

World Bank Engagement in Transboundary Waters in West Africa

Retrospective and Lessons Learned

NOVEMBER 2021

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Preface

This note looks at the World Bank's engagement in transboundary waters in West Africa¹ over the past 20 years to derive lessons that can inform and influence any future engagement in the sector. It first presents the rationale for and current status of engagement in this sector to understand the dynamics at play in transboundary waters, among riparian countries but also in terms of relevance for continued World Bank engagement. It then examines the main characteristics of the World Bank's 20-year engagement in the transboundary water sector to derive key lessons that can improve the relevance, effectiveness, and efficiency of any future engagement, and help shape its vision for the next decade, and its contribution to the Bank's broader strategy in the region.

This note is a retrospective analysis that focuses on the World Bank program. It does not aim to provide a forward look for new transboundary engagements in the region. It will inform and complement a separate, forward-looking analysis that will explore water security engagement options in West Africa in line with the Bank's current priorities and strategic orientations. It also does not aim to provide an in-depth evaluation of the broader history of transboundary cooperation in West Africa beyond the World Bank program, such as the emergence, political economy, and impact of river basin organizations, or the history of engagement and influence of other donors or regional partners.

This assessment has been financed by the Cooperation in International Waters in Africa (CIWA)² program. It is consistent with a focus on promoting cooperative management and development in transboundary waters in Africa. Such critical retrospective assessments are key to a better understanding of transboundary issues that will, in turn, inform decisions, including about future investments.

1 The United Nations defines Western Africa as the 16 countries of Benin, Burkina Faso, Cape Verde, The Gambia, Ghana, Guinea-Bissau, Côte d'Ivoire, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

2 CIWA, a multidonor trust fund managed by the World Bank, was established in 2011 in support of transboundary water resources management in Africa.

Executive Summary

A History of Cooperation in Transboundary Waters in West Africa

Transboundary waters are a critical and vulnerable resource for stability and growth in West Africa. Africa has a greater share of its area within transboundary basins or aquifers than any other continent. In West Africa, the water resources they provide are critical for socioeconomic development, in particular for food and energy security, in a region that faces structural and growing deficits in both. These resources and the systems they support are nevertheless fragile and could soon face an even bigger water security crunch, which could in turn jeopardize the region's growth and stability.

West African countries have been coordinating the management of transboundary river basins for decades. Since the early 1960s, key agreements have been made to jointly manage transboundary water, and dedicated institutions were set up for the largest transboundary basins. In the Senegal and Niger basins, those bodies evolved into stronger organizations in 1972 and 1980, respectively, to respond to the multiyear drought affecting the Sahel. Today, river basin organizations (RBOs) in West Africa have broadly similar mandates and functions. The Organization for the Development of the Senegal River Basin (Organisation pour la Mise en Valeur du Fleuve Sénégal, OMVS) has largely succeeded in establishing itself as the most effective and comprehensive RBO in Africa, while the Organization for the Development of the Gambia River Basin (Organisation pour la Mise en Valeur du fleuve Gambie, OMVG), the Lake Chad Basin Commission, and the Niger Basin Authority have had mixed results. In the case of the Lake Chad Basin, cooperation in water resources has been a challenge due in large part to the endoreic nature of the basin. The Volta Basin Authority was established in 2009 but is still in the relatively early stages of functioning and capacity development.

Twenty Years of World Bank Engagement in Transboundary Waters in West Africa

World Bank engagement in water resources management in West Africa has primarily consisted of regional projects. These were implemented through the transboundary RBOs that had for the most part been established decades earlier. Over the past 20 years, this engagement comprised 10 regional projects in four major transboundary basins, totaling \$714 million.

An initial wave of regional grants in the four basins, where successfully implemented, led to deeper World Bank involvement that showcased the benefits of transboundary cooperation. In the Senegal and Niger Basins, these grants led to the development of long-term regional lending programs that helped build institutional capacity and supported the development of large-scale infrastructure and the reversal of environmental degradation. The Bank also remains engaged with the Lake Chad Basin Commission as the lake remains a fragility hotspot and a high priority for Bank management.

Following the successful implementation of these grants, lending programs were prepared for the Senegal and Niger basins. The two programs had many similar features and, once adjusted for the number of countries in each basin, similar sizes. The first phases of the programs for the Senegal and Niger basins

financed similar types of investments, including long-term strengthening of RBOs; the development of large regional hydraulic infrastructure and improvements in the performance of existing infrastructure; and smaller-scale structural and nonstructural investments in irrigation, aquaculture, and reducing environmental degradation, among others. For the Senegal Basin, the design of the second phase (2013–22) is similar to that of the first phase, but more ambitious. For the Niger Basin, the second phase consisted of investment financing for the Kandadji Dam that is being implemented by the Niger government.

The lending programs for the Senegal and Niger basins have had a notable impact. In the Senegal Basin, 20 years of World Bank engagement with OMVS facilitated the successful integration of Guinea, home to the river’s headwaters; provided support for the development, adoption, and implementation of a Basin Master Plan and cost-sharing formula; significantly improved information sharing at the basin level; and, last but not least, contributed to the rehabilitation/modernization of 20,000 hectares of irrigated land, while reducing the prevalence of malaria and schistosomiasis. In the Niger Basin, 15 years of World Bank engagement helped develop, adopt, and implement essential tools for the shared management and development of the basin water resources (shared vision process, water charter, climate resilience plan) and also proved essential in critical infrastructure decisions, such as preventing irreversible decisions around the Fomi Dam and optimizing the planning and implementation of the Kandadji Dam through a two-stage development process.

Nonetheless, complex implementation arrangements created a number of challenges. The implementation arrangements for the initial phases of the Senegal and Niger basin programs had similar features as both programs were conceived to give OMVS and the Niger Basin Authority strong leadership over their respective regional operations, and also to strengthen their legitimacy in fulfilling some of their key mandates. Nevertheless, like most regional programs and infrastructure projects, all transboundary programs have experienced some level of implementation delays and cost overruns. These were partly driven by a volatile implementation environment and the complexity of the large portion of investments carried out by national agencies. In addition, a few activities raised specific challenges, such as dam feasibility studies and nonstructural measures (training and capacity building).

Overall, the Bank’s engagement in transboundary waters still has limitations in a number of areas. The Bank’s regional engagements and national engagements were conducted mostly independently, despite the evident need for mutual reinforcement. There has also been limited attention given to transboundary aquifers despite their potential for climate resilience. A number of other high-priority areas for the World Bank have yet to be given due attention, namely gender, fragility and conflict, and nature-based approaches, which also require a stronger cross-sectoral approach.

Lessons to Help Shape Future Engagement in Water Management in West Africa

The Bank’s historic engagement in transboundary water in West Africa is at a turning point. Learning from such a broad experience is critical to inform the Bank and should help shape any future

engagement in the sector in order to continue supporting the socioeconomic development, environmental sustainability, and political stability of the region. This work, and the lessons derived from our experience in the past two decades, is an opportunity to reevaluate our engagement in the sector and its contribution to the future of water resources management in West Africa.

The World Bank has a unique opportunity to raise its game and adjust to evolving priorities. Broader and more extensive analytical work could help make a better case for the value of transboundary water management to the socioeconomic development of the region, and to the preservation of biodiversity and sustainable management of its natural resources. A better understanding of each country's priorities and political economy could support engagement at a higher and more effective level and ensure better alignment with regional and country strategies.

Exploring new avenues of engagement should help leverage the Bank's technical breadth. More consideration could be given to sustainability issues linked to RBO governance and financing sources. Any future engagement, especially in institutional capacity building, should also better leverage the Bank's various instruments and incorporate the Bank's constantly evolving technical offerings. On the technical side, recent and emerging global technical work should be incorporated in any future engagement. For example, institutional strengthening for transboundary water management should also take place at the national level and build on water platform engagements.

A more consistent approach to risk management should help mitigate implementation difficulties. The Bank should have a clear and consistent position on its risk appetite for long-term programs and large infrastructure, especially dams, which often take years before benefits are fully achieved, beyond the life of any single project. This will help manage expectations and resources more adequately and increase incentives for leadership and proactivity, especially in a region with frequent crises. In particular, the Bank has a unique opportunity to build on lessons from the past 20 years to address specific implementation weaknesses, especially increasing the capacity of national agencies and attention to nonstructural measures.



Abbreviations

CIWA	Cooperation in International Waters in Africa
ECOWAS	Economic Community of West African States
GDP	gross domestic product
GEF	Global Environment Facility
GWh	gigawatt-hour
ha	hectare
IDA	International Development Association
LCBC	Lake Chad Basin Commission
MW	megawatt
NBA	Niger Basin Authority
OMVG	Organization for the Development of the Gambia River Basin (Organisation pour la Mise en Valeur du fleuve Gambie)
OMVS	Organization for the Development of the Senegal River Basin (Organisation pour la Mise en Valeur du Fleuve Sénégal)
RBO	river basin organization
VBA	Volta Basin Authority

A History of Cooperation in Transboundary Waters in West Africa

A Critical Resource for Stability and Growth

Africa has a larger share of its area within transboundary basins or aquifers than any other continent. Sixty-two percent of Africa's land surface lies within transboundary basins (Wolf et al. 1999), while globally the share is 45 percent. In addition, transboundary aquifers cover 40 percent of the continent, sitting under almost 400 million people, a third of its population. A total of 68 transboundary basins—out of 310 worldwide—are on the African continent (McCracken and Wolf 2019). In West Africa, there are 28 transboundary basins; the larger ones being the Senegal River, Niger River, Lake Chad, Volta River, and Gambia River basins (table 1). Furthermore, each country on the African continent has at least one transboundary river, with 41 countries having two or more, and 15 countries having five or more, while only two do not have any known transboundary aquifers (Sierra Leone and Equatorial Guinea). The countries with the most transboundary rivers are in West and Central Africa: Guinea has 19 transboundary rivers, including the Senegal and Niger rivers, and Côte d'Ivoire has nine, including the Niger and Volta rivers. The main surface water resources of Africa lie in its many major transboundary river basins (Rangeley et al. 1994).

West Africa's socioeconomic development depends highly on the water resources these transboundary basins and aquifers provide. The Senegal river system, supplying more than 40 percent of the Dakar Metropolis water supply (and up to 60 percent under future investment plans) and most of the country's irrigated area and mining industries, is critical to 40–60 percent of Senegal's gross domestic product (GDP) (World Bank 2020), while the Niger River is estimated to contribute, depending on the country considered, between 20 and 50 percent of national GDP in its basin (BRL 2007). Transboundary water is the main source of potable water for most rapidly growing metropolises in West Africa (i.e., Dakar, Nouakchott, Bamako, Niamey, Abuja, N'Djamena, and Banjul), and many smaller towns and villages. Therefore, it is fundamental to the health and well-being of most of the region's population, and also to the many services and industries that rely on water utilities for doing business. As such, transboundary water in West Africa is key to job security, particularly in growing urban centers.

Transboundary water is also critical to food and energy security, in a region that faces structural and growing deficits in both. Transboundary rivers are responsible for practically all hydropower generation in West Africa. With only 17 percent of its 23,500 megawatt (MW) potential developed to date, there is room for expansion. For instance, only 13 percent of the Niger River's hydropower capacity of 15,000 MW is developed,³ as are 7 percent of the Senegal basin's 6,000 MW capacity (Laval University 2016)⁴ and 70 percent of the Volta basin's 2,325 MW capacity (World Bank 2015a) (see Senegal River basin in

³ Not fully exploited, it produces on average 6,500 gigawatt-hours (GWh)/year when it could produce up to 30,000 GWh/year (Haut Commissariat à l'Amenagement de la Vallée du Niger 2008).

⁴ The Manantali Dam's installed capacity is 200 MW (producing ~800 GWh/year) and the Felou run of the river's is 60 MW. The Gouina Dam—nearly completed—has a capacity of 140 MW and is expected to produce around 600 GWh/year. See appendix B for more details.

appendix A and Niger River basin in appendix B). Generated hydropower is exported through the West African Power Pool, hence electricity produced in one country in the basin often benefits other countries in the same basin and increasingly countries beyond the basin itself. For example, most electricity generated in the Volta basin is produced in Ghana, and is benefitting all countries in the basin, except for Mali. All installed hydropower generation in the Senegal basin is in Mali and shared with Senegal and Mauritania. The region's transboundary hydrosystems are also key to regional food security, providing water for flood recession agriculture and pastures, irrigation, drinking water for livestock, fishing, and aquaculture (see more on the Lake Chad basin in appendix C). There is also significant potential for irrigation development from transboundary rivers and aquifers in the region, which could contribute to stabilizing and increasing food production to respond to a rapidly growing food demand, in a context where rainfed and flood recession agriculture, which are the dominant production models, face significant challenges due to increasing rainfall variability and uncertainty.⁵ It is estimated that about 20 percent of the Sahelian basin's irrigation potential is developed,⁶ while this figure is 60 percent in the Senegal basin. While the scope for irrigation development from transboundary groundwater is unknown, it is considered significant.

West African transboundary sociohydrologic systems⁷ are nevertheless fragile. Widespread poverty, conflict, and violence make West Africa one of the most vulnerable regions in the world, and most exposed to shocks. In 10 out of 15 countries, the average poverty rate is above 40 percent.⁸ Eight countries (Burkina Faso, Chad, Mali, Niger, Nigeria, The Gambia, Guinea-Bissau, and Liberia) are on the World Bank's fragile and conflict-affected situations list, while more than 6 million people are displaced in the region, and millions more are unable to find work. The fragile and increasingly degraded hydrological and ecological states of the transboundary basins exacerbate these vulnerabilities. Since 1975, West Africa has lost 30 percent of the land covered by natural vegetation, which roughly corresponds to the increase in the cultivated area that more than doubled over the same period. Agriculture is expanding into increasingly marginal dry land or pastureland, and multiyear fallow periods are being shortened—lowering average productivity, increasing vulnerability to climate shocks, and fueling tensions over access to natural resources between farmers, between farmers and herders, and between herders. This, in turn, contributes to increased runoff, erosion, and riverbed sedimentation. Increases in runoff have led to a decrease in soil water retention, groundwater recharge, and river flows during the dry seasons—exacerbating the effects of droughts and dry spells and fueling tensions over access to water. With higher runoff and more sedimentation in riverbeds, flood events have become more frequent and extreme. Higher population densities along the riverbanks and more settlements in flood-prone areas are further increasing flood damages.

5 According to FAO AQUASTAT, out of the 75.5 million ha of arable land in West Africa, only 1.2 percent (917,000 ha) is developed for irrigation, and 0.8 percent (635,000 ha) is used effectively. Future developments of irrigation will largely depend on transboundary waters, both surface and groundwater.

6 Maybe up to around a third in the Niger basin (Van Der Wijngaart et al. 2019).

7 *Sociohydrologic systems* are systems in which the social, economic, and hydrologic subsystems are causally linked (Mohorjy 1989).

8 Poverty headcount ratio at \$1.90 a day (2011 PPP) (% population).

These already vulnerable transboundary systems could soon face an even bigger water security crunch, which could in turn jeopardize the region's growth and stability. Water demand in the region is increasing sharply due to rapid population growth and rising temperature. West Africa is experiencing the highest population growth rates in the world: its population multiplied fourfold in the past 50 years and is expected to double in the next 20 years. Meeting the increasing demand for potable water, food, energy, and jobs will, to a large extent, depend on water resources lying in the transboundary basins and aquifers. At the same time, the region is also subject to increases in temperature that are above the world average.⁹ Water availability is expected to decrease in most parts of West Africa as a result of increased evaporation and changes in rainfall patterns. Droughts and floods are expected to further intensify. These trends are likely to exacerbate the degradation of natural resources. As a result, increased water scarcity along with the interdependency between upstream and downstream countries, extreme hydrological events, and water contamination will also have larger cross-country spillover effects. These developments are likely to put poverty alleviation and progress toward reaching the Sustainable Development Goals at risk. Moreover, as these effects intensify, the risk of cross-border tensions and conflicts rises, especially as forcibly displaced people and refugees increase pressure on already scarce water resources in host communities.

A Rich History of Cooperation in Shared Resources

West African countries have been coordinating the management of transboundary river basins for decades. Since the early 1960s, key agreements have been made to jointly manage transboundary water, and dedicated river basin organizations (RBOs) were set up for the largest transboundary basins. These include the Lake Chad Basin Commission (LCBC), the Niger Basin Authority (NBA), the Organization for the Development of the Senegal River Basin (Organisation pour la Mise en Valeur du Fleuve Sénégal, OMVS), the Organization for the Development of the Gambia River Basin (Organisation pour la Mise en Valeur du fleuve Gambie, OMVG), and the Volta Basin Authority (VBA) (see table 1). In the Lake Chad, Niger River, and Senegal River basins, transboundary cooperation bodies were established in the 1960s, as newly independent countries were eager to promote economic cooperation around the sustainable development of the basins' natural resources. In the Volta River basin, VBA was established much later in 2009,¹⁰ with the support of the Economic Community of West African States (ECOWAS), whose mandate calls for promoting integrated water resources management and setting-up of transboundary RBOs. ECOWAS is further supporting the establishment of transboundary organizations in smaller basins, such as the Mono Basin between Togo and Benin; the Comoé-Bia-Tano between Mali, Burkina Faso, Côte d'Ivoire, and Ghana; and the Cavally-Sesto-Sassandra Basins between Côte d'Ivoire, Liberia, and Guinea.

⁹ Since the 1980s, West Africa has experienced an average temperature increase of up to 0.5°C per decade, higher than in the rest of the world where the average increase since the 1980s has been 0.18°C. With global warming, West Africa is projected to have a continuous and stronger warming (up to 6.5°C), higher than the projected average global temperature of 1.5°C by the year 2100 (USAID 2012; Klutse, Owusu, and Bofo 2020).

¹⁰ Prior to VBA, bilateral arrangements for cooperation in water resources management (the Joint Technical Committee for Water Resources Management) had been in place between Ghana and Burkina Faso since 2004, both countries accounting for 85 percent of the basin's geographic area.

TABLE 1. Major Transboundary Basins and Organizations in West Africa

Transboundary basin and basin organization	Average annual discharge (billion m ³)	Area of hydrologically active basin (km ²)	Basin countries	Share of hydrologically active basin (%)	Characteristics of the basin
Senegal River basin <i>Organization for the Development of the Senegal River Basin (OMVS)</i>	25	437,000	Mauritania Mali Senegal Guinea	50 35 8 7	Small number of countries, all francophone, with a large share of the basin and of the main stem of the river. Heavy rainfall upstream; almost none downstream.
Niger River basin <i>Niger Basin Authority (NBA)</i>	180	1,272,814	Nigeria Mali Guinea Niger Burkina Faso Cameroon Benin Côte d'Ivoire Chad Algeria	44 21 8 7 7 7 3 2 1 <1	Large number of countries, of which four out of nine do not share the main stem of the river and are located upstream of tributaries with intermittent flows.
Lake Chad Basin <i>Lake Chad Basin Commission (LCBC)</i>	22	814,000	Cameroon Central African Republic Chad Libya Niger Nigeria	6 26 27 — 17 24	Endoreic basin with Lake Chad the outlet, and remote to capital cities (except for Chad).
Volta River Basin <i>Volta Basin Authority (VBA)</i>	390	414,000	Burkina Faso Ghana Togo Mali Benin Côte d'Ivoire	46 40 6 2 4 2	Ghana and Burkina Faso account for 86 percent of the basin area, while most rainfall and runoff occur downstream.
Gambia River Basin <i>Organization for the Development of the Gambia River Basin (OMVG)</i>	5	77,053	The Gambia Guinea Guinea-Bissau Senegal	14 15 — 71	Small number of countries, all with a large basin share, except for Guinea-Bissau. Most rainfall in upstream countries. The Gambia, downstream, depends fully on the basin's water.

Sources: Authors' compilation based on Wolf et al. (1999); Rangeley et al. (1994); BRL (2007); World Bank (2015b).

In the Senegal and Niger basins, those bodies evolved further in 1972 and 1980, respectively, as a response to the multiyear drought affecting the Sahel. At the peak of the drought, the Niger and Senegal rivers almost dried up and the need to jointly develop and manage hydraulic infrastructure to regulate river flows, by storing water in the wet season and later sharing it during the dry season, became evident to the riparian states. The drought, compounded with increasing water uses, also affected the Lake Chad basin, as the lake rapidly decreased (from 22,000 square kilometers [km²] in 1960 to 1,700 km² in 1985), raising fear that it would disappear and, as in the case of the Niger and Senegal basins, affecting tremendously the livelihoods and food security of millions of people depending on those transboundary waters.

RBOs in West Africa have broadly similar mandates and functions. As table 2 shows, the main functions are: (1) collection of water- and environment-related information, with the objective of monitoring the state of the basin water and the environment to support decision-making; (2) basin planning, which is a key tool for water allocation and protection; (3) authorization of projects with significant impact through the treatment of prior notification; (4) the construction and operation of hydraulic infrastructure projects with regional benefits to develop and share common water resources potential; and (5) the mobilization of development partners' financing for regional projects. RBOs with a water charter (OMVS, NBA, LCBC) also have stronger functions in the protection of water resources and related ecosystems, including (6) setting rules related to environmental flows, water quality standards, emission standards, and environmental impact assessments; (7) issuing water use authorization and discharge permits; and (8) additional financing tools (which OMVG also has), such as a portion of the water use fee and pollution tax collected by countries or revenues from the sale of bulk water and electricity.

OMVS has largely succeeded in establishing itself as the most comprehensive RBO in Africa. Its broad mandate was among the most innovative in the 1970s and was later adopted in water charters for other RBOs as well. Based on a solid basin planning and information system, OMVS was able to cofinance and then co-manage large common hydraulic infrastructure to regulate the river flows to develop irrigation, hydropower, potable water supply, and navigation, while striving to protect its rich ecosystems. The operation, maintenance, and a portion of debt repayment of this shared infrastructure is covered by bulk water and electricity tariffs. The balance of investments is financed by loans contracted by each member state. The rest of OMVS's activities and its administration is financed by its member states' annual contributions. However, while both bulk water and electricity tariffs are set up, and energy tariff collection is adequate, OMVS has had difficulties in collecting enough revenue from water tariffs for adequate maintenance of the Diama Dam. The resulting deferred maintenance had to be financed by member states with World Bank financing.

OMVG, LCBC, and NBA have had mixed results. OMVG is adopting a similar trajectory as OMVS, albeit in a smaller basin with less hydraulic development potential than in the Senegal Basin, and is currently mostly focused on hydropower generation. NBA and LCBC, among the first RBOs in West Africa, have yet to entirely fulfill their functions, in many cases due to diverging interests of member states that often do not act collectively. NBA and LCBC have nevertheless achieved interesting results and have mobilized substantial support from development partners, in part due to their strategic importance in a

TABLE 2. Functions of Transboundary RBOs in West Africa

Main functions	Information and knowledge	Basin planning	Infrastructure projects (studies, construction, operation and maintenance)	Setting rules	Treatment of notification; authorization of projects	Water use authorization and discharge permits	Mobilizing financing and promoting cooperation	Financing tools, besides state contributions
Niger basin (NBA)	Yes	Yes	Yes	Environmental flows, water quality standards, Environmental and Social Impact Assessments	Yes	No	Yes	Water use fees shared with member states
Senegal basin (OMVS)	Yes	Yes	Yes	Water allocation, environment flows, water quality standards	Yes	Yes (above certain volume)	Yes	Water use fees, electricity tariffs, navigation fees
Lake Chad basin (LCBC)	Yes	Yes	Yes (since 2017)	Coordination of hydraulic infrastructure operation, environmental flows, pollution discharge, and water quality standards (since 2017)	Yes	Yes (consultative, since 2017)	Yes	Water use and pollution fees shared with member states (since 2017)
Volta basin (VBA)	Yes	Yes	Yes	No	Yes	No	Yes	No
Gambia basin (OMVG)	Yes	Yes	Yes	No	Yes	No	Yes	Electricity tariff

Sources: Convention on the Status of the Volta River and the Establishment of VBA; Status of the Volta Basin; Convention on the Status of the Senegal River; Convention on the Establishment of OMVS; Senegal Water Charter; Convention on the Status of the Gambia River; Convention on the Creation of OMVG; Convention on the Creation of NBA, Water Charter of the Niger Basin; Convention on the Status of the Lake Chad and the Creation of LCBC; and Lake Chad Water Charter.

fragile and conflict-prone region. LCBC even expanded its mandate to security and development issues and has been hosting the regional joint military force against Boko Haram since 2015.

In the case of the Lake Chad Basin, cooperation in water resources has been a challenge due in large part to the endoreic nature of the basin. There is a delicate balance between the protection of the lake and the services it provides to its population with the development of the basin's water resources. Indeed, water withdrawal and water flow regulation in the basin have a very strong and direct impact on the lake size and its natural flood, and therefore on the benefits derived from it (see appendix C). This balance has been strongly affected by droughts in the 1970s and 1980s, making protection of the dwindling lake all the more difficult to reconcile with the development of the basin's water resources. At the political level, the remoteness of the lake and its population from the capital cities of all riparian countries (except Chad) and the difficulties in getting all the member states to reach an agreement on sharing water resources are a barrier to cooperation and to ensuring sustainability.

In the Volta River Basin, VBA was created 10 years ago and is still in the early stages of operationalizing its mandate. While VBA put in place a basin observatory and developed a transboundary diagnostic and action plan, data collection from member countries has nevertheless proved challenging and planning or investment has not advanced much so far. In addition, VBA has insufficient and irregular financing which hampers the hiring of some key technical staff, and members' heads of state have met only once since its creation, limiting opportunities for strategic discussions and decisions, such as the approval of the Water Charter. This situation likely reflects the early stages of institutional development for VBA, but it could also be a result of the Volta Basin's characteristics which favor bilateral rather than multilateral arrangements around concrete and relatively localized transboundary issues (see appendix D).

Twenty Years of World Bank Engagement in Transboundary Waters in West Africa

An Initial Wave of Regional Grants Had Mixed Results

The World Bank's engagement in transboundary water in West Africa started with regional grants to the four basins. During 2003–04, the Senegal, Niger, and Lake Chad basins were financed with grants from the Global Environment Facility (GEF) transboundary window.¹¹ The grants ranged from \$3 million to \$6 million and typically supported three types of activities: (1) the institutional strengthening of the river basin organization (RBO), (2) a transboundary diagnostic assessment followed by a strategic action plan, and (3) the implementation of transboundary pilot projects, in support of the strategic action plan. A similar approach was later applied in the Volta basin, after the establishment of the VBA in 2012, with grants from GEF and CIWA totaling \$10 million. These technical assistance grants allowed the World Bank to start engagement in the four largest basins in West Africa that had established RBOs and where the potential benefit of riparian cooperation in the use of shared water resources was most significant.

In the Senegal and Niger basins these grants led to deeper World Bank involvement. A programmatic approach was adopted considering the long-term efforts required for institutional capacity building, development of large-scale infrastructure, and reversal of environmental degradation. Ten-year and twelve-year lending programs were prepared in the Senegal and Niger basins, respectively, each comprising two phases, with the first phase covering five years (see next section). The programs were financed by national and regional grants from the International Development Association (IDA),¹² including a bilateral grant from the Dutch government and grants from GEF for the Senegal basin and from CIWA for the Niger basin.

In the Lake Chad and Volta basins, the implementation of these grants was more challenging for structural reasons as well as design issues. With relatively limited support from their member countries, the LCBC and the VBA struggled with project implementation. In part this was due to basin characteristics that did not favor cooperation and hampered resource mobilization for those organizations. It was also due to overly ambitious and complex project designs and implementation arrangements¹³ that both organizations struggled with, as well as difficult supervision conditions from the Bank side. It is worth noting two interesting design elements of the LCBC's activities: (1) it focused on strengthening the capacity of its five member states, recognizing that effective transboundary water management requires adequate capacities at both regional and national levels and harmonization of tools (e.g., legal framework, national plans) between both levels; and (2) it financed innovative approaches that also addressed concrete cross-border issues that required the collaboration of more than one riparian state. In the case of the

¹¹ The GEF was established in 1992.

¹² Regional programs enabled participating countries to leverage regional development and national development assistance, providing an incentive to participate.

¹³ For example, there were joint financing arrangements between the World Bank and the United Nations Development Programme, which instituted two different implementation units that initially failed to coordinate and had different hiring processes.

Volta Basin, the VBA did achieve some of the intended institutional results but on-the-ground investments that accounted for the largest part of the financing could not be completed.

In both basins, technical assistance activities saw limited proactivity from the Bank side. The relatively small size and resources of both projects and their financing entirely through trust funds, combined with the complexity and sometimes conflicting priorities of the countries involved, meant that the intensity of supervision for these activities was not achieved at the expected level during implementation. In the case of the Lake Chad basin, the project was not restructured to address design flaws that had been identified in early quality reviews. In the case of the Volta basin, the activities were restructured but only to reduce their scope and expectations, and without resolving persistent staffing issues. Finally, in the case of the Lake Chad project, political unrest in Chad exacerbated these difficulties, making staffing, travel, and communication difficult, even forcing the suspension of project activities twice.

The Bank is still strongly engaged with LCBC as Lake Chad remains a fragility hotspot and high priority for Bank management. A second attempt at World Bank engagement in Lake Chad's transboundary water management was supported by a CIWA grant in 2015. It led specifically to the preparation of the Lake Chad Development and Climate Resilient Action Plan—for presentation by its heads of state at the twenty-first session of the Conference of the Parties (COP21) in Paris to mobilize the support of development partners for its financing. It also contributed to the development of a regional IDA project that focused on addressing forced-displacement issues albeit without a water component.¹⁴ Other activities included the creation of an integrated dataset and a first attempt at groundwater systems modelling of the transboundary aquifer system. CIWA is now financing a new window of engagement in the Lake Chad basin.

A Deeper Involvement in Programmatic Lending in the Senegal and Niger Basins

Following the successful implementation of technical assistance grants, lending programs were prepared for the Senegal and Niger basins, with many similar features. A programmatic approach was adopted in both cases to support the long-term efforts required for institutional capacity building, the development of large-scale infrastructure, and the reversal of environmental degradation. The two programs were prepared at the same time, and their similarities are likely due to the two basins' common features as large, dry basins in western Africa, such as: (1) highly variable runoff as a source of droughts and floods; (2) a large potential for hydropower, irrigation, and fishery development in a context of recurrent food and energy shortages; (3) a population that is mostly poor, rural, and dependent on agriculture/livestock/fishing for its livelihood; (4) the presence of fragile and conflict-prone areas; and (5) RBOs established decades ago for common water resources' development and management.

Once adjusted for the number of countries in each basin, the programs had similar sizes and implementation arrangements. In the Senegal basin, total financing for the program was originally planned at \$266 million, with a first tranche of \$110 million and a second tranche of \$156 million (both intended to cover the

¹⁴ Activities identified in the climate resilience plan could still be included in a later phase of the program.

four member countries). In the Niger basin, total financing for the program was originally planned at \$500 million (with a first tranche of \$186 million covering five countries, and a second tranche of \$314 million intended to cover all nine countries). The implementation arrangements for the initial phases of the Senegal and Niger basin programs had similar features. Both programs were conceived to give the OMVS and the NBA strong leadership over their respective regional operations and also to strengthen their legitimacy in fulfilling some of their key mandates, such as: (1) mobilizing development partners' financing for implementing the basin master plans, and (2) financing the feasibility studies (including safeguards instruments) and even executing some key transboundary hydraulic infrastructure in the basin.

The first phases of the programs for the Senegal and Niger basins financed similar types of investments.

The programs financed four types of investments:

- (i) *Long-term strengthening of RBOs* including staff training, information, and decision-support tools (e.g., for basin planning and dam operating rules) and transboundary legal instruments to promote shared water development and management. These activities were focused on the transboundary RBOs and did not concern, in general, the strengthening of national institutions.
- (ii) *Development of large regional hydraulic infrastructure and improvements in the performance of existing infrastructure* (which represented around 50 percent of the investment cost) in order to develop the basins' significant potential in hydropower, irrigation, and navigation; secure large cities' water intakes; and protect people and assets from floods and droughts. It was initially expected that the first phase would finance the feasibility studies of new infrastructure and the rehabilitation/improvement of existing ones, while the second phase would cofinance some of the new infrastructure.
- (iii) *Smaller-scale structural and nonstructural investments* mostly focused on irrigated agriculture (including flood recession irrigation), fisheries, and aquaculture with the aim of improving livelihoods and food security, and contributing to a reduction in poverty and malnutrition. These investments generated quick, tangible benefits to the basins' stakeholders and were key to gain support from civil society and key basin stakeholders. This contributed to strengthening the legitimacy of OMVS and NBA, and keeping member countries committed to the shared development and management of basin water resources (e.g., in the Niger basin where several countries located upstream have much to contribute, especially in terms of reductions in sedimentation, flooding, and contamination).
- (iv) *Small-scale structural and nonstructural investments for reducing environmental degradation*, including watershed management, riverbank restoration, and protection. In the case of the Senegal basin, this also included mitigation measures for some of the negative impacts of the first-generation dams (i.e., Manantali and Diama), such as the significant increase in water-borne diseases (particularly malaria and schistosomiasis) and the proliferation of invasive vegetation (i.e., Typha) in the rivers and canals, which reduced their carrying capacity and fish population and provided breeding sites for vectors of water-borne diseases.

The first phase included the feasibility studies of major hydraulic infrastructure that could be considered under subsequent phases. Hydraulic infrastructure enables the development of the socioeconomic potential of those river systems, by regulating river flows, increasing the water availability in the long dry season, and reducing flooding in the short rainy season. For the member states and RBOs, as well as for civil society, financing feasibility studies under a World Bank project brings assurance that the highest technical, environmental, and social standards are applied when designing this high-reward, high-risk infrastructure, maximizing the chance to attract financing for its construction, and minimizing its social and environmental risks. The first phase of the Senegal basin program was to complete the feasibility studies of the basin's second generation of multipurpose dams (Gouina, Boureya, Koukoutamba, and Balassa), while the second phase was to cofinance the implementation of one of those dams, the rehabilitation/modernization of the Diama Dam in the maritime delta, and the feasibility studies for the navigation program. The first phase of the Niger basin program was to finance (1) the rehabilitation and modernization of the Jebba and Kanji dams and their associated power plants, and major hydro-power dams in Nigeria exporting electricity to upstream riparian states; and (2) feasibility studies up to detailed design, including environmental and social safeguards, for the Kandadji, Taoussa, Fomi, and Zunguru dams. The development of these transboundary dams in Niger, Mali, Guinea, and Nigeria was agreed upon by the heads of state as part of the 2006 basin master plan. The second phase of the Niger program was to cofinance the construction of an unspecified number of those dams.

For the Senegal basin, the design of the second phase (2013–22) is similar to the first phase, yet more ambitious. The Senegal basin's second phase of lending includes larger financing—\$229 million, more than double the financing of the first phase—and a scope to encompass additional topics such as climate change adaptation, navigation, invasive plants (i.e., typha), aquaculture (in addition to fishery), and neglected tropical diseases (in addition to malaria and schistosomiasis). The second phase, which is still ongoing, does not cofinance any of the dams for which feasibility studies were financed under the first phase. Striving to avoid inflating their national debt,¹⁵ and learning from similar experiences in the sub-region, member states expect the private sector to finance construction, recovering the investment cost through the sale of electricity. The implementation arrangements remained the same.

In the Niger basin, the second phase consisted of the financing of the Kandadji Dam, which is being implemented by the Government of Niger. The first phase of the Niger basin program built the foundation for the scaling up of the development and management of joint hydraulic infrastructure. In particular, this materialized as the Kandadji Dam project to be implemented from 2012 to 2026¹⁶ with a total World Bank financing of \$408 million.¹⁷ The Kandadji project was designed as a regional project due to its wide-ranging impacts on neighboring countries like Mali and Nigeria but implemented by Niger as a single

15 Member states borrowed for the construction of the Manantali and Diama dams in the 1980s, which represented a significant share of their national debt. The Koukoutamba and Gourbassi dams represent an even larger investment, exceeding \$1.5 billion.

16 Though originally it was closing in 2021.

17 The original financing was of \$203 million, but two additional financings in 2014 and 2020 increased the envelope by \$55 million and \$150 million, respectively.

borrower¹⁸ through the Kandadji Dam Agency, a national agency. The involvement of NBA in the Kandadji project focuses on the mobilization of an independent panel of experts when its inputs are needed by the Kandadji Dam Agency. It is also spending \$3 million under the project to conduct an institutional audit and implement some of its recommendations. Other investments originally foreseen in a larger second phase benefiting all countries in the basin (including as part of the Niger basin climate investment plan presented at COP21) and further technical assistance to NBA have not yet materialized.

An Already Notable Impact from the Senegal and Niger Lending Programs

In the Senegal basin, the World Bank's 20-year engagement with OMVS has led to notable improvements in the sustainable and shared development and management of the basin resources. First, it facilitated the successful integration of Guinea, home to the Senegal River's headwaters and thus generating most of the basin's runoff, into the OMVS structure. Second, it provided support for the development, adoption, and implementation of the basin master plan and the cost-sharing formula, both essential tools and infrastructure for the shared management and development of the basin's water resources. Third, it has significantly improved information sharing at the basin level. And last but not least, investments on the ground significantly benefitted the basin's population, for example, through increases in rural incomes and food security thanks to the rehabilitation/modernization of 20,000 hectares of irrigated land, and reductions in the prevalence of malaria and schistosomiasis in the Senegal basin, which had increased rapidly since the 1980s as a side effect of development in irrigation made possible by the construction of the Manantali and Diama dams by OMVS (see appendix A).

In the Niger basin, the World Bank's 15-year engagement has contributed to the sustainable and shared management of the basin resources, including critical infrastructure decisions. Some of these results were not planned at the project preparation stage and their benefits at times surpassed those tracked in the projects' result framework. Similar to OMVS, this engagement provided support for the development, adoption, and implementation of essential tools for the shared management and development of the basin's water resources, such as the preparation and endorsement by all Niger basin member states of the shared vision process; the preparation of the climate resilience investment plan that helped raise more than \$300 million for climate-resilient investments; the preparation and validation process of the water charter and several of its annexes, complementing the rules for transboundary water management in the basin; and the improvement of NBA's capacity for monitoring water resources, essential for making decisions around the management and development of transboundary waters. The Bank's support also proved essential in preventing irreversible decisions around the Fomi Dam, by abandoning the initial site that would have resulted in tremendous negative environmental and social impacts offsetting the expected economic benefits. It also managed to address risks related to the construction of the Kandadji Dam that would have negatively affected the basin's population (see appendix B).

¹⁸ Though it has only one borrower, the project has received both national and regional IDA funds due to its regional impacts, and is considered and accounted for as part of the regional integration portfolio.

A Challenging Implementation Environment

Like most regional programs and infrastructure projects in the region, all transboundary programs suffered from a volatile implementation environment. In a number of instances, political instability (such as in Guinea in 2008, Niger in 2010, and Mali in 2012 and after 2017), security deterioration (due to Boko Haram and more recently the Islamic State in the Sahel), and health crises (Ebola in Guinea in 2014 and 2015; and COVID-19 in 2020) that the region faced often considerably slowed down implementation of country-level interventions, sometimes even bringing them to a halt.

National agencies struggled to carry out the large portion of investments under their responsibility. They were in charge of implementing most of the in-country investments, and mostly relied on their own staff instead of dedicated implementation units. This limited their access to outside expertise, resources, and funds, which often depended on cumbersome national processes over which they had little control, and in some instances led to a high level of staff turnover. The Kandadji project also suffered important implementation delays, due to the slow capacity-building process of the government's implementation agency, issues around the quality of the work done by the firm selected for the civil works (which were not financed by the World Bank), and deterioration of the security situation in the Kandadji Dam area.

RBOs had dedicated implementation units with both a supervisory and coordinating role, which often helped improve implementation. Mostly independent, well staffed, and fully funded, these units coordinated or consolidated supervisory activities, including fiduciary and safeguards processes and carried out some investments directly. This helped considerably to improve the quality of fiduciary, safeguard, and technical aspects, both through the oversight of national agencies as well as by ensuring continuity in the case of national political instability.¹⁹ Nevertheless, in less frequent instances, this may have added an ineffective layer of review, which slowed down implementation.

Finally, significant cost overruns occurred in all aspects related to the implementation of large- and small-scale infrastructure activities. This included feasibility studies, construction, and safeguards implementation, and as a result the number or scope of many investments had to be reduced. Building on this experience in the first phase, this issue was largely addressed during the subsequent phases. Under the Niger program, the need for increased financing was linked to design issues prior to World Bank involvement, such as the estimated resettlement costs of 50,000 project-affected persons in the reservoir area, which has increased from \$130 million in 2012 when the Bank joined the project to over \$600 million today.

A Few “Soft” Activities Did Not Fully Achieve Intended Results

Nonstructural measures (training and capacity building) that help ensure the sustainability of structural investments tended to receive less attention. Under the first phase this was due to cost overruns and implementation delays, but also because in some cases their financing depended on counterpart funds.

¹⁹ When Guinea had a de facto government, the Bank suspended disbursements, but the OMVS project's activities continued in Guinea thanks to funds that OMVS advanced to the project management unit. This period lasted for more than 18 months.

In addition, the outputs and outcomes of these measures were often not clearly reflected in high-level objectives and results that tend to set project priorities. In the Senegal basin, this remains an issue, particularly for the capacity-building activities of the entities in charge of the operations and maintenance of irrigation systems and the management of typha in countries that do not have a strong experience in this area, which is key to the sustainability of investments after the World Bank financing is closed.

Measures to strengthen RBOs have had mixed success. Institutional strengthening measures were quite successful in developing and strengthening the legal framework and tools available to the RBOs. Nevertheless, more could be done to promote deep and lasting changes that would help these organizations carry out their mandate fully, such as effective and sustainable financing mechanisms and recruitment processes. For example, there could be an opportunity for NBA to assume a more prominent role in the coordinated management of large dams as the 2019 approval of the Niger basin water charter includes an annex that makes it legally binding for all member countries to coordinate the strategic, tactic, and emergency management of these large dams. Finally, a strengthened legal framework and tools for transboundary management are still partially applied and enforced, particularly at the national level for which the programs did not provide the same level of technical assistance, despite their important role in the shared management of water resources.

Limitations of the World Bank's Overall Engagement

Regional and national engagements in the water sector are not entirely coordinated, despite the evident need and opportunity for mutual reinforcement. The four main basins where the World Bank did indeed have a regional program in place and that are analyzed in this note cover almost all West and Central African countries. As RBOs derive their mandate from strong national representation, implementation of national activities under these regional programs was often conducted in close coordination with national agencies (see previous section). Nonetheless, the Bank's national portfolios in these countries are implemented and monitored mostly independently, whether it is in water supply and sanitation, environment, energy, territorial development, or any other, and irrespective of the size of the national program. This limits both the opportunity for a more strategic engagement and the opportunity to elevate issues at the appropriate level to resolve them (e.g., national capacity issues mentioned above).

Transboundary aquifers are largely absent from the World Bank's transboundary engagement, despite their high potential for resilience to climate change and food security. All four large sedimentary aquifer systems in West Africa are shared by three countries or more, and their limits do not match the limits of the transboundary watersheds, that is, the purview of the RBOs. This discrepancy and decades-long inattention to building capacity to better understand these aquifers and groundwater flows and balance has limited the opportunity to plan sustainable transboundary groundwater development and to capitalize on a climate-resilient resource that can help achieve food security, scale up industrial growth, and strengthen human capital. The risks are considerable: local overexploitation is dramatic (e.g., the Dakar water supply, oasis in the Mauritanian Adrar) and will only be exacerbated by climate change (resulting in a 10-20 percent reduced aquifer recharge). Shallow aquifers are under pressure to allow scaling up of farmer-led irrigation, and availability for urban uses is under pressure because of soil sealing resulting

in reduced recharge or contamination (e.g., nitrate contamination in N'Djamena). The Bank has recently launched a regional analytical program to identify a series of projects to address groundwater knowledge gaps, focusing on the Sahel region.

The World Bank's transboundary program included some gender-sensitive activities but lacked a systematic approach to benefit women. The active Senegal River basin program with OMVS has a few features that differentiate it from other programs such as (1) having a gender specialist within the implementation unit to work with the irrigation, fisheries, and health components to make sure that the gender dimension is taken into account during implementation; (2) including an objective of 100 hectares per country for irrigation investments exclusively targeting women cooperatives, such as the installation of irrigation equipment in small plots for growing vegetables, transformation and storage units, and capacity building for women to operate these units; and (3) systematically collecting gender-differentiated data for monitoring and evaluation. Nevertheless, these activities have suffered from delays due to the limited attention overall to capacity building, especially by the national irrigation agencies in each country, which were in charge of implementing these activities and more focused on infrastructure than on “soft” activities (gender-focused activities in agroforestry, for example, which are usually implemented by nongovernmental organizations, suffered from fewer delays). Such approaches are being progressively scaled up across regional programs, providing a unique opportunity for transboundary water programs to target women more systematically.

The World Bank has yet to capitalize on its historic and unique position within the complex political economy of transboundary waters to shift to high-priority strategic challenges. Over the past 20 years, the World Bank has established itself as a major actor in transboundary waters in West Africa, and a partner of choice for major RBOs such as OMVS and NBA. In that process, it has leveraged its strong partnerships and involvement with bilateral and multilateral donors in the region, in addition to its deep national footprint in most if not all countries in West and Central Africa. Despite its unique position within the political economy of the sector, and its significant role in strengthening RBOs over the past couple of decades and supporting major infrastructure investments, the Bank has yet to find a way to engage with RBOs at a more strategic level and in a more streamlined manner to make sure that the sector's vision for the next two decades addresses some of the most pressing challenges it is facing, such as climate change, fragility and conflict, or environmental preservation.

Conclusion: Lessons to Help Shape the World Bank's Future Engagement in Water Management in West Africa

The World Bank's historic engagement in transboundary water in West Africa is at a turning point. The Bank has only two ongoing projects in the Senegal and Niger basins. There are also two new activities focusing on the fragile and conflict-afflicted hotspots of the Sahel and Lake Chad basins, and a number of national technical cooperation activities focusing on the potential establishment of national water platforms. This assessment, and the lessons derived from the Bank's experience in the past couple of decades, is an opportunity to reevaluate its engagement in the sector and its contribution to the future of water resources management in West Africa.

It is therefore time for the World Bank to reengage in transboundary water management at scale with its clients. All transboundary water bodies create hydrological, social, and economic interdependencies between societies. They are vital for economic development and poverty reduction and provide opportunities for cooperation and promotion of regional peace and security. Transboundary basins support the incomes and livelihoods of most people in West Africa, and wetlands such as lakes and floodplains, which are shared by neighboring countries, provide invaluable ecosystem services to humans such as food provision and reduction of flood impacts and pollution. Pressures over those transboundary waters are mounting rapidly in the region due to population growth, climate change, poorly managed development, and weak governance, putting at risk all the benefits they provide. The need for cooperation in transboundary water has therefore never been as urgent. Through a combination of projects, technical cooperation, and convening services, the World Bank is uniquely placed to support efforts to improve the management of transboundary water resources and tip the balance from conflict to cooperation.

Raising Our Game

Broader and more extensive analytical work could help make a better case for the value of transboundary water management to the socioeconomic development of the region. Knowledge generation to date has focused on technical assessments of the water resources and their management, with little detailed economic analysis of the sector's influence and importance in the broader economy and across stakeholders (such as World Bank 2017). This is particularly the case for fragility, conflict, and violence (FCV) affected countries where the linkages between water and conflict are broadly understood but have yet to be analyzed in detail. Such work could lead to better integration in regional and country diagnostics and give a better sense of the importance of and entry points for further engagement in transboundary waters. For example, this could include an assessment of the dependence of different sectors on transboundary waters and the potential benefits of greater cooperation among countries. It could address strategic orientations in the region such as a transition away from high-water-use crops (similar to water-scarce countries like Jordan, where 90 percent of the production consists of fruits and

vegetables and only 10 percent is of grains). Ongoing analytical work focusing on the Sahel and Lake Chad basins are a step in that direction, provided the analysis also includes political and socioeconomic considerations.

Better understanding of country priorities and the political economy could help engage at a higher and more effective level and ensure better alignment with regional and country strategies. Any engagement in transboundary waters lies at the nexus of numerous national and sectoral priorities. A more proactive engagement in each of these moving parts, by leveraging the World Bank's unique relationships and economic partnerships with countries in the region, could help build a more solid and sustainable foundation for any future support in the sector. As these partnerships have evolved in the past 20 years, the context is ripe to revisit how supporting cooperation in transboundary waters can be a pillar of the World Bank's regional strategy for Africa and its various country diagnostics and partnership frameworks, as well as the Bank's global engagements on climate change and fragility and conflict. With a solid footing, a more systematic engagement can emerge, which can both open spaces for new strategic analytics and elevate the World Bank's partnership with national governments and regional organizations.

Basinwide RBOs have been the preferred option to foster collaboration in transboundary waters in West Africa; yet in some basins alternative avenues exist. When the water interdependency among (most) riparian users is weak—either because of the particular geography of the basin or because the transboundary stressors are not strong—alternative cooperation mechanisms should be considered that address clearly identified transboundary issues and involve the subset of concerned basin countries. For example, in the Niger basin, cluster commissions (e.g., between Niger and Nigeria) helped move on sub-basin-specific agendas and were invited to the NBA Council of Ministers. Even if a basinwide organization were to be the right cooperation mechanism, its mandate should be in line with the priority transboundary water issues and opportunities and to the extent of the countries' interest and willingness to cooperate.

A strong engagement with RBOs may have conversely boxed in the Bank, which could reexamine both its role and priorities in the sector. Though the World Bank's 20-year engagement has delivered significant results in the Senegal and Niger basins, it did not achieve equally strong results in other basins, due in large part to the complex political economy and implementation arrangements of regional approaches. The Bank should draw from these experiences to reassess its possible support to the sector and its overarching priorities, beyond its historic engagement with RBOs. It could, for example, establish itself as an integrator between RBOs, national governments, and civil society, and help develop clear articulation/sequencing of interventions at the policy, program, or project level, to make sure it is operating where it brings most value. In particular, it should have a clear vision for engaging in current or future investments, to make sure World Bank financing is leveraged to crowd-in other development partners as well as private financing whenever such options are more efficient.

The opportunity to broaden the World Bank's strategic horizon should also be a key part of any prospective analysis and a foundation for any future engagement. This could include addressing (1) issues around regional integration of power systems through the West African Power Pool and the role of RBOs; (2) issues

around environmental degradation and measures to preserve biodiversity, enhance sustainability of natural living resources, and promote climate resilience; (3) issues around security in Sahelian countries and the role of transboundary water management in enhancing socioeconomic benefits for vulnerable populations in FCV environments, thereby contributing to regional peace and security; and (4) specific considerations resulting from its past experience such as addressing the special issues of endoreic (closed) basins like Lake Chad or continuing to include smaller-scale structural and nonstructural measures to improve people's livelihoods.

Exploring New Avenues of Engagement

The World Bank should always have an eye on the long view and not shy away from sustainability considerations linked to RBO governance and financing sources. A broader comparative assessment of the governance structures, budgets, and financing mechanisms of the main RBOs in Africa should provide insights into the strength of these organizations and their viability. This is all the more important in cases where there is strong dependency on donor financing. Where appropriate, the Bank should explore new avenues to engage with member countries and press the case for independent revenue streams. For example, OMVS is the only RBO that has its own revenue stream in addition to national contributions. This relative financial independence helps OMVS maintain operations even when national contributions are suspended, whether for political or exogenous reasons.

Institutional strengthening for transboundary water management should also take place at the national level, and build on water platform engagements. To be effective, transboundary water management requires strong water resources management institutions at both regional and national levels. While the World Bank's past and ongoing engagements in transboundary waters have systematically included strengthening the regional institutions, they have not, in general, built capacity for water resources management at the national level. Moreover, water resources management has been practically absent from national portfolios. The strong role given to OMVS in the implementation of the Senegal program has worked well and is a reason for the overall success of the projects. However, in most instances, more attention should be given to activities implemented by national entities, for example, by establishing direct project implementation units reporting to the World Bank, while the regional institution maintains the function of overall monitoring and evaluation. In addition, there are now increasing opportunities to strengthen national capacity for managing shared resources through national water sector projects and water platform engagements.

Any future engagement, especially in institutional capacity building, should better leverage the World Bank's various instruments and incorporate the Bank's constantly evolving technical offerings. New programmatic lending instruments could be better suited to support transboundary cooperation because institutional strengthening, transboundary cooperation, and large-scale hydraulic infrastructure development all require long-term efforts and vision. In addition to traditional investment lending, which until now has systematically been the chosen instrument, the use of development policy lending and result-based disbursement financing instruments should be considered to get stronger institutional outcomes, for

example, by including policy considerations in policy loans. The mobilization of private capital should also be given due consideration.

On the technical side, recent and emerging global technical work should be incorporated in any future engagement. Moving forward, World Bank teams should build on the water practice's evolving technical offerings in water security and transboundary water management, as well as other strategic areas such as climate change, the circular economy, fragility and water, early warning systems, source-to-sea, dam safety, and many others. Furthermore, lessons learned from other regional work, for example, in food security, agriculture and pastoralism, transport, and social development, should also be taken into account.

Managing Risks More Consistently

The World Bank should have a clear and consistent position on its risk appetite for long-term programs and large infrastructure. A clear vision and more consistent engagement as well as honest and transparent communication on risks, will help manage expectations and resources more adequately and will be an important ingredient for the success of such high-risk but also high-reward engagements. For example, small stand-alone grants are useful to first engage in a basin, but require disproportionately intensive supervision for their size but should nevertheless receive proper and consistent attention. There should also be space for adequate physical and price contingency provisions during project preparation, and for making provisions for the full implementation of social and environmental safeguards measures. Similarly, most regional projects suffered implementation delays, and while project design should better reflect the time necessary to implement activities on the ground, there should also be space for extension when unforeseeable events take place, such as disease outbreaks and conflicts.

In future engagements, the decision to finance feasibility studies for large hydraulic infrastructure should be carefully assessed on a case-by-case basis, with proper attention to risk mitigation measures. For RBOs, countries, and civil society, the World Bank provides reassurance that the highest technical, social, and environmental standards are applied, and that public or private investors may be interested in subsequent financing of the infrastructure. In cases where the World Bank finances subsequent works under a lending program, close attention should be paid during supervision to the application of environmental and social safeguard policies, revising all terms of reference, drafts, and final reports, and making sure that adequate budgets are available for their implementation. When the World Bank finances design studies, including environmental and social safeguards instruments, but is not involved in the construction phase, careful consideration should also be given to any residual risks and potential mitigation measures that need to be monitored. In addition, regardless of which phase the Bank is involved in, an independent panel of experts should be financed by the borrower to review all studies and visit the sites.

The World Bank has a unique opportunity to build on lessons from the past 20 years to address specific implementation weaknesses. Any future regional engagement should leverage the growing portfolio of

national engagements to strengthen the capacity of national agencies. This will increase their ability to work effectively with RBOs and implement key investments. This must include stronger attention to nonstructural measures, which are key to reaping the full benefits of transboundary investments. On the Bank side, this requires a more consistent coordination between regional projects and national portfolios.

Appendix A. The Senegal River Basin

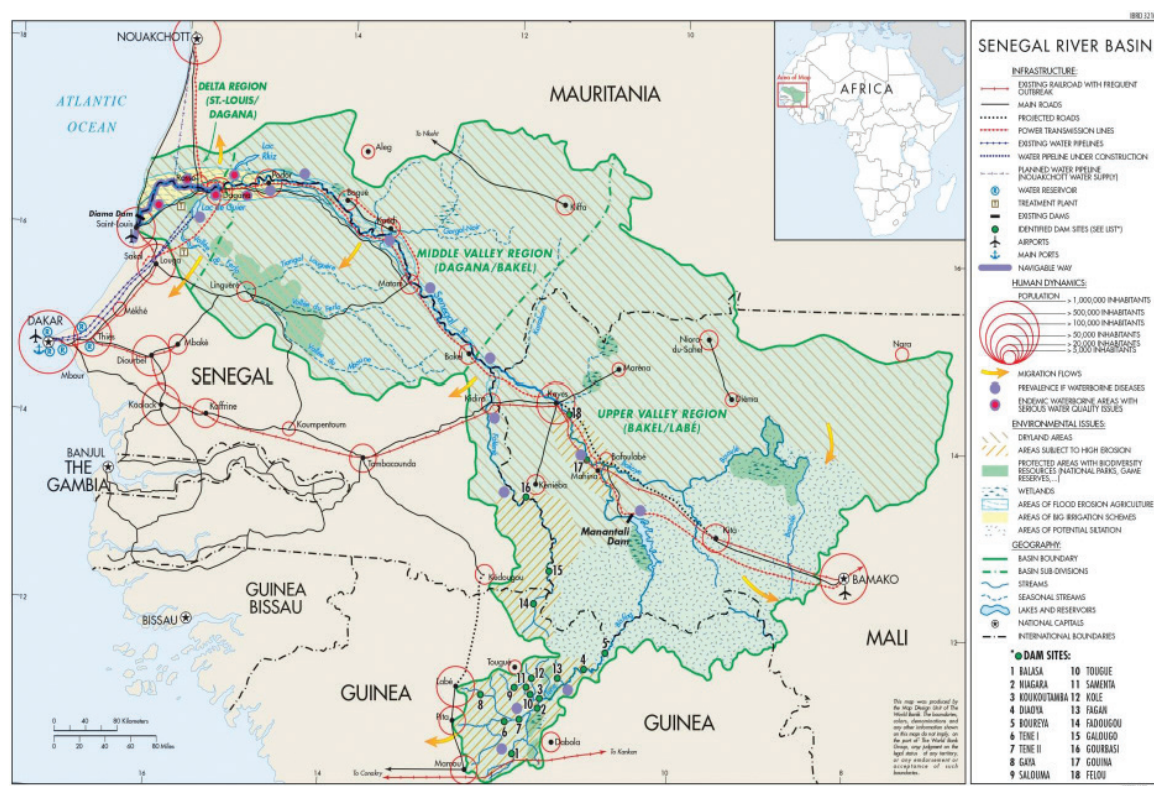
The Senegal River Basin Is Key to Water, Food, and Energy Security in West Africa

The Senegal River basin is shared by Guinea, Mali, Mauritania, and Senegal. This hydrosystem is critical for the socioeconomic development of the four basin countries and the subregion beyond.

First, it is the main source of water for two rapidly growing capital cities (100 percent of Nouakchott's water and 60 percent of Dakar's) and numerous smaller towns and villages and is therefore key to the water security of most of these two countries' population and GDP.

Second, the Senegal River system is key to the energy security of the subregion. Today, the per capita electricity consumption in the four riparian countries is among the lowest in the world with approximately 160 kilowatt-hours (kWh) per capita. There is thus an urgent need to increase energy production to respond to regional demand. To date, the OMVS has two energy-producing dams operational, the Manantali and the Felou dams, with an average annual production of 262 MW. Those dams account for approximately 90 percent of all electricity generated in Mali, 30 percent in Mauritania, and 10 percent in Senegal. They represent 22 percent of the basin's hydropower potential that OMVS is working

MAP A.1 The Senegal River Basin



Source: World Bank. 2013. *Senegal River Basin Climate Change Resilience Development Project*. Project Appraisal Document. Washington, DC: World Bank.

actively to develop. Commercial contracts have been signed for the construction of the Koukoutamba and Goubassi dams, which will provide an additional capacity of 312 MW; feasibility studies are completed for the Boureya Dam (240 MW), and in preparation for a series of small hydro projects. Beyond energy generation for its member states, OMVS's ambition to export electricity to the subregion and its power generation sites are already integrated in the regional West African Power Pool, which currently serves 14 West African countries.

Third, the Senegal River system is critical to the food security and rural employment in Senegal and Mauritania, where it supplies most of the irrigated land—Mauritania (90 percent) and Senegal (80 percent). Finally, the riparian states would like to develop navigation on a stretch of about 900 kilometers (km) from the Atlantic to Mali, providing this country with an open access to the sea.

Yet, the Senegal River is also a fragile socio-hydrological system. First, developments upstream threaten the seasonal floods, critical to the livelihoods of many fishermen, pastoralists, and farmers in the lower valleys and to the recharge of regional aquifers. Second, in dry years, during the low-flow season, OMVS is not able to guarantee water for all uses and negotiations among states will be necessary. Today, these negotiations take place within the OMVS Permanent Water Commission, which decides on the operation of the jointly owned dams to provide multiple benefits to its member states. In the future, climate change—alongside water-using developments in the four countries—is expected to exacerbate these already lingering tensions.

Key Results of the World Bank's Lending Program in the Senegal River Basin

First, it facilitated the successful integration of Guinea in the OMVS structure. Guinea was the missing riparian state, critical for the overall management of the transboundary waters and its hydropower potential, as most of the basin's runoff is generated on its territory (the country is home to the Senegal River's headwaters). The value of this cooperation is recognized in the Interim Strategy Note for the Republic of Guinea (2011) that highlighted that “after several years of isolation ... [Guinea can]... start reaping organizational and efficiency gains from cooperation with countries with whom Guinea shares ... rivers....” The program supported the amendment of the transboundary legal framework (i.e., conventions), the adaptation of the OMVS organizational structure, the harmonization of the Guinean national legal and organization framework to the newly ratified international convention, and the revision of the cost-sharing formula to share the cost and benefits of the major hydraulic infrastructure (ongoing, see below). Since then, Guinea has taken part in the decision to move ahead with the second phase, the development of the next generation of large hydraulic infrastructure projects, including the Koukoutamba Dam in Guinea, the Gouina Dam in Mali, the Goubassi Dam in Senegal, and the fluvio-maritime navigation program, and in coordinating the operation of existing hydraulic infrastructure.

Second, it provided support for the development, adoption, and implementation of essential tools for the shared management and development of the basin's water resources. The first phase financed the Senegal River master plan, developed in a participatory manner and approved by OMVS's heads of state. It is the key mechanism for countries to agree upon the future multisectoral water development and

allocation in the basin. The master plan not only identifies the next round of joint hydraulic infrastructure to be developed by OMVS (i.e., Koukoutamba, Gourbassi, etc.), but also, based on increased water availability resulting from the development of this infrastructure, defines targets for the development of various water uses (i.e., irrigation area, hydropower generation, navigation, water supply, and ecosystem services) and the related minimum flows. The update of the 10-year master plan is currently ongoing under the second phase, which is also financing the revision of the joint infrastructure cost-sharing formula. Its revision is necessary, not only to consider Guinea's integration into the OMVS system, but also to reflect the environmental priorities introduced by the 2002 water charter. Previous efforts had failed, as one of the countries routinely rejected the proposed methodologies, but the revised methodology was validated by the OMVS Council of Ministers in April 2019, which is expected to approve the new mechanism next year.

Third, the program has significantly improved information sharing at the basin level, through a modernized OMVS document center and digitalized historical data and documents, which are available online; upgraded hydrological observation networks in the four countries; the strengthened capacity of national hydrological services through training and equipment; and the development of interinstitutional protocols for information exchange. Moreover, satellite images have been bought to complete and update the OMVS database, and thematic maps for the basin are being developed. Thanks to the project, OMVS is already able to use SENTINEL images for the monitoring of typha in the delta.

Finally, investments on the ground significantly benefitted the basin's population. Impacts on beneficiaries include increases in rural incomes and food security thanks to the rehabilitation/modernization of 20,000 hectares of irrigated land benefitting 60,000 farmers; the restoration of 5,500 hectares of degraded land restored through agroforestry and other interventions;²⁰ the control and clearance of invasive aquatic species has boosted the development of the fisheries sector at these locations and, in addition to better supplying downstream irrigation schemes, also supported the development of irrigation adjacent to the channels. There has been a 15 percent increase in the quantity of fish sold in the main markets. Beneficiaries interviewed at the end of the first phase confirmed the positive impact of these investments. Farmers reported the possibility of double cropping and increased incomes. In field discussions, beneficiaries spoke of the benefits of being able to pay health and school fees. Women reported the benefits of vegetable gardens and household nutrition. Investments also significantly reduced the prevalence of malaria and schistosomiasis in the Senegal basin, which had increased rapidly since the 1980s as a side effect of irrigation development made possible by the construction of the Manantali and Diama dams by OMVS. As a result of the program's distribution of treated mosquito nets and praziquantel associated with strong awareness campaigns, the number of children and women of child-bearing age sleeping under treated mosquito nets increased from 20 to 84 percent between 2013 and 2020, and schistosomiasis treatment reached 99 percent of the targeted population in the basin in 2020, while the prevalence of malaria decreased in Mauritania from 170 percent in 2007 to 13 percent in 2014 and in Senegal from 78 percent to 26 percent.

²⁰ Though recent studies show negative impacts on traditional flood recession agriculture in the Senegal River Valley.

Appendix B. The Niger River Basin

The Niger River Basin Is the Largest Transboundary Basin in West Africa and the Lifeline of the Sahel

The hydrologically active watershed covers 1.5 million square kilometers (km²) and spreads across nine West African countries: Benin, Burkina Faso, Cameroon, Chad, Guinea, Côte d'Ivoire, Mali, Niger, and Nigeria. All countries are members of the NBA. Of an estimated total basin population in 2015 of 138 million people, 69 percent resided in Nigeria and 9 percent in Mali and Niger each. Population density in the basin is four to five times greater than the national averages with the national-level annual population growth ranging from 2 to 4 percent. The Niger basin hydrosystem contributes between 20 and 50 percent of the basin countries' GDP as it enables agriculture, generates significant employment, and provides food security for the basin's population, including for major metropolitan centers such as Bamako, Niamey, and Abuja. The Niger River is also important for the region's energy security, with an installed and partially integrated hydropower capacity of 2,000 MW. The inner and maritime deltas are

MAP B.1 The Niger River Basin and Kandadji Dam



Source: World Bank. 2012. *The First Part Of The Second Phase (APL 2A) Of The Niger Basin Water Resources Development And Sustainable Ecosystems Management Program*. Project Appraisal Document. Washington, DC: World Bank.

wetlands of international importance (RAMSAR sites) that provide livelihoods to millions of people. The population of the basin is mostly young, rural, poverty stricken, agriculture dependent, and vulnerable, due on the one hand to food security and social well-being being dependent on unpredictable and extreme rainfall regimes, and on the other, to the recent conflicts which have arisen in Mali, Burkina Faso, and Niger as well as the resurgence of the Boko Haram.

The basin's large potential for water infrastructure development is mostly untapped. Lack of water resources development and coordinated flow regulation in the upper and middle basin has been preventing equitable socioeconomic growth, endangering water security in towns bordering the river, limiting the scale of intensity of irrigation investments, and depriving countries of a relatively clean, accessible, and cheap source of energy. Currently, about 20 percent of the hydropower potential and even less of the irrigation potential are being used.

NBA was created in 1980 with the overall goal to “promote cooperation between the nine riparian countries and ensure the integrated development of the Niger basin in the areas of energy, hydraulic, agriculture, animal husbandry, fishing and aquaculture, agro-forestry, transport and communications and industry.” In addition, NBA gradually embraced direct functions that enable the coordinated management of water resources in the basin, particularly along the Niger River, where several large dams and significant irrigation abstractions were and are still planned.

In 2004, the nine riparian countries committed to regional cooperation for joint development and sustainable management of shared water resources through coordinated multisectoral investments and common water governance rules. This commitment, known as the Paris Declaration, initiated the Shared Vision Process (SVP) that reaffirmed the central role of NBA as a coordination, knowledge, and development organization and led to a basinwide Sustainable Development Action Plan (SDAP) piloted by NBA which was approved in 2007. Based on the SDAP, the member states approved a \$8 billion 20-year investment program in April 2008. The World Bank, together with five other donors, accompanied the SVP and committed to align their financial assistance to the pillars of the SDAP. With the coming online of major regulating infrastructure, the demands on NBA and its role in promoting and participating in the design and exploitation of works and projects of common interest are growing. As part of the SDAP, three large dams were initially planned in the upper basin to work in cascade: the Fomi Dam in Guinea, Taoussa in Mali, and Kandadji in Niger. The latter two are under construction already, whereas the former, now planned in a different site, is at an advanced stage of study. Given the high concentration of population along the Niger River in its Sahelian portion, including two capital cities (Bamako and Niamey) and the vast Niger Inner Delta wetland in Mali, host of the livelihoods of 1 million people, it is essential that decisions on the design, operating rules of large dams, and the accompanying measures be based on evidence and take into account the local and transboundary impacts. Today, NBA struggles to fill these critical functions. Despite NBA's weaknesses, member states remain committed to the organization and are keen to improve its institutional capacity and role in managing resources in the basin. As an example, the October 2019 Council of Ministers, representing all member countries, validated and approved several steps for improving NBA as an organization.

Key Results of the World Bank's Lending Program in the Niger River Basin

The lending program helped develop, adopt, and implement essential tools for the shared management and development of the basin's water resources. It facilitated the preparation and endorsement (in 2007) of the SVP by the nine Niger basin member states, a political process to unanimously determine priority investments in the basin that started in 2004 with the active political and financial support from more than five development partners with the World Bank as lead. The SVP was based on two complementary elements: (1) a basinwide hydroeconomic planning model designed to propose water development scenarios based on the construction of new dams on the Niger River and optimized water allocation rules (SDAP); and (2) a \$3 billion investment program based on the latter as well as on the investment needs of countries that are not directly connected to the river. At the time, the prospect of the first phase, of which a large share (70 percent) was to be devoted to the rehabilitation and modernization of two dams in Nigeria, proved instrumental in the approval of the SVP by all countries, particularly Nigeria, after decades of unsuccessful attempts by upstream countries to regulate the river through dams and increase economic benefits from water development.

The Niger program and a grant funded by CIWA then facilitated the preparation and validation process of the water charter and several of its annexes, complementing the rules for transboundary water management in the basin. The water charter was ratified in 2010, and four of the five annexes necessary to develop certain provisions of the charter are now effective and legally binding, including provisions for the coordinated management of dams (2019) and cost and benefits sharing (2017). The CIWA grant also helped NBA prepare the climate resilience investment plan, which was endorsed by heads of states in November 2015 and presented at COP21 in Paris and helped basin countries raise more than \$300 million financing for climate-resilient investments.

Another important intangible result of the Niger program is that it improved NBA's capacity for monitoring water resources, essential for taking decisions around the management and development of transboundary waters. Today, NBA is able to publish a monthly water resources bulletin, and it has a water information database, publicly available, that is regularly fed with information coming from national entities. In return, NBA helps countries maintain their monitoring network by raising funds and run a valuable flood monitoring and forecasting system. In 2019, a model to simulate the impact of different flood levels in the Niger Inner Delta, a critical ecosystem that sustains the livelihoods of 2 million people and was not well addressed in previous planning, was also finalized. This model, which can simulate the impacts that different dam operation scenarios would have on river flows, will be a critical tool once the Fomi/Moussaka Dam comes online—and it will help NBA effectively enforce annex 2 of the water charter.

Finally, the World Bank's support proved essential in improving decision-making around large and critical infrastructure. It helped reach an important decision to change the site of the Fomi Dam, preventing irreversible decisions that would have resulted in significant negative environmental and social impacts offsetting expected economic benefits. The Fomi Dam in Guinea is a 50-year-old national project. When its feasibility studies, initially carried out by Guinea in the 1990s, were updated

with World Bank financing under APL1,²¹ they revealed greater environmental and social impacts than expected, with more than 50,000 people needing relocation, several towns flooded, and impacts on livelihoods in the Niger Inner Delta. The Bank financed international experts through the CIWA grant to review the studies and facilitate validation workshops. At the end of these validation workshops, participants unexpectedly reached a unanimous decision to abandon a site that had been the Guinean government's priority for more than 50 years and considered as a key condition for Mali to expand its irrigation area—and focused instead on another dam (Moussaka), with substantially lower social and environmental impacts. The Bank's support also helped correct some worrying trends witnessed around the construction of the Kandadji Dam that would have negatively affected the basin's population.

The Kandadji Program

The Kandadji program is unique in that it is optimized to provide benefits at the regional, national, and local levels, with strong ownership at all levels. The Kandadji program includes the Kandadji Dam, which will be located on the Niger River in Niger, about 60 km downstream from the Mali border, 187 km upstream from the capital city of Niger (Niamey), and about 489 km upstream from the Nigerian border. It aims to enhance regional coordination, development, and management of the Niger basin's water resources through the construction of the Kandadji Dam in the Tillaberi region of western Niger. The World Bank-financed Kandadji project contributes to the wider Kandadji program led by the Government of Niger by financing the hydroelectric equipment of the power plant, the local development program, irrigation activities, and parts of the resettlement program in the reservoir area.

Studies on the Kandadji program began in 1976. The program design focused on national benefits with little consideration for regional impacts. Only in the mid-1990s, as part of efforts to strengthen NBA, did studies look to optimize the program's benefits from a regional perspective. Among other things, this involved designing an economically attractive program for Niger and the other riparian countries while limiting negative regional impacts, as well as ensuring that activities were sized appropriately to the limited water resources available at the basin level. As a result of this shift from a national-centered design to a regional-centered design, planned water storage was significantly scaled down from more than 10 billion cubic meters (m³) to about 1.5 billion m³. This reduction in water storage limited the impact of the Kandadji program on the annual flow in downstream countries (i.e., Benin and Nigeria) while ensuring an increased low flow, making water available at a critical time of the year (during the dry season) for multiple water users (agriculture, fisheries, etc.) downstream of the dam. The Kandadji program is also part of the West African Power Pool as per the Economic Community of West African States' (ECOWAS) revised master plan for electricity generation and transmission (2011). Hydroelectricity is a factor of integration and regional stability and presents strong trading potential for the basin member countries in terms of the benefits to be shared.

²¹ Adaptable Program Loan.

Improved management of the Niger River is expected to improve water security and availability, foster agricultural development, stimulate biodiversity protection, and encourage new infrastructure. The program promotes regional and local initiatives toward development and lasting peace to benefit the poorest, most vulnerable, and internally displaced populations. Several benefits of the program, such as maintaining and enhancing of valued biodiversity, including natural resources, forests, and protected areas throughout the Niger River basin downstream of the Kandadji Dam (such as the Kandadji National Nature Reserve and Hippopotamus Sanctuary that was established in 2017 as an environmental offset for the impoundment of the Kandadji reservoir), present opportunities for local and regional dialogue about their use and shared access, opening potential pathways for peace.

Through the Kandadji project, the World Bank is supporting Niger in navigating complex and extensive cooperation with its 11 development partners, who have co-financed the entire Kandadji program. The Bank has funded an innovative resettlement reservoir program—RAP-2A for 33,000 project-affected persons (PAPs) in Niger for a reservoir height of 224 meters above sea level (masl) and RAP-2B for 17,000 PAPs for a reservoir height of 228 masl. Donor funding of \$433 million was confirmed in 2018 for RAP-2A and included \$150 million from the Bank. With World Bank financing, an audit was also carried out of the resettlement at the dam site, which was implemented and financed by the Government of Niger (phase 1 or RAP1 for 9,000 people) and the associated remediation measures are now under implementation with World Bank funding. Successful completion of the reservoir resettlement is a prerequisite for the reservoir impoundment—and hence for the finalization of most activities financed directly by the Kandadji program (e.g., most of the services to be derived as benefits from the reservoir can only become operational once the water is available).

Appendix C. The Lake Chad Basin

Lake Chad Is Key to the Food Security of Its 15 Million Inhabitants, Yet with Much Poverty, Its Productive Socio-Hydro System Is Vulnerable, Facing Numerous Transboundary Risks

Lake Chad is shared by Cameroon, Chad, Niger, and Nigeria. Parts of the Central African Republic are in its active hydrological basin. It is a source of livelihood for nearly 2 million people living around its shores. Following the rhythm of the annual flood, riparian communities have developed fishing, agriculture, and livestock farming, particularly precious in the Sahelo-Saharan region, characterized by chronic food insecurity. They have created a food-exporting hub, playing a key role in the food security of a hinterland with nearly 15 million inhabitants and two metropolitan centers, N'Djamena and Maidiguri.

MAP C.1 The Lake Chad Basin



Source: GIZ. 2016. *Report on the State of the Lake Chad Basin Ecosystem*. N'Djamena: Lake Chad Basin Commission.

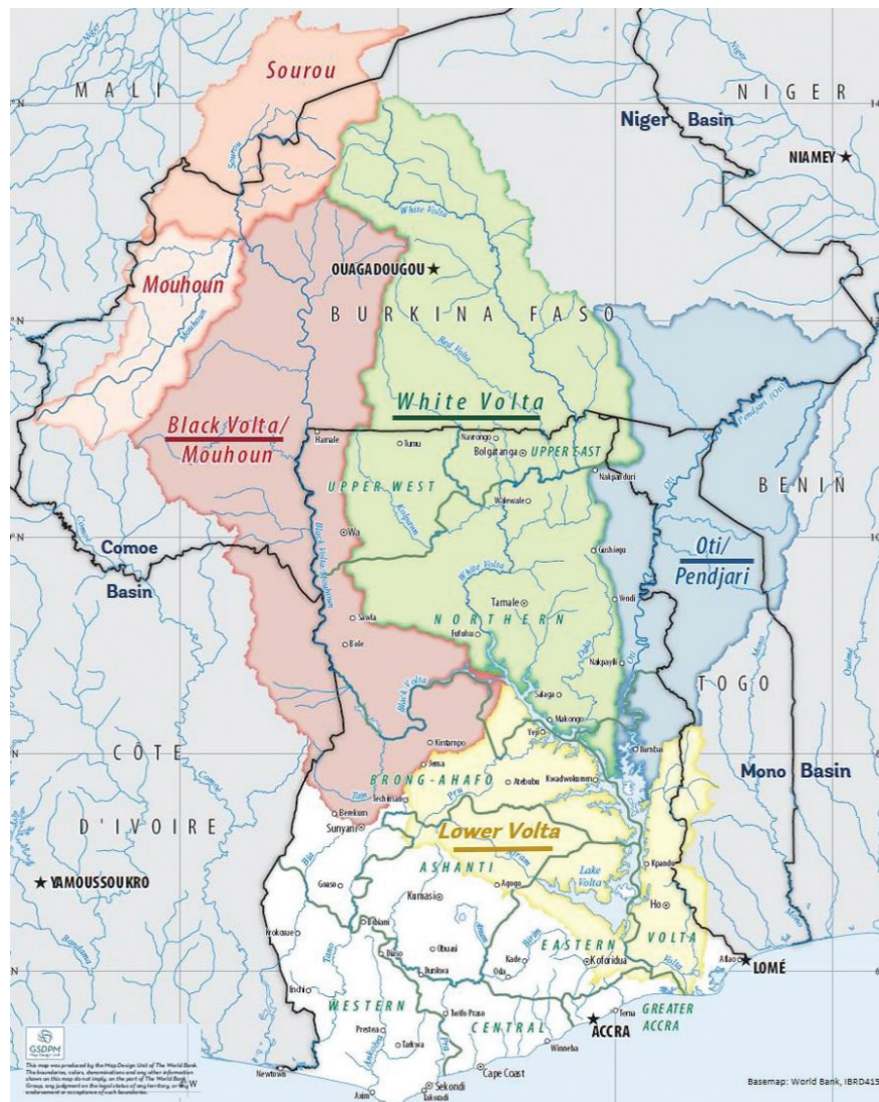
Yet Lake Chad is a very fragile sociohydro system, facing numerous transboundary risks. Demographic pressure and conflicts and violence exacerbate the vulnerability of already poor populations. Moreover, the lake is exposed to potential modifications of its hydrological conditions that a changing climate, flow regulation through dams, and uncontrolled expansion of irrigation in the Chari-Logone, responsible for about 90 percent of water inflows to the lake, could trigger. The reduction in the amplitude of the annual flood, as well as the drying up of the northern part of the lake in Niger and Chad are of particular concern. The lake is also threatened by pollution from its riparian states putting at risk the health of its population, its rich biodiversity, and its agricultural productivity. The exploitation of hydrocarbons is expanding in the basin, and the inappropriate use of pesticides in agriculture may already have an impact on animal health (ruminants and fish). Untreated municipal wastewater and industrial effluents are also a risk. Moreover, the Lake Chad basin is experiencing one of the highest rates of population growth in the world, which could heighten risks related to the overexploitation of natural resources and to sociopolitical instability, especially if not enough jobs are created to provide a living for a growing number of young adults.

Appendix D. The Volta River Basin

A Good Example of Why in Some Cases Bilateral Coordination Mechanisms May Work Better than Basinwide Ones: The Management of the Bagré and Akosombo Dams

The convention providing the legal basis for the creation of the VBA was adopted in 2007 by the basin's six riparian countries, and VBA itself was created in 2012. More than a decade later, the benefits for its member countries remain limited. Several reasons are responsible for this performance, not least the basin geography, which is not conducive to basinwide transboundary cooperation. First, there is a clear

MAP D.1 The Volta River Basin



Source: World Bank. 2017. *Volta River Basin Support Program An institutional Assessment of the Volta Basin Authority*. Report No: ACS22632. Washington, DC: World Bank.

imbalance in the contribution of the riparian countries to the basin, as 85 percent of the basin area falls under the national boundaries of Ghana (42 percent) and Burkina Faso (43 percent). Second, most of the basin is drained by three independent river systems before they converge very much downstream (about 100 km from the basin outlet in the Gulf of Guinea) to form the Volta River, which limits many transboundary issues and interests to two or three countries that share a common subbasin. Third, most rainfall and runoff occur downstream, limiting the dependency of downstream riparians on the water flows coming from upstream countries. This may explain the late start in the transboundary cooperation process.

However, this has not precluded Burkina Faso and Ghana, which share most of the basin, from collaborating at a bilateral level. This relationship has been characterized as “somewhat cordial” until 1998 when Ghana experienced an energy crisis due to the reduced level of water at the Akosombo Dam—and blamed Burkina Faso for increasing water withdrawals (less rainfall was the reason). Another issue that fostered collaboration between the two countries were the occasional spills from the Bagre Dam built in 1992 in Burkina Faso, which were believed to exacerbate flooding in Ghana. In the end, the two countries agreed that Ghana would provide power to Burkina Faso to reduce its need to build dams in the Volta basin. Interestingly, before the creation of VBA, Ghana and Burkina Faso had signed a Joint Declaration in 2004, which acknowledged both countries’ common environmental and water issues and expressed a desire to collaborate on integrated management of the shared water.

And while VBA was being established, in 2005 and 2006, Burkina Faso and Ghana developed a “Code of Conduct for Sustainable and Equitable Water Resources Management of the Volta Basin between Burkina Faso and Ghana.” This is a nonconventional international collaborative instrument—a rarity in shared water resources management in West Africa (Garane 2006).

Today, hydrometeorological data continue to be exchanged between the two countries, basically to assist in dam operations for the generation of power at Akosombo, Ghana. In the case of the possible spilling from Bagré, information is transmitted from Burkina Faso’s national electricity company (SONABEL) to the Volta River Authority in Ghana, which in turn relays the information to its regional offices in the affected areas.

References

- BRL. 2007. "Elaboration Du Plan D'action De Développement Durable Du Bassin Du Niger." Niger Basin Authority. http://www.abn.ne/images/documents/textes/padd/phase_1_fr.pdf
- Garane, Amidou. 2006. *Study on the Evaluation of the Role of the Relevance of the 1997 UN Watercourses Convention for the Reinforcement of Transboundary Water Related Co-operation and Conflict Management in West Africa*.
- Haut Commissariat à l'Amenagement de la Vallée du Niger. 2008. "Evaluation Environnementale et Energie: Conférence Internationale, Québec." https://www.sifree.org/static/uploaded/Files/ressources/actes-des-colloques/quebec/seance-simultanee-13/3_GOUDOU.pdf.
- Klutse, Nana Ama Browne, Kwadwo Owusu, and Yaw Bofo. 2020. "Projected Temperature Increases over Northern Ghana." *SN Applied Sciences* 2 (Article No. 1339). <https://doi.org/10.1007/s42452-020-3095-3>.
- Lemoalle, J., and D. de Condappa. 2009. *Water Atlas of the Volta Basin*. Colombo, Sri Lanka: CGIAR Challenge Program on Water and Colombo, Marseille: Food and Institut de Recherche pour le Développement.
- LAVAL University. 2016. "Allocation optimale de l'eau dans le bassin versant du fleuve Sénégal." <https://corpus.ulaval.ca/jspui/bitstream/20.500.11794/26573/1/32277.pdf>.
- Magrin, G., Lemoalle, J., Pourtier, R., et al (2015). *Atlas du Lac Tchad*. Paris: Passages.
- McCracken, M., and A. T. Wolf. 2019. "Updating the Register of International River Basins of the World." *International Journal of Water Resources Development* 35 (5): 732-82.
- Mohorjy, A. M. 1989. "Multidisciplinary Planning and Managing of Water Reuse." *Journal of the American Water Resources Association* 25 (2): 433-42.
- Rangeley, R., B. M. Thiam, R. A. Andersen, and C. A. Lyle. 1994. "International River Basin Organizations in Sub-Saharan Africa." Technical Paper WTP250, World Bank, Washington, DC.
- USAID (United States Agency for International Development). 2012. "Climate Change Adaptation in Western Africa." https://www.climatelinks.org/sites/default/files/asset/document/west_africa_adaptation_fact_sheet_jan2012%20%281%29.pdf.
- Van Der Wijngaart, R., J. Helming, C. Jacobs, P. A. G. Delvaux, S. Hoek, and S. Gomez y Paloma. 2019. *Irrigation and Irrigated Agriculture Potential in the Sahel: The Case of the Niger River Basin: Prospective Review of the Potential and Constraints in a Changing Climate*. JRC Technical Report. Luxembourg: Publications Office of the European Union.
- Wolf, A. T., J. A. Natharious, J. J. Danielson, B. S. Ward, and J. K. Pender. 1999. "International River Basins of the World." *International Journal of Water Resources Development* 15 (4): 387-427.
- World Bank. 2015a. *Volta River Basin Strategic River Basin Strategic Action Programme Implementation Project*. Project Appraisal Document. Washington, DC: World Bank.
- World Bank. 2015b. *Lake Chad Development and Climate Resilience Action Plan*. Washington, DC: World Bank.
- World Bank. 2017. *Economic Rationale for Cooperation in International Waters in Africa: A Review*. Washington, DC: World Bank.
- World Bank. 2020. *Senegal Water Security Diagnostic*. Washington, DC: World Bank.

