiple actors. This is even more so the case in the situation that many basins are facing: one of increasing demand facing a declining trend in relative availability and quality of the resources. Countries generally move in nonlinear paths from unilateral to cooperative action. Along this process, Third-Party facilitation can support interaction and communication toward collaboration.

BOX 5.9. Multidonor Trust Funded Programs for Transboundary Waters

The Cooperation for International Waters in Africa (CIWA) is a multidonor trust fund (MDTF) administered by the World Bank and financed by Denmark, European Commission, the Netherlands, Norway, Sweden, and the United Kingdom. The Trust fund finances upstream work in African international rivers, 75 percent of which goes to four priority basins—Nile, Niger, Volta, and Zambezi.

See *CIWA* portal at: http://www.worldbank.org/en/programs/cooperation-in-international-waters-in-africa.

The South Asia Water Initiative (SAWI) promotes cooperation for integrated water resources management on the Great Himalaya River Basins among the riparian countries of the Indus, Ganges and Brahmaputra Rivers—Afghanistan, Bhutan, Bangladesh, China, India, Nepal and Pakistan. The Program and MDTF is administered by the World Bank and financed by the United Kingdom (through the Department for International Development), Australia (through the Department of Foreign Affairs and Trade) and Norway.

See *SAWI* portal at: http://www.worldbank.org/en/programs/sawi.

The Central Asia Energy and Water Development Program (CAEWDP) is an MDTF administered by the World Bank and financed by the European Commission, the Swiss State Secretariat for Economic Affairs, USAID, and DFID. The MDTF promotes an enabling environment for energy and water security at regional and national level in Central Asia, benefiting Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

See *CAEWDP* portal at: http://www.worldbank.org/en/region/eca/brief/caewdp.

The African Water Facility (AWF) is a general fund administered by the African Development Bank and led by the African Ministers' Council on Water (AMCOW). The AWF was established to mobilize resources to finance water resources development activities in Africa and has provided nearly US$130 million to more than 300 projects, of which seventeen are in transboundary basins.

See *AWF* portal at: https://www.africanwaterfacility.org/en/.

A neutral country, development agencies, or private sector sponsors can be valuable partners to facilitate dialogue and coordination. Facilitation requires the ability of a third party to organize, convene, and mediate various types of interaction at various levels of decision making (political and technical) and at different times. Usually this process is complemented by studies and TA. Third parties can contribute in various ways:

- ***Convener* (T79)** through facilitation of dialogue processes to build trust and confidence among basin countries (e.g., the Petersberg Process and application to the Drin Basin—**box 5.12**).

BOX 5.10. Nile Basin Trust Fund

The NBI was established as a transitional mechanism as a platform for dialogue and joint work, to better understand and use the common Nile Basin resources, and to harness benefits for equitable and sustainable regional economic development. In recognition of this step taken by riparian countries, in 2001, ten development partners came together to establish the Nile Basin Trust Fund (NBTF) to support pursuit of this shared vision in a coordinated manner. Canada, Denmark, the European Union, France, Finland, the Netherlands, Norway, Sweden, the United Kingdom, and the World Bank contributed US$203 million to the fund, with many additional donors providing coordinated support to the Nile countries in parallel. The NBTF was administered by the World Bank. NBTF financing helped establish the three Nile Basin institutions (Nile-SEC, ENTRO, and NELSAP-CU); it financed the implementation of the Shared Vision Program, as well as multiple other projects and basin development studies. Building on these seed funds, the countries are currently advancing regionally significant development projects in the order of US$6 billion, with $1.5 billion of the portfolio already under implementation.

See *Nile Basin Trust Fund* article at: http://www.worldbank.org/en/programs/cooperation-in-international-waters-in-africa/brief/nile-basin-trust-fund.

BOX 5.11. Indus Basin Development Fund

The World Bank was a signatory to the Indus Waters Treaty (IWT) for certain specified purposes. Article V deals with the World Bank's responsibilities to manage the Indus Basin Development Fund. The Fund was used to finance the sizeable replacement works that Pakistan needed to end its reliance on the Eastern rivers that were allocated to India for its water use. Pakistan did not have the capacity to finance these works, which included three dams, eight link canals, three barrages, and 2,500 tube wells. The 1960 Indus Basin Development Fund Agreement mobilized about US$800 million, mostly in grants from a number of partners, including Australia, Canada, Germany, New Zealand, the United Kingdom, the United States, and the World Bank (through loans), as well as contributions from India and Pakistan. (The IWT set out a schedule for India to provide a fixed financial contribution of £62,060,000, in 10 annual installments and paid to the Fund, during the transition period to help defray the costs of the replacement infrastructure.) A supplemental agreement was concluded in 1964 for additional contributions from the original participants to the Fund.

See *1960 Indus Basin Development Fund Agreement* at: https://iea.uoregon.edu/treaty-text/1960-indusbasindevelopmentfundentxt.

See *1964 Indus Basin Development Fund Supplemental Agreement* at: http://treaties.fco.gov.uk/docs/fullnames/pdf/1966/TS0068%20(1966)%20CMND-3139%201964%2031%20MARCH-8%20APRIL,%20WASHINGTON%3B%20THE%20INDUS%20BASIN%20DEVELOPMENT%20FUND%20(SUPPLEMENTAL)%20AGREEMENT%201964.PDF.

BOX 5.12. The Petersberg Process

The Petersberg Process is a German initiative which resulted from the "Petersberg Round Tables on Trans-boundary Waters," launched in March 1998 as a joint effort of the German Government and the World Bank. The first conference was held at Petersberg near Bonn, in 1998, and highlighted water as an opportunity for close regional cooperation from a global perspective. Four Round Tables facilitated an open debate on the problems of transboundary water management and the development of an integrated approach to resolving them. The issue was addressed from the perspective of development, environment, security, and economic policy. An informal circle, including ministers, senior policy makers, academics, representatives of international organizations, and NGOs outlined the problems of transboundary water management and examined regional case studies. Based on the Round Tables of Phase I, the German Ministry for the Environment, Nature Conservation and Nuclear Safety, and the World Bank decided to initiate Phase II of the Petersberg Process.

The Phase II process supported a series of complementary activities that provided a forum for transboundary water management issues in Southeastern Europe (SEE). Operationally, six types of activities constituted the formal aspects of this regional dialogue process (a coordination group, roundtable dialogues, capacity building materials, targeted workshops, information management, and partnership building). These activities constituted the first time for SEE stakeholders to engage in a systematic and sustained process of dialogue and capacity building on transboundary water resource management in their region, in particular since the emergence of new states, post-conflict reconstruction, transition to market economies, and regional EU integration processes began. The themes addressed were of broad nature (management of rivers, lakes, and groundwater; adaptation to climate variability and change; balancing multipurpose uses; stakeholder participation) and each addressed a variety of transboundary water aspects. The process contributed to building capacity of a large range of SEE stakeholders at the regional, national, and local levels regarding transboundary water resources management, through cross-fertilization of knowledge and experiences and introduction of new elements and lessons learned from outside the region. At process roundtables, stakeholders communicated their aspirations and views on challenges and necessary responses regarding TWRM in their countries and identified cooperation opportunities.

The process was influential in the preparation of the 2011 Memorandum of Understanding (MoU) for the Management of the Extended Transboundary Drin Basin, signed by the former Yugoslav Republic of Macedonia, Greece, Kosovo, and Montenegro. The Drin MoU provides the political framework for and defines the context of cooperation among the Drin Riparians.

See *Petersberg Process* article at: http://www.twrm-med.net/southeastern-europe/regional-dialogue/framework/petersberg-phase-ii-athens-declaration-process.

- ***Broker* (T80)** to serve as a bridge between countries that lack diplomatic ties or are at the minimum end of the Level of Integration dimension (see "Dimensions of Coordinated Basin Management" section in chapter 2) (e.g., World Bank brokerage of Albania and the former Yugoslav Republic of Macedonia Memorandum of Understanding [MoU] concerning the Lake Ohrid watershed).[2]
- ***Weight of Presence* (T81)**: the mere presence of influential third parties can give parties the confidence to come together to discuss and agree on difficult issues, including water sharing. Although most examples of agreements that have been concluded due to the presence of influential witnesses committing to promoting compliance through diplomatic means are peace agreements, it is conceivable that this can also happen on difficult water sharing questions (e.g., 1942 Protocol of Peace, Friendship, and Boundaries, signed by Argentina, Brazil, Chile, and the United States as witnesses, who brokered the 1995 Cenepa War Itamaraty Peace Declaration; 2000 Algiers Agreement between Ethiopia and Eritrea with AU, EU, UN, and US as witnesses).

5.2 Design of Intervention Tools

5.2.1 Neutral Knowledge Provision

*Cross-referenced with **(T70–71, 73)** and **(boxes 5.1–5.2).**

Neutral knowledge provision can be as critical during the design stage as during the indentification of opportunities stage of a basin development process. Information, TA, and expertise provided by third parties are often used by countries in the design of complex development interventions. The tools are the same as for the earlier stage of engagement; these include:

- ***Data and Information Provision* (T70)** to provide neutral and trusted/reliable data to countries and verify data integrity for the design of development interventions (e.g., IUCN's BRIDGE program, which developed and manages an information and data portal/platform for the 3S Basins in the Mekong Region—**box 5.1**).
- ***Experts to Conduct Assessments and Studies* (T71)**, which can provide cutting-edge advice on new projects, latest methodologies, and technologies and bring lessons learned from other projects they worked on in various regions (e.g., World Bank OKR—**box 5.2**).
- ***Just in Time Notes, Analysis and Advice* (T73)** to assist countries with advice on policy reform or other interventions.
- ***Oversight Experts* (T82)** to ensure neutral advice and impartiality of technical work. Experts could be used to help with or supervise the design process carried out by countries jointly; this can build trust and confidence in data and information, as well as decision making.

5.2.2 Project Finance

Basin development interventions, such as flow regulation, storage, or construction of irrigation schemes, may require large sums of money. Third parties can assist with provision of finance for construction of such infrastructure requirements. Financing can come from private or public sources. Although private financing primarily looks at profitable investments, public funds would focus on financial sustainability in the long-term to provide public services. In addition, riparian countries can turn to bilateral or international development organizations for access to finance provided on concessional terms. Concessional financing for water management is available both on considerations of achieving important human development goals by providing access to a resource that is vital for life, but also because sustainable and peaceful water and related-ecosystem management is recognized as providing a (global) public good.

The multiple tools provided by private and public third parties to finance projects related to transboundary water resources include:

- ***Grants*** **(T83)** are nonrepayable funds. They are typically provided for project finance in some of the least developed countries or countries in or emerging from conflict. They are also often used as a co-financing tool to fund institutional strengthening, policy, or sector reform alongside of infrastructure investments.
- ***Loans and credits*** **(T84)** are provided based on agreement for future repayment of the principal amount usually along with interest or other financial charges. Concessional finance in the form of loans and credits at lower-than-market rates is very often used by developing countries and transition economies to invest in transboundary basin development. A regular source of concessional finance are IFIs, such as the World Bank and regional development banks (e.g., International Bank for Reconstruction and Development [IBRD] and International Development Association [IDA] Financing Terms—**box 5.13**).
- ***Project Finance Guarantees*** **(T85)** are risk mitigation measures insuring political, loan, or payment risks in order to promote investments. In developing countries, the presence of multilateral or bilateral risk insurance brings additional comfort to investors and are often the key to making complex investments reality (e.g., World Bank Group Guarantee Mechanisms—**box 5.14**).

BOX 5.13. International Bank for Reconstruction and Development and International Development Association Financing Terms

In the World Bank, the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA)[a] offer concessional loans and credits. IBRD loans are low cost and predictable. Borrowers benefit from long maturities (up to 35 years), transparent LIBOR-based pricing, built-in hedging products[b] to manage financial risks over the life of the loan, and the ability to customize repayment schedules according to project needs or debt management requirements. IDA credits have no interest rates although there is a small service charge and a commitment fee on undisbursed balances. The repayment period for IDA credits varies from 25 to 40 years depending on the income level of the country, with a 5- to 10-year grace period. Very often, different IFIs come together and co-finance investment projects or programs with other development partners. In co-financing, expenditures from a common list are jointly financed by the co-financiers. The funds are disbursed in agreed proportions.

See *IBRD Lending Rates and Loan Charges* at: http://treasury.worldbank.org/bdm/htm/ibrd.html.

See *IDA* overview at: http://ida.worldbank.org/about/what-ida.

a. IBRD countries are those with a per capita income of minimum US$1,045. IDA countries are those with a per capita income less than US$1,045.
b. These include currency conversions and swaps, interests rate conversions and swaps, interest rate caps and collars or commodity swaps. http://treasury.worldbank.org/bdm/pdf/IFL_MajorTermsConditions_en.pdf.

BOX 5.14. World Bank Guarantee Mechanisms

The World Bank (IBRD and IDA) provides loan or payment guarantees in the context of specific investment projects. Loan guarantees provide risk mitigation to commercial lenders with respect to debt service payment defaults caused directly or indirectly by government failure to meet specific payment and/or performance obligations arising from contract, law, or regulation. Payment Guarantees provide risk mitigation to private projects or to foreign public entities with respect to payment default on non–loan-related obligations by government. All World Bank guarantees require a sovereign counter-guarantee and indemnity, comparable to the requirement of a sovereign guarantee for Bank lending to subsovereign and nonsovereign borrowers. Also under the World Bank Group, the Multilateral Investment Guarantee Agency (MIGA) provides guarantees in the form of political risk insurance for cross-border direct investments for a wide range of private sector clients. International Finance Corporation (IFC) provides credit guarantees for private sector participants as their primary clients.

See *World Bank Guarantees Program* at: http://www.worldbank.org/en/programs/guarantees-program#1.

Public-Private Partnerships (P3) **(T86)** combine the skills and resources of both the public and private sectors through sharing risks and responsibilities. They are frequently used to finance public assets or services. Financing is often a combination of equity and debt. In addition to hedging risk for a private investor, a P3 can benefit a government through private expertise for designing, building, financing, maintaining, and/or operating an investment (e.g., Financing the Nam Theun 2 Project—**box 5.15**).

5.2.3 Facilitation/Dialogue Processes

*Cross-referenced with **(T79-81)** and **(boxes 5.11 and 5.12).**

As with the identification of opportunity stage, the convening and facilitation roles played by third parties can be the key to agreement on the design of a development intervention. As with the previous phase, third parties contribute in the following ways:

- ***Convener*** **(T79)** through facilitation of design processes to facilitate decisions among basin countries (e.g., The Petersberg Process—**box 5.12**).
- ***Broker*** **(T80)** to guide the countries through the design process, ensure transparency and broker an agreement which becomes the basis for the implementation of a project (e.g., World Bank brokerage of Albania and FYR Macedonia MoU concerning the Lake Ohrid watershed).
- ***Weight of Presence*** **(T81)**: the presence of a trusted and neutral partner can become the key to country agreement on coordinated basin development interventions, such as the replacement works financed through the Indus Basin Development Fund (see **box 5.11**).
- ***Project Finance Safeguards*** **(T87)** promote country compliance with international standards and legal principles. They require, for example, the assessment of transboundary impact as part of the project environmental impact assessment. They can also be a means to initiate or facilitate riparian country discussions on projects with transboundary impact during the preparation and design stage, such as the notification requirement under Operational Policy 7.50 on International Waterways (e.g., World Bank safeguard policies and OP 7.50—**box 5.16**).

BOX 5.15. Financing the Nam Theun 2 Project

The Nam Theun 2 Project (NT2) includes the development, construction, and operation of a 1,070 MW transbasin diversion power plant on the Nam Theun River; a 450 km^2 reservoir on the Nakai Plateau in the Lao People's Democratic Republic, including a 39-meter-high dam northwest of the plateau; a powerhouse 350 meters below the plateau; a regulating pond below the powerhouse; and a 27 km channel from the regulating pond to the Xe Bang Fai River Basin, also a tributary of the Mekong River. NT2 will generate 1,070 MW of electricity, of which 93 percent will be exported to Thailand.

The project was financed through $330 million of equity and US$920 million of debt from equity loans and guarantees from Multilateral Development Banks (including the World Bank, Asian Development Bank, European Investment Bank, and the Nordic Investment Bank), export credit agencies (COFACE of France, EKN of Sweden, and GIEK of Norway), bilateral financing agencies (French Development Agency, PROPARCO, and the Export–Import Bank of Thailand), international commercial banks providing finance in hard currencies (including BNP Paribas, Crédit Agricole Indosuez, ANZ from Australia, Société Générale, Fortis Bank, and Bank of Tokyo-Mitsubishi), and Thai commercial banks providing finance in Thai baht. The Project follows a "Build Own Operate Transfer" public–private partnership framework with a concession period of 31 years (25 of which are operating years) after which the government acquires the rights to the facilities free of charge. The project was developed by the Nam Theun 2 Power Company (NTPC), which is owned by two private consortiums of shareholders: Eléctricité de France (EDF) owning 40 percent, Electricity Generating Public Company Limited of Thailand owning 35 percent, and the remaining 25 percent equity owned by the Lao PDR Holding State Enterprise. The expectation is that the government will receive between US$1.9 to US$2 billion in revenue over the first 25 years of operation until 2023, at which point it will receive full ownership rights to the project and the entirety of the revenue it creates.

The P3 was made possible through three main contracts: the shareholder agreement to establish NTPC; the concession agreement for a period of six years of construction and 25 years of operation between NPTC and the Lao PDR government; and the power purchase agreement (PPA) with Energy Generating Authority of Thailand and Electricity Du Lao. Shareholders included two private international companies (functioning as the Head Contractor and the Principal Subcontractor) and two public entities, Lao Holding State Enterprise (LHSE) from Lao PDR in charge of the revenues and ETPC from Thailand in charge of supplying the energy. LHSE, representing the government of Lao PDR, needed financing for equity participation, mainly provided through IFIs loans and grants (AFD, ADB, European Investment Bank, and the World Bank). World Bank, MIGA, and ADB guarantees were fundamental for commercial banks to invest in the project.

See *Nam Theun 2 Project Overview* at: http://www.worldbank.org/en/country/lao/brief/nam-theun-2-project-overview-and-update.

BOX 5.16. OP 7.50 Projects on International Waterways

Projects on international waterways may affect relations between the World Bank and its borrowers and between states (whether members of the World Bank or not). The World Bank recognizes that the cooperation and goodwill of riparians is essential for the efficient use and protection of the waterway. Therefore, it attaches great importance to riparians' making appropriate agreements or arrangements for these purposes for the entire waterway or any part thereof. Through this policy (OP 7.50), the World Bank ensures that the international aspects of a project on an international waterway are dealt with at the earliest possible opportunity. If such a project is proposed, the World Bank requires the beneficiary state, if it has not already done so, formally to notify the other riparians of the proposed project and its project/program details. If the prospective borrower indicates to the World Bank that it does not wish to give notification, normally the World Bank itself does so. The notification ensures that potentially affected countries are informed of planned projects in shared basins. Following notification, if the other riparians raise objections to the proposed project, the Bank in appropriate cases may appoint one or more independent experts to examine the issues in accordance with BP 7.50. Should the Bank decide to proceed with the project despite the objections of the other riparians, the Bank informs them of its decision.

The following exceptions are allowed to the Bank's requirement that the other riparian states be notified of the proposed project: (a) For any ongoing schemes, projects involving additions or alterations that require rehabilitation, construction, or other changes that in the judgment of the Bank (i) will not adversely change the quality or quantity of water flows to the other riparians; and (ii) will not be adversely affected by the other riparians' possible water use. This exception applies only to minor additions or alterations to the ongoing scheme; it does not cover works and activities that would exceed the original scheme, change its nature, or so alter or expand its scope and extent as to make it appear a new or different scheme. In case of doubt regarding the extent to which a project meets the criteria of this exception, the executive directors representing the riparians concerned are informed and given at least two months to reply. Even if projects meet the criteria of this exception, the Bank tries to secure compliance with the requirements of any agreement or arrangement between the riparians; (b) Water resource surveys and feasibility studies on or involving international waterways. However, the state proposing such activities includes in the terms of reference for the activities an examination of any potential riparian issues; and (c) Any project that relates to a tributary of an international waterway where the tributary runs exclusively in one state and the state is the lowest downstream riparian, unless there is concern that the project could cause appreciable harm to other states.

See *OP 7.50—Projects on International Waterways (Operations Manual)* at: https://policies.worldbank.org/sites/ppf3/PPFDocuments/2660090224b0825462f9.pdf.

5.3 Implementation and Compliance Tools

5.3.1 Neutral Knowledge Provision

*Cross-referenced with **(T82).**

During the implementation and compliance stage, neutral third parties can be engaged to help with independent monitoring of compliance and to assist in identifying any necessary adjustments to be made due to changes in circumstances. Two tools can be of particular importance during this stage:

- ***Data and Information Provision*** **(T70)** to provide neutral and trusted data to monitor compliance and identify opportunities for adjustments.
- ***Oversight Experts*** **(T82)** to monitor implementation, and to alert on questions of compliance and necessary adjustments.

5.3.2 Capacity Building

*Cross-referenced with **(T73–75)** and **(boxes 5.3–5.7)**

Capacity building remains an important activity for the strengthening of joint management mechanisms also during the implementation and compliance stage as there may be staff turnover or new staff is hired with expanding institutional mandates and new projects coming on board. Capacity building can be delivered in various ways:

- ***Tailored Workshops and Training Programs*** **(T73)** to provide intensive technical learning on specific topics (e.g., JRC, Bangladesh Capacity Strengthening Programs [SAWI]—**box 5.3;** and Capacity Building for Cooperation on Dam Safety for the Kyrgyz Republic and Kazakhstan [UNECE]—**box 5.7**).
- ***Twinning*** **(T74)** is a process that pairs an organizational entity with a similar but more mature/experienced ("twin") entity in another country to transfer relevant operational knowledge, including managerial, financial, and technical skills and systems. Twinning can help organizations be more strategic in their initiatives and use of funds and staff (e.g., Global Environment Facility GEF IW:LEARN project twinning program—**box 5.5**).
- ***Study Tours*** **(T75)** are exposure visits to learn from good practice elsewhere. They can be used to gain ideas on how to address specific basin development challenges. Tours can showcase good practices in aspects of basin management and facilitate participant dialogue to identify areas of collaboration (e.g., SAWI Study Tour to the Yellow River **box 5.6**).
- ***Equipment, Software, and Technology Provision*** **(T88)** to strengthen a country's ability to carry out certain basin management tasks, such as data analysis and manipulation (e.g., Third-Party equipment and technology provision to Georgia—**box 5.17**).

5.3.3 Promoting Compliance

The financial tools provided by third parties and legal agreements attached to it, can be used to promote the implementation and adherence to international agreements reached between riparian countries for the management of their shared resources. Examples of financial tools used include the following:

- ***Implementation Trust Funds*** **(T89)** have been set up to facilitate the implementation of a small number of international water agreements. The Secretariat of the 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes administers a trust fund that can fund TA to assist countries with the Convention's obligations, such as review of national laws to improve water quality standards. The Indus Basin Development Fund has been set as a multidonor trust fund (MDTF) to finance irrigation replacement works in Pakistan to implement the provisions of the Indus Waters Treaty (IWT) (see **box 5.11**).
- ***Payment and Loan Guarantees*** **(T90)** can potentially be designed such that they can be used to guarantee compliance; for example, to guarantee compliance with storage reservoir release schedules for

BOX 5.17. Equipment Provision to Georgia

The National Meteorological and Hydrological Services of Georgia (NMHS) has received assistance from multiple sources in carrying out its functions including:

(a) Beginning in 2006, the World Bank assisted the NMHS in conducting an assessment of economical efficiency of hydrometeorological provision in Georgia. This was followed by the installation of the United States weather-forecast model (WRF-EMS) for a limited area, installation of a German weather-forecast model (HRM) for a limited area (in 2007), and installation of a hydrological model (FEWS) for the Rioni River Basin in 2008.

(b) Cooperation with the World Meteorological Organization (WMO) began in the 1990s when the NMHS purchased and installed a satellite meteorological information-receiving system and a telecommunications system (MESSIR-COM). In 2003, with the WMO's support, Georgia purchased and installed an air meteorological information receiving system (SADIS). In 2008, WMO provided support for reequipping the Tbilisi Meteorological Station with modern measurement devices. WMO also provided training for more than 20 specialists.

(c) In 2003, USAID assisted the NMHS with the reequipment of two meteorological stations with modern measuring devices and rehabilitation of the stations' buildings, reequipment of seven hydrological gauges with modern measuring devices, and equipping the agency with satellite Internet (WEB-SAT). More recently, USAID has helped the NMHS develop a website, has equipped the NMHS with a portable water discharge-measuring Doppler device (2007), and has helped install a water-resources distribution simulation-model (Mike Basin 2007).

(d) The Government of Finland has also supported Georgia's efforts to reequip itself by providing for: the reequipment of seven hydrometeorological gauges with modern measuring means and 10 devices, as well as reequipping the hydrometeorological department with a portable water-discharge measuring Doppler device.

See *The Role of Hydrometeorological Services in Disaster Risk Management* report at: http://documents.worldbank.org/curated/en/960511468037565188/pdf/709420WP0P12910fHydrometerological0.pdf.

downstream hydropower production or irrigation benefits. These can be structured either as (a) loan guarantees to cover commercial lenders against payment defaults by the private sector where such payment default occurred because of noncompliance by upstream dam operators; or (b) payment guarantees to cover the private sector or other stakeholders, including countries, against such noncompliance, provided any such noncompliance can be monetized and results in a payment obligation owed by the relevant foreign public entity or a foreign government. Such guarantees are contemplated for the Nachtigal Project in Cameroon, which is located on a national river basin (**box 5.18**). Similar guarantees could also be done at the cross-border level, as the World Bank can finance a guarantee for a nonloan

BOX 5.18. Guarantee Arrangement for Lom Pangar/Nachtigal Dams

Lom Pangar Dam reservoir will unlock the energy production potential of a downstream run-of-river (ROR) dam cascade, as well as increasing the energy productivity of Edea and Song Loulou existing dams, in the Sanaga River Basin in Cameroon. The dam will store water during the wet periods and releasing it during dry periods. The reservoir will increase the guaranteed average water flow on the Sanaga River Basin from 720 m^3/s to 1,040 m^3/s year-round, thus benefiting downstream hydropower production, among other uses. ROR dams are envisioned to be developed by the industrial sector for auto consumption, under electric and water sector reforms to supply the national grid and contribute to basin management. Among these ROR dams is Nachtigal.

Lom Pangar will be financed through World Bank, Europe Investment Bank and African Development Bank concessional lending. To hedge the risks of Nachtigal and to help Cameroon mobilize private financing, the project (currently under preparation) will include payment and loan guarantees. The payment guarantees will be based on the monetization of the loss of energy production as a consequence of Lom Pangar deficient water flow regulation. Therefore, the guarantee would not only be hedging risk but also promoting compliance of the upstream Dam operating agreement.

See *Hydropower Development on the Sanaga River Technical Assistance Project at*: http://projects.worldbank.org/P157733?lang=en.

service related to government payment obligations in favor of another foreign public entity or a foreign government (e.g., a cross-border guarantee has been designed for the planned Banda Gas Project).[3] The key issue is whether the obligation being guaranteed can be monetized (e.g., calculated hydroelectricity generation loss in case of deviation from the release schedule).

- ***Financing Agreements*** **(T91)** that are concluded between the project financier and the beneficiary country can be used to include legal covenants to promote adherence to implementation standards by including disbursement conditions. For example, as a result of the World Bank's safeguards reform, environmental and social commitment plans become part of the financing agreement; these could include implementation of a project in such a way that transboundary harm is mitigated. The compliance with such plans could be made a disbursement condition of a loan promoting compliance with risk and impact mitigation plans (e.g., World Bank Safeguard Reform—**box 5.19**).
- ***Procurement Standards*** **(T92)** applied to projects financed by IFIs may include requirements that oblige the contractor to observe certain environmental, social, health, and safety standards (e.g., World Bank Procurement Reform—**box 5.20**).

5.3.4 Dispute Settlement Tools

Third parties may assume responsibilities in dispute settlement procedures, such as playing a facilitating role through mediation and conciliation or appointment of arbitrators or neutral experts (NEs). Judicial or review bodies can also be designated to intervene when differences or disputes arise. Parties may choose to submit their dispute to a Third-Party decision maker

BOX 5.19. World Bank Safeguard Reforms

On August 4, 2016, the World Bank Board of Executive Directors approved a new environmental and social framework (ESF) that substitutes former Operational Policies with ten new Environmental and Social Standards (ESS). This new reform will enter into force in early 2018. Similarly, a new reform in procurement could be used to drive improvements with environmental, social, health, and safety (ESHS). Although indirect, these tools could help facilitate compliance of basin agreements. The World Bank could hold a riparian borrower accountable to the ESS through the legal agreement, and the borrower could also promote compliance by holding the contractor accountable through work contracts.

Under the Safeguards Reform, the World Bank will require the borrower to prepare and implement projects so that the borrower meets the requirements of the new ESS.[a] This could be done through the existing borrower's ESF. The borrower's ESF could be enhanced by different measures and actions to address gaps and strengthen the framework when required in order to comply with the new ESS. These measures and actions will be part of the environmental and social commitment plan (ESCP). The ESCP will form part of the legal agreement, including, as necessary, obligations of the borrower to support the implementation of the ESCP.

See the *World Bank's ESF* at: http://www.worldbank.org/en/programs/environmental-and-social-policies-for-projects/brief/the-environmental-and-social-framework-esf.

a. http://documents.worldbank.org/curated/en/383011492423734099/pdf/114278-WP-PUBLIC-13-4-2017-11-23-38-EnvironmentalandSocialFrameworkWeb.pdf.

BOX 5.20. World Bank Procurement Reform

Environmental, social, health, and safety (ESHS) requirements will be included into the World Bank's new bidding procedures, employment requirements and contracts. More importantly, ESHS performance security will be part of works contracts. Along with other safety and labor standards, specifications shall be drawn from the Environmental Impact Assessment and Environmental and Social Management Plans. Among the practical considerations is the possibility of the employer (the borrower) to withhold payments when there is lack of compliance with the ESHS specifications.

The inclusion of Environmental and Social considerations in the legal agreement through the ESCP and the inclusion of ESHS performance securities in works contracts could also support compliance of basin agreements (although indirectly). For example, a prohibition to pollute a shared water source could be enhanced if appropriate water treatment or alternative disposal is included in the Environmental Mitigation Plan. If the borrower fails to do so, the borrower would no longer be in compliance with the legal agreement with the World Bank. The borrower, in turn, could also hold the contractors accountable through the ESHS performance security.

because it provides the certainty of a neutral, orderly, and principled dispute settlement procedure and may increase certainty that the dispute will be resolved. The steps countries can take with the engagement of third parties may include:

- ***Mediation* (T93)** involves a Third-Party mediator who conducts the negotiations between contending parties on the basis of proposals made by the mediator, which are aimed at a mutually acceptable solution.
- ***Conciliation* (T94)** is the process of settling a dispute by referring it to a commission of experts, whose task is to investigate the dispute and propose ways to resolve it by combining elements of inquiry and mediation (e.g., Mediation and Conciliation under the *Organisation pour la Mise en Valeur du fleuve Sénégal* [OMVS]—**box 5.21**).
- ***Appointment of a Neutral Expert or Expert Commission* (T95)** is particularly useful in cases where the dispute revolves around very technical issues. An NE or expert commission would be appointed by the parties or by a third party to investigate and issue a decision, which may be binding on the parties or subject to appeal (e.g., the Baglihar Difference—**box 5.22**).
- ***Reference to an Arbitration Tribunal* (T96)** or ***Independent Court* (T97)** is adopted as a tool usually only as the last resort in a multistep dispute settlement procedure. It refers the final decision to an independent third party, which decides based on law. This procedure is typically preagreed between the parties in an international agreement. However, it always remains an option and can be done also by an ad hoc joint agreement once the dispute has emerged (e.g., Arbitral Appointment in the Sava Basin—**box 5.23**; the Gabčikovo-Nagymaros Case before the International Court of Justice [ICJ]—**box 5.24**).

BOX 5.21. Mediation and Conciliation under the *Organisation pour la Mise en Valeur du fleuve Sénégal*

When differences between Member States owing to interpretation or application of the 1972 Organisation pour la Mise en Valeur du fleuve Sénégal (OMVS) Convention arise, Article 24 indicates that Member States shall first resolve them via conciliation and mediation. If the Member States cannot reach agreement, the dispute is to be submitted to the Commission of Mediation, Conciliation, and Arbitration of the Organization of African Unity (the third party). The Commission's decision can be appealed to the International Court of Justice. Article 5 of the 2002 Senegal River Water Charter reemphasizes the need to peacefully solve conflicts that arise within the Basin, and identifies the obligation to negotiate as a key water law principle for cooperation. The informal dispute resolution mechanisms under Article 24 of the OMVS Convention have been praised as particularly well-functioning.

See *OMVS Convention* at: http://www.portail-omvs.org/sites/default/files/fichierspdf/textes-de-bases-de-_lomvs.pdf.

See *Senegal River Water Charter* at: http://www.portail-omvs.org/en/presentation/eng-cadre-juridique/water-charter-senegal-river-basin.

BOX 5.22. The Baglihar Difference

In 2005, Pakistan claimed that a "difference" had arisen between India and Pakistan concerning India's construction of a run-of-river (ROR) hydropower plant on the Chenab River, the Baglihar Project, in contravention of the Indus Waters Treaty (IWT). Although the primary use of the waters of the Chenab River was allocated to Pakistan, India was allowed certain uses of the river, including ROR power plants, subject to certain conditions. Pakistan alleged that the design of the Baglihar Plant was in violation of a number of conditions and would permit India to obstruct and control the flow of the Chenab. Pakistan raised three technical objections to the design of Baglihar, relating to the dam's storage capacity, spillways, and power intake tunnels. Pakistan claimed that Baglihar did not conform to paragraph 8 of Annexure D to the IWT (Generation of Hydro-Electric Power by India on the Western Rivers): It alleged that the plant design was not based on correct, rational, and realistic estimates of maximum flood discharge at the site; the pondage exceeded twice the pondage required for firm power; and the intake for the turbines for the plant was not located at the highest level consistent with satisfactory and economical construction and operation of the plant as a ROR plant. India contended it was fully in compliance with the IWT and neither Baglihar's height nor storage capacity disqualified it under Annexure D. Following failed negotiations, the World Bank was called upon to exercise its role under the IWT with regard to appointing the neutral expert (NE) (in the absence of an agreement between the parties to appoint an NE, or the appointment of an NE by a third party agreed upon by the countries, the World Bank, in consultation with the countries, appoints the NE). The decision of the NE on all matters within the NE's competence would be final and binding. The NE directed the parties to share costs equally.

See *Baglihar Difference Expert Determination* at: http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1171996340255/BagliharSummary.pdf.

BOX 5.23. Arbitral Appointment in the Sava Basin

In the event of a dispute referred to an arbitration tribunal under the Framework Agreement on the Sava River Basin, the designated arbitrators must agree on the choice of the president of the arbitration tribunal within two months following the designation of the second arbitrator. If they are unable to reach an agreement, then each party in dispute can request from the president of the International Court of Justice (ICJ) designation of the chairman of the arbitration tribunal, within two months. Additionally, if any one of the parties has not designated its arbitrator within two months following the delivery of the notification to the secretariat of the Sava Commission, the other party can inform the president of the ICJ who shall, within two months, designate the chairman of the arbitration tribunal. After his or her appointment, the chairman of the arbitration tribunal will request the party that did not designate the arbitrator to do so within two months. If the party does not comply, the chairman will inform the president of the ICJ who shall make the appointment within two months.

See *Framework Agreement on the Sava River Basin* at: http://extwprlegs1.fao.org/docs/pdf/mul45452.pdf.

BOX 5.24. Gabčikovo-Nagymaros Case before the International Court of Justice

The Gabčikovo-Nagymaros case arose out of a treaty signed in 1977 between Hungary and Czechoslovakia concerning the construction of a system of locks on the Danube River, to be operated jointly by the parties and designed for the production of electricity, improved navigation, flood protection, and regional development. Construction began in 1978. In the face of growing domestic ecological concern and criticism, the Hungarian government suspended works on its part of the project in 1989. The Hungarian government contended that the construction of the system of locks would inflict unjustifiable environmental harm on the ecology of the Danube and its surrounding wetlands. It argued that the ecological risks of the project were unacceptable. The Slovak Republic, which succeeded Czechoslovakia as a party to the project, denied these allegations and proceeded unilaterally with a provisional solution consisting of a single barrage on its side (Variant C), which resulted in a major reduction in the flow of the Danube downstream into Hungary. As a result of this unilateral action by the Slovak Republic, Hungary decided to terminate the 1977 Treaty. Despite efforts at mediation by the Commission of the European Communities, Hungary and the Slovak Republic were unable to resolve their differences. Hungary and the Slovak Republic (which succeeded to Czechoslovakia's rights and obligations under the Treaty) executed a special agreement to refer the dispute to the International Court of Justice (ICJ) for adjudication. Three questions were submitted for resolution by the ICJ: (a) whether Hungary was entitled to suspend and subsequently abandon the works on the project; (b) whether the Slovak Republic was entitled to proceed with a provisional solution for damming the Danube River on the Slovak Republic territory; and (c) the legal effects of Hungary's notification to terminate the 1977 Treaty. The ICJ was also requested to determine the legal consequences, including the rights and obligations of the parties, arising from its judgment on these three questions. The ICJ ruled that Hungary was not entitled to suspend the project and that by doing so it was showing its unwillingness to comply with multiple provisions of the Treaty. The court found that the Slovak Republic had the right to start construction on "Variant C" but the Slovak Republic violated Hungary's international rights by putting it into operation in 1992. When "Variant C" was put into operation it violated the terms of the 1977 treaty, which was still in effect even though Hungary had sent notice of termination. The court further decided that Hungary's notification of termination of the Treaty and related instruments on the basis of ecological necessity was not a legal termination, and, consequently, the Treaty is still in force and governs the relationship between the Parties. The court did not issue any specific orders. It concluded, "Hungary and the Slovak Republic must negotiate in good faith in the light of the prevailing situation, and must take all necessary measures to ensure the achievement of the objectives of the Treaty of 1977, in accordance with such modalities as they may agree upon." The court added that the parties should take evolving international environmental norms into account, as it recognized that the project might cause environmental harm and that the Treaty required the parties to consider these norms.

See *Gabčikovo-Nagymaros Case* at: http://www.icj-cij.org/files/case-related/92/092-19970925-JUD-01-00-EN.pdf.

5.4 Coordination Frameworks

5.4.1 Engagement Frameworks Preparation and Implementation

TA can be provided by third parties to assist countries with preparing and implementing engagement frameworks, including through assistance in the drafting of legal instruments, establishing institutions or joint management mechanisms and defining rules and procedures.

- ***Co-Signatory of an Agreement*** **(T98)** taking on specific obligations agreed to between parties as a party to the agreement (e.g., the World Bank as a signatory to the IWT—**box 5.25**).
- ***Assistance for Drafting Legal Instruments*** **(T99)** with precision and incorporation of best practice provisions/clauses from international experience (e.g., United Nations Development Program [UNDP] supported a Panel of Experts [multidisciplinary committee] to negotiate a cooperative framework treaty for the management of the Nile—**box 5.26**).
- ***Assistance for Building Institutions*** **(T100)** to ensure joint mechanisms are appropriately set up, taking into account scope and mandate (e.g., UNECE, United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP] and Organization for Security and Cooperation in Europe [OSCE], along with governments of Sweden, Estonia, and the United Kingdom provided assistance to the Kyrgyz Republic and Kazakhstan to establish the commission called for under Article 4 of the 2000 Chu-Talas Agreement—**box 5.27**).
- ***Assistance for Preparing Rules and Procedures*** **(T101)** to describe operations for managing shared resources and ensuring efficient and sustainable performance of institutions (e.g., the GEF and the World Bank supported the preparation of rules and procedures for water utilization, and protocols for data/information sharing and exchange and notification/consultation for the Mekong River Commission [MRC]—**box 5.28**).

BOX 5.25. World Bank Co-Signatory to the Indus Waters Treaty

The World Bank is a signatory to the Indus Waters Treaty (IWT) for certain specified purposes. This is the only international waters treaty that is signed by a third party. The purposes for which the Bank signed the Treaty are specified in Articles V and X, and Annexures F, G, and H of the Treaty. Article V deals with the financial provisions, including the establishment and administration of the Indus Basin Development Fund. Article X deals with emergency situations that might have interfered with completion of the works funded under the Indus Basin Development Fund. Annexure F deals with the NE to be appointed to resolve differences between the two parties. Annexure G deals with the Court of Arbitration to be established to resolve disputes between them. Annexure H deals with the arrangements during the transitional period when Pakistan was discontinuing its reliance on the Eastern Rivers. The responsibilities of the World Bank under Articles V and X, and Annexure H were completed in the 1970s. The remaining responsibilities of the World Bank relate to settlement of differences and disputes under Annexures F and G.2.

See *1960 Indus Waters Treaty* at: http://siteresources.worldbank.org/INTSOUTHASIA/Resources/223497-1105737253588/IndusWatersTreaty1960.pdf.

BOX 5.26. Panel of Experts to Negotiate a Framework Treaty for the Nile

The Nile Basin countries have negotiated a cooperative framework treaty for the management of the Nile, the "Agreement on the Nile River Basin Cooperative Framework." The process, which commenced in 1997 and was initially supported by United Nations Development Program (UNDP), was prepared through a Panel of Experts, a multidisciplinary committee in which each country was represented with three members. UNDP funding supported regular meetings of the Panel of Experts from 1997 to 2000 as well as national consultations and study tours to the Mekong and the Senegal River Commissions in order to draw applicable lessons for the Nile river basin through the review of other institutional frameworks. The Panel of Experts reported regularly to the Council of Ministers of Water Affairs on the progress of the framework preparation.

See *Cooperative Framework Agreement* http://www.nilebasin.org/index.php/nbi/cooperative-framework-agreement.

See *Agreement on the Nile River Basin Cooperative Framework* at: http://www.nilebasin.org/index.php/media-center/documents-publications/30-cooperative-framework-agreement/file.

BOX 5.27. Third-Party Assistance to Establish the Chu-Talas Commission

The Republic of Kazakhstan and the Kyrgyz Republic share the waters of transboundary Central Asian rivers Chu and Talas, which provide essential resources for irrigation of agricultural lands as well as opportunities for the generation of hydropower. Because all the facilities for the rivers' regulation—dams, water reservoirs, and canals—are located upstream in the territory of the Kyrgyz Republic and Kazakhstan depends on the operation and proper maintenance of these facilities, the two countries decided to establish a legal basis for the joint operation of this infrastructure. In January 2000, the Agreement on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas was signed by Kazakhstan and the Kyrgyz Republic and subsequently ratified by their Parliaments in 2002. Under Article 5 of the Agreement, the parties committed to establish a permanent commission to determine the operation mode for water infrastructure and the share of each party in funding O&M costs. In 2003 OSCE, United Nations Economic Commission for Europe (UNECE) and UNESCAP initiated the project "Support for the Creation of a Transboundary Water Commission on the Chu and Talas Rivers between Kazakhstan and Kyrgyzstan" (Chu-Talas I) with funding from the United Kingdom, Sweden, and Estonia. The project facilitated the establishment of a bilateral Commission in 2006. In particular, the project allowed developing the Statute of the Commission. The main activities of the Chu-Talas Commission focus on (a) approval of water

box continues next page

BOX 5.27. continued

resources allocation in the Chu and Talas River Basins between Kazakhstan and the Kyrgyz Republic; (b) determination of measures to maintain water facilities of inter-State use and provide for their routine and capital repair; and (c) approval of a financing plan for the above measures. The establishment of this sustainable coordination structure, which includes a permanent secretariat as well as experts and working groups, enables joint and transparent decision making on water allocation and maintenance costs by the two parties, as well as relevant information sharing, efficient implementation of joint projects, prevention, and rapid settlement of problematic situations in the Chu and Talas River Basins.

See *Support for the Creation of a Transboundary Water Commission on the Chu and Talas Rivers Between Kazakhstan and Kyrgyzstan UNECE* final report at: https://www.unece.org/fileadmin/DAM/env/water/Chu-Talas/OSCE_Chu_Talas_Final_Report.pdf.

BOX 5.28. Global Environment Facility and World Bank Support to the Mekong River Commission

The Mekong River drains a basin area of about 795,000 km^2 in six countries: China's Yunnan Province, Myanmar, the Lao People's Democratic Republic, Thailand, Cambodia, and Vietnam. Third parties have provided support in particular to the downstream countries for coordinated management since the 1950s. The United Nations Development Program (UNDP), with strong donor involvement, brokered the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin among the Lower Mekong countries: Cambodia, Lao PDR, Thailand, and Vietnam. The Agreement governs basin planning and management; outlines requirements for notification, consultation and prior agreement for planned measures; and establishes the Mekong River Commission (MRC). The MRC is funded through contributions from the four Member Countries, and through technical and financial contributions from 13 countries, the European Union and the World Bank. One example of Third-Party TA in the basin was the support by the Global Environment Facility and the World Bank (with co-financiers Finland, Japan, and France), under the Water Utilization Project (WUP) of the MRC Secretariat. The WUP helped to develop a Decision Support Framework, tools for the joint use of the basin's resources, including robust hydrological simulation models, and Rules on Mekong Water: (a) the Rule on Notification of the riparian neighbors in case of interventions in the water system that may affect the neighbors; (b) the Rule on Sharing of Data, which now allows a more comprehensive and reliable collection and use of hydrological information; and (c) the Rule concerning the maintenance of the minimum required flow, which was changed into a Procedure after negotiations facilitated by the World Bank.

See *Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin* at: http://www.mrcmekong.org/assets/Publications/policies/agreement-Apr95.pdf.

See *Mekong River Water Utilization Project* at: http://projects.worldbank.org/P045864/mekong-river-water-utilization-project?lang=en.

Notes

1. Recipient-executed grants can also be used for other project finance purposes, including small infrastructure investments among other.
2. See Watershed Management in the Lake Ohrid Region of Albania and the former Yugoslav Republic of Macedonia article at: https://www.researchgate.net/publication/229726473_Watershed_management_in_the_Lake_Ohrid_region_of_Albania_and_Macedonia.
3. See *Banda Gas to Power Guarantee* at: http://projects.worldbank.org/P145664?lang=en.

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