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West Africa—A Regional Approach to Reducing Poverty in the Senegal River Basin

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Executive Summary

The Senegal basin countries show that regional cooperation—rather than unilateral development of a shared resource—can improve the possibilities for tackling poverty. Driven by the idea of pan-African unity, Guinea, Mali, Mauritania, and Senegal realized that they could get more from the Senegal river by cooperating in its development, and at a lower cost to each country, than they could by proceeding unilaterally. In 1972 Mali, Mauritania and Senegal established the *Organisation pour la Mise en Valeur du fleuve Sénégal* (OMVS), also known as *l'espace OMVS* or a space within which countries could cooperate. Decisions are based on the *Clé de répartition* which espouses the principles of *equity*, or the countries' needs, and *solidarity*, or mutual support in sharing development costs.

By jointly owning and operating the Manantali and Diama dams, the OMVS countries have increased their electricity and water availability. This in turn is supporting economic growth by reducing investment risk and also reducing poverty by increasing income-generating activities across sectors. Though it is too early to quantify the overall economic impact, widespread perceptions of improved services are driving further cooperation within *l'espace OMVS* and beyond. Even though Guinea is not party to OMVS, it is working with the member countries to find ways of jointly developing the basin.

The Senegal basin experience is not only a political success; it is also a success in improving access to basic services. Its achievements have contributed to reducing poverty while moving the countries toward closer regional integration.

Powering development

The jointly-owned Manantali dam and its network of transmission lines covering 1,300 kilometers finally came online in 2002, and has been working at full capacity since May 2003. Together with the Diama dam, this followed improved provision of fresh water for agriculture and municipal uses. The countries believe it is more effective to provide these services jointly rather than unilaterally. This is what they have been working toward for the last 30 years.

Since 2002 electricity, though not sufficient, is at least more reliable and is slowly transforming the economies of the OMVS countries. It is clear that there is a growing confidence in these countries. In Guinea, however, which has not shared in the OMVS countries' benefits, enterprises in both the informal and formal sectors suffer economically from unreliable electricity. For example, in medical facilities across the country, vaccines and medicines already in scarce supply cannot be stored properly. Guinea's difficulties are linked to a lack of infrastructure and a lost opportunity to share in the basin's joint development.

Focusing on benefits, not allocations

The decision of Mali, Mauritania, and Senegal to cooperate marked a significant shift in how international river basins are developed. By choosing to develop the Senegal River jointly, the three countries focused on generating the services they needed and then sharing them equitably. Referred to as the “principle of benefit sharing,” this approach focuses on sharing benefits rather than allocating the water itself. The international donor community is beginning to espouse this approach as the way forward in such situations.

The countries overcame traditional sovereignty concerns to establish strong political commitment to joint management and commonly held works, which then reinforced intra-basin relationships that facilitated economic growth by building trust that the benefits will be shared equitably and that the country hosting common works will respect their joint ownership. The OMVS countries used an economic model that separated the infrastructure’s costs from the benefits each country would gain to devise the burden-sharing formula, the *Clé de répartition*. The loans to construct the Diama and Manantali dams were guaranteed equally by Mali, Mauritania, and Senegal. This burden-sharing approach also ensured an equitable allocation of water to different sectors. For example, the expansion in irrigation was divided equitably, with the irrigation area increasing from 20,000 hectares in 1980 to 120,000 hectares, mainly in the valley between Mauritania and Senegal. Agricultural intensification also helped to smooth the unequal balance of payments among OMVS members. Joint infrastructure ownership has meant that the basin countries have a common interest in safeguarding the works and the benefits that flow from them. Soon after the Manantali and Diama dams were completed in 1989, their existence and the relationships under *l’espace OMVS* helped pull back Mauritania and Senegal from armed conflict. In July 1991, Mauritania and Senegal worked out an agreement between themselves, based on recognition of their shared interests in the dams.

Providing infrastructure for basic needs

The OMVS countries created two types of shared infrastructure: physical and institutional. Physical infrastructure included water management works, telecommunications networks, and transportation links. Institutional infrastructure included OMVS and related agencies, which seek to harmonize national planning and legal frameworks to promote development, and trade and labor flows. Both infrastructure types are needed for the basin’s development.

Running water has improved people’s lives in the three countries. Waterborne diseases diminish after people are connected to the waterworks. The women’s burden of water collection disappears and bathing is easier with running water in the household. Having a dependable reliable electricity source eases daily life for households and in small and medium industries. In Mali, the dams decreased electricity costs, increased supply, and reduced fuel imports used to generate electricity.

The Regional Hydropower Project shared across the OMVS countries provided an opportunity for them to introduce efficiencies that extended beyond the energy sector. For example, in connecting Manantali to the three national grids, dual-purpose fiber optic technology

was used for the transmission lines, which the telecommunication sector can also use, thus lowering communication costs.

The three countries have also benefited from using their common physical and institutional infrastructure, which includes shared hydrological data collection, to jointly manage extreme events, such as floods and droughts. A coordinated response was critical in minimizing the loss of life and socioeconomic damage from the 2003 floods to the Senegal basin's economy and the poor.

Evidence is growing that reliable supplies of water and electricity are encouraging income-generating activities, and making investments less risky in the OMVS economies. They have encouraged entrepreneurship at different levels, from new video halls opening in Mauritania to improved irrigation techniques used to grow higher value off-season crops near key markets in Dakar.

By contrast, in Guinea the shortage of reliable electricity and water supplies is seriously handicapping economic activity and pushing the government to seek stronger links with its Senegal basin neighbors, with a view to regional integration. Guinea's participation in basinwide decision making will open more cost-effective opportunities to augment existing energy supplies and tap the basin's development potential. Against the background of the New Partnership for Africa's Development (NEPAD), the four Senegal basin countries are looking to strengthen their integration through partnerships with each other, the international community, and the private sector.

The four basin countries have already collaborated in preparing the Global Environment Facility's (GEF) project on the Senegal River basin. Significantly, OMVS was designated as the recipient and executor of the GEF grant, not just on behalf of its member countries, but also for Guinea. As an indication of the political commitment to cooperate on all sides, Guinea was invited to Nouakchott to attend the OMVS Heads of State meeting in May 2003, and again for the first basinwide Inter-Ministerial meeting held in April 2004.

Tackling the environmental and social challenges

The Senegal River's regulation also brought problems. The Diama dam changed the ecology and livelihoods of the lower Senegal river in Mauritania and Senegal, and the Manantali dam affected traditional recessional agriculture in Mali. One of the biggest challenges for the countries is the need to tackle the growth of aquatic weeds, such as water hyacinth and typha australis, resulting from the uniform environment induced by the Diama dam.

Work is under way along the river's length to restore livelihoods lost by the drought and the flow's alteration. To restore the valley's ecological diversity and rural livelihoods, Mauritania and Senegal both established the Djoudj and Diawling National Parks in 1971 and 1991, respectively, on their sides of the river. Community-level measures have been particularly effective. For example, market gardening has proved successful in providing an alternative income source for local populations, especially women. The addition of two sluice gates has rekindled local fisheries. The ecosystem's regeneration has also stimulated wildlife. To encourage

the public's decision-making role, OMVS is reaching out to stakeholders by inviting their representation in its central advisory bodies such as the *Commission Permanente des Eaux* (CPE). Conflicts among different water users were avoided in the Diawling National Park by working directly with local communities.

What cooperation can do for investment and inclusion

Applying the Shanghai framework to the Senegal basin highlights how the countries' innovative cooperation has created an enabling climate for investments and social inclusion.

- *Commitment and political economy for change.* The countries have repeatedly shown their commitment to change in their policies and declarations. National policies encourage private sector involvement through deregulation, and privatization is under way in the basin's energy sector.
- *Institutional innovation.* The OMVS institutions allowed member countries to give up some sovereignty for the basin's greater good. The countries own the infrastructure jointly; decision making is based on equality, with the benefits and burdens of development shared equitably.
- *Learning and experimentation.* Since 1963, there have been three different basin organizations, each with mandates that evolved with experience.
- *External catalysts.* The countries captured the political opportunities in the post-independence drive for pan-African unity. The severe droughts of the 1970s were another external catalyst. The 2003 floods prompted the OMVS system to further coordinate its activities with local communities.

Lessons from the Senegal Basin

Cooperative development of the Senegal River has benefited the economies of Mali, Mauritania, and Senegal by increasing the reliability of key inputs such as electricity and water.

- *Grasping opportunities through cooperation.* The group's success in collectively raising external investment shows what can be done if all parties cooperate rather than acting unilaterally.
- *Engaging top political leaders.* Political will was fundamental to engendering trust among basin countries and with key international partners.
- *Sharing a vision for development.* From the outset, the Senegal basin's development was based on an agreed plan that reflected the countries' priorities through a regional approach.
- *Engaging all stakeholders.* To tap regional opportunities, stakeholders at all levels need to participate in identifying and developing opportunities, and then in sharing the benefits.
- *Looking at different scales of development.* Outcomes at the local, national, and regional levels from development must also be assessed.

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- *Binding cooperation with legal instruments.* Legal instruments are needed capture the agreements and bind future cooperation.
- *Promoting private sector involvement.* Maintaining a consistent policy for private sector involvement was critical.

IN A SERIES OF CONVENTIONS and other agreements beginning in 1963, the four coastal countries in the Senegal River Basin—Mali, Mauritania, and Senegal—agreed to cooperate in developing and managing the river and its resources. Motivating them was a belief in pan-African unity and the realization that they could all get more from the Senegal River—and at a lower cost—by cooperating in its development than by proceeding unilaterally. Their experience shows that regional cooperation rather than unilateral development of a shared resource can help tackle poverty.

Cooperation in the Senegal Basin

In 1963 the Bamako Convention, signed by Guinea, Mali, Mauritania, and Senegal, recognized the Senegal River's international status and created the Interstate Committee (CIE) to manage the river. Colonial conferences on the status of Africa's rivers had not recognized the Senegal River as an international river, as it belonged to a single colonial power. After independence landlocked Mali sought to have the Senegal River's international status recognized in order to ensure navigation rights. Freedom of navigation on the Senegal River derives from the principle of reciprocity, not universal access.

Driven by a strong will to cooperate, the countries signed the Labé Convention, creating the Organization for the Coastal States of the Senegal River (OERS) on March 24, 1968, with the mandate to develop the basin by facilitating closer coordination beyond the water and agricultural sectors. In a wide-ranging development plan the countries pledged to cooperate in other areas through OERS: harmonize civil legislation; improve education, industrial growth, transport, and telecommunications; and facilitate trade and labor movements across borders. In conformity with the Organization for African Unity Charter, the countries adopted a resolution calling for unprecedented levels of cooperation and integration. The aim was, as President Modibo Keita of Mali put it, for all citizens to “regard themselves as citizens of the Senegal River states rather than Guineans, Malians, Mauritians, or Senegalese.”

On March 11, 1972, Mali, Mauritania, and Senegal signed the Nouakchott Convention, reconfirming the river's international status and establishing Senegal River Development Organization (OMVS) and dissolving the OERS. Although Guinea was not a party to the convention, it did not oppose it.

The resulting forum, often referred to as the “OMVS space” (*l'espace OMVS*), has three organs: the executive organ, which includes the Heads of State Summit and the Council of Ministers; the technical organ including the High Commission, based in Dakar; and the consultative organ, made up of the Permanent Water Commission and the Regional Steering Committee, which advise the High Commission. Learning from the OERS experience, OMVS incorporated changes. First, OMVS was given a narrower mandate, focusing on developing the basin's water resources and related economic activities. Second, a stronger decisionmaking process was established. Links to the executive organs were strengthened so that if, in exceptional

circumstances, a unanimous decision could not be reached, the heads of state could intervene to move matters forward.

Box 1. Chronology of cooperation in the Senegal River Basin

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| 1963 | Guinea, Mali, Mauritania, and Senegal establish the Interstate Committee and declare the Senegal River an international river. |
| 1968 | The four basin countries form the Organization for the Coastal States of the Senegal River (OERS) and define a basinwide development program. |
| 1972 | Mali, Mauritania, and Senegal create the Senegal River Development Organization (OMVS) to implement the development program outlined by the OERS. |
| 1978 | Mali, Mauritania, and Senegal sign a convention establishing the legal status of common works. |
| 1982 | Mali, Mauritania, and Senegal sign a convention on financing the common works. |
| 1984 | Twelve donors support building the Manantali and Diama Dams. |
| 1986 | The Diama Dam becomes operational. |
| 1990 | The Manantali Dam becomes operational. |
| 1992 | The OMVS-Guinea protocol is signed. |
| 1997 | The Regional Hydropower Project begins. |
| 2000 | The Diama Dam Management Company (SOGED) and the Manantali Dam Management Company (SOGEM), the dams’ management agencies, are established. |
| 2002 | Electricity generated at Manantali is transmitted to Bamako, Dakar, and Nouakchott. Mali, Mauritania, and Senegal sign and ratify the Water Charter. |
| 2003 | Guinea participates in the OMVS Heads of State Summit in Nouakchott. |
| 2004 | The first interministerial meeting between Guinea and the OMVS member states is held, in Nouakchott. |
| 2004 | The first technical meeting on establishing an inclusive framework for the basin’s joint management is held, in Conakry. |

Focusing on benefits, not allocations

The Senegal River Basin countries’ decision to cooperate marked a significant shift in how international river basins are developed. By choosing to develop the Senegal River jointly, Mali, Mauritania, and Senegal focused on generating the services they needed—and then sharing them equitably. Referred to as the “principle of benefit sharing,” this approach is unique in that it focuses on benefits rather than allocations. The international donor community is beginning to embrace this approach. By working as partners rather than competitors, the countries face their common challenges of reducing poverty and sustaining economic growth together.

The strong political commitment to joint management and common works has reinforced intrabasin relationships and built trust that the benefits will be shared equitably and that the country hosting the common works will respect their joint ownership. Assane Diouf, the Director of Energy Transportation at the Senegal National Electric Company (SENELEC), explains why the Senegal Basin countries chose to forgo unilateral planning: “After independence, African countries were confronted with budgetary constraints. To facilitate the search for funds, the only way was for the riparian countries to manage the Senegal River jointly.” This spirit remains uncommon, obstructed in many cases by a lack of trust, which can take time to build and be politically very difficult. Lack of trust often prompts countries to choose unilateral options, despite the higher returns on investments in cooperative development and the greater impact on poverty.

Providing infrastructure for basic needs

The OMVS countries created two types of shared infrastructure. Physical infrastructure includes water management works, telecommunication networks, and transportation links. Institutional infrastructure includes the OMVS and related agencies, which seek to harmonize national planning and legal frameworks to promote trade and labor flows. Both are needed for the basin's development. As Madia Fall, technical advisor in Senegal's Ministry of Agriculture and Water, explains, "The dams have favored the development of potable water, electricity, and telecommunications—not only in the valley but also for other crucial geographical areas not in the basin, such as Bamako, Dakar, and Nouakchott."

Increasing the power supply

Owned jointly by the OMVS countries, the Manantali Dam and its network of 1,300 kilometers of transmission lines came on line in 2002. Mali's national grid was connected in January, Senegal's in July, and Mauritania's in November. Since May 2003 the station has been working at full capacity, generating 200 megawatts (MW).

Manantali Dam was built on the Bafing River, entirely within Mali. It has a storage capacity of 11.3 cubic kilometers and an annual generating capacity of 800 gigawatt-hours (GWh). It regulates the flow at 300 cubic meters per second. Electricity generation in the region is still not sufficient, but since 2002 it has become more reliable and is slowly transforming the lives of people in Mali, Mauritania, and Senegal (box 2).

The Diama Dam, located 23 kilometers from the Senegal River's mouth, was built to block intrusion into the river by the Atlantic Ocean, to facilitate perennial irrigation, and to improve the water supply of Dakar and Nouakchott by filling Lac de Guiers in Senegal and Lac Rkiz in Mauritania. Used jointly with the Manantali Dam, the Diama Dam has ensured a water supply for Dakar and reduced irrigation costs.

In 1997 the OMVS countries initiated the Regional Hydropower Project at Manantali. The project installed electricity-generating turbines with capacity of 200 MW and laid transmission lines to Bamako, Dakar, and Nouakchott. It also established the institutions to operate the generating system. Two operating agencies, the Manantali Dam Management Company (SOGEM) and the Diama Dam Management Company (SOGED), were commissioned in 2000. In addition, an independent entity from the private sector was appointed to operate the Manantali Dam under SOGEM's supervision. Mirroring OMVS's Permanent Water Commission, which advises on water allocation, the Permanent Technical Committee on Interconnection was created, along with a Management Committee for Interconnection, to define the program of production, supply, and regulation of electricity production.

Box 2. A tale of two countries: how cooperation has affected people's lives in Senegal and Guinea

In a suburb of Dakar, Demba Ndiaye and his friends and siblings started a cooperative in 2001. The 10 young men and women were faced with university strikes and other difficulties that threatened their studies. Rather than lose time, they decided to open a cybercafe to provide them with income and make the Internet more accessible to other young people. They bought three computers and established a connection with SONATEL, Senegal's main telecommunications provider. Today the cooperative has two cybercafes, with average daily revenues of \$82 from 12 computers.

The cooperative survived during a period of frequent electrical outages. Not owning its own electrical generators, it was completely dependent on SENELEC. As Demba explains, "When there was no electricity, nothing worked. We would stop working during those hours and on occasions lost a whole day's business." Before electricity supply stabilized, the business's average daily turnover was \$16—a fifth of what it is today.

Electrical outages were not the only obstacles. Frequent breakdowns in equipment also hampered business. Lack of security, another consequence of the outages, forced the cybercafes to close at 8 p.m. Outages still occur today, but they are less frequent and shorter than before. As Assane Diouf, the director of energy transportation at SENELEC, notes, "Since the end of outages, when Manantali came on line, we have noticed less frustration among households and more constant activity at small and medium industries."

The situation is far different in Guinea. Mamadou Diallo, the owner of a cybercafe in the central part of the country, is angry about electricity outages, which cost him a third of his revenues. Mamadou uses 10 liters of fuel a day to generate his own electricity during outages. The fuel costs him \$0.67 a liter if it is available from legitimate suppliers. If it is not, he is forced to buy it on the black market, at \$2 a liter. Mamadou's fuel bill alone ranges from \$6.70 to \$20.00 for every day of outage. The drop in revenues has forced him to cut his staff from four employees to two. Because of the problems, Mamadou is considering closing his business and emigrating to Europe or the United States.

For other enterprises in Guinea the story is much the same. Unreliable electricity is threatening the incomes of butchers and women selling fish or fruit juices, who are losing their inventory because they cannot keep their products cool. In hospitals, medical centers, and pharmacies, vaccines and medicines, already in scarce supply, cannot be stored properly. Guinea's difficulties are linked to its lack of infrastructure and the lost opportunity to be part of the transformation occurring down the Senegal River in Mali, Mauritania, and Senegal.

The Regional Hydropower Project provided an opportunity for the countries to introduce efficiencies that would benefit more than the energy sector. For example, the transmission lines that connect Manantali to the three national grids use dual-purpose fiber optic technology, which can be used for telecommunications. As a result of this technology Senegal has one of Africa's most modern telephone networks—80 percent of it already digital—with links to international networks in Europe and Asia. Its lower rates give it a comparative advantage in developing telecommunication services, such as call centers.

In 1999, before the dam came online, Mali's installed electrical power was 123 MW, of which 100 MW was on an interconnected transmission network already at the saturation point. Due to the lack of capacity, Mali Energy (EDM) was forced to cut off approximately 46.5 GWh, at an estimated loss of \$38.3 million, disrupting economic activities and triggering social turmoil.

In 2002 Manantali's commission reduced the cost of electricity to \$0.15–0.17 per kWh in the basin and minimized outages in all three countries. It has also reduced Mali's imports of fuel to generate electricity. (As a non-oil producer, Mali is highly dependent on imports.) The positive impact of Manantali is evidenced by the closure of the Balingue, Dar Salam, and Kita central fuel depots.

SOGEM sells electricity to EDM at \$0.05 a kilowatt-hour, a price EDM raises to \$0.13 a kilowatt-hour at resale. Access to electricity remains difficult in Mali because of the country's size, high tariffs, and low population density outside the Bamako area. Even so, the number of subscribers increased from 66,175 in 1995 to 101,800 in 2003 and total consumption rose from 245 GWh to 384 GWh.

Improving the supply of water

As a result of the dams Senegal's rural population is enjoying improved water supply, although many people still rely on untreated water drawn directly from the river. In the Dagana municipality the population is benefiting from water stations and distribution networks financed mainly by expanding agro-businesses, such as the Senegal River Development Agency (SAED). The dams will provide 62 villages on the valley's left bank with potable water. Work is also under way to increase Nouakchott's daily water supply of 50,000 cubic meters to 170,000 cubic meters by 2020 by using water from the Senegal River through the Aftout-es-Saheli.

The Diama Dam straddles the river between Mauritania and Senegal, 27 kilometers from its mouth. It stops the ocean's intrusion up river during the dry season, increases irrigation, and improves the filling of Lakes Guiers and R'kiz, as well as other depressions, such as the Aftout-es-Saheli. It also supplies potable water. Embankments along the river were built to create a freshwater lake, managed at 1.75 meters above sea level, which allows farmers upstream to pump water for rice cultivation at a lower cost. Together the dams aim to increase the irrigated area from less than 50,000 hectares to 375,000 hectares in Mauritania and Senegal and to provide Mali with access to the Atlantic Ocean.

Dakar's metropolitan area experienced recurrent and seasonal water shortages (estimated at 65,000 cubic meters a day during the dry season) due to the pressures of growing demand (expected to triple over the next 30 years) and the need to close contaminated boreholes. Dakar's heavy reliance on the nearby Littoral Nord fossil aquifers was unsustainable (recharge rates were low), overexploitation was already leading to saltwater intrusion, and an additional 35,000 cubic meters a day could be drawn from the aquifers only through 2005. To tackle the problem, groundwater extraction needed to be reduced to 3,300 cubic meters a day by 2005. Doing so meant providing an alternative water source from Lake Guiers, about 240 kilometers away, which relies on water levels in the Senegal River regulated by the Diama Dam (box 3). A water treatment plant at Ngnith currently provides 40,000 cubic meters of treated water a day to Dakar and its surrounding area. A second plant is being constructed on the lake, which will provide an additional 65,000 cubic meters a day, allowing the aquifers to be sustained.

Box 3. Changing people's lives by providing clean water

The Senegal National Water Company (SONEES) has changed the lives of hundreds of thousands of people by installing fountains in Dakar and other urban areas. Upon request, local communities and individuals can be connected without having to pay the \$10 connection fee or the \$23 water meter fee. Alioune Mboup, a resident of Thiaroye, near Dakar, explains, "My wives no longer need to go to the communal fountain, which was a source of a lot of conflict. My water bill is around \$25 every two months, but we can wash better and whenever we want. As a father, it makes me proud to see my family well."

Improvements have occurred in the area around Lake Guiers, too. According to Sogui Ba, a Ngnith resident, "Before running water arrived in the house, everyone went to the lake for all domestic needs. It has been a long time since I have gone to the lake. Now only children go there to play. Our water invoice is around \$33, which we find very expensive given that the Lake Guiers is so close to us. People have said to us that if they lived so close to the river, they wouldn't have connected to SONEES. But we will never give up the running water, even if it costs a lot, because we know what the costs would be to use the lake's water. There was a local belief that the lake's water didn't contain any microbes if it was collected early in the morning or after leaving it in the sun. This belief disappeared with the arrival of running water. Today we wash ourselves when we want. The women do not have the drudgery of collecting water. And the children are always clean."

Maimouna Diop is a housewife living in St. Louis. "I live with my husband, four children, and son-in-law. The connection with the SONEES changed our lives, because before that there wasn't a fountain nearby. Each day I would walk with my daughter several blocks to draw water to drink. For the dishes and laundry we used the well by the side of the house. If I had had my own tap when I was younger, I wouldn't have aged so quickly and would have better health. I am a woman who likes cleanliness," she says. "My greatest satisfaction is to see my children clean."

Financing infrastructure jointly

The most valuable outcome of cooperation is the strong intrabasin relationships that have been formed, which have facilitated economic growth through joint development of infrastructure. For example, in addition to the common interest in establishing and maintaining a reliable energy supply, Mali wanted navigation to the sea and Mauritania and Senegal wanted to expand irrigation in the valley. Rather than pursue these goals unilaterally, the OMVS countries chose to share the burden of large loans to fund their development plans, so that each economy would not need to carry the full weight of the investments.

The countries could have followed the common international practice of preserving sovereignty and minimizing commitments to other countries by opting to share the benefits based on a minimum common denominator or by "splitting the difference." Instead, the Senegal Basin countries opted to act as a single community and to maximize their common interest. Their decisions were based on consensus and the principles of solidarity and equity. Solidarity means joint fiscal responsibility for shared infrastructure, even if the immediate outcomes do not benefit a particular country. Equity means that each country's share of the benefits is congruent with its needs.

To obtain financing for the Diama and Manantali Dams, the countries needed to define common ownership and the related principle of financial solidarity. The countries agreed to guarantee and repay construction loans according to a formula that apportioned repayment based

on benefits received. Doing so allowed donors to conclude agreements directly with each country for its share of the total loan repayment.

The loans to construct the Diama and Manantali Dams were guaranteed equally by Mali, Mauritania, and Senegal, but loan repayment is proportional to the benefits each country derives from the dams. Under the current benefit-sharing formula, 42.1 percent of the benefits accrue to Senegal, 35.3 percent to Mali, and 22.6 percent to Mauritania. To revise the formula, a country applies in writing to the OMVS Council of Ministers.

This approach ensured an equitable allocation of water to different sectors, including irrigation and joint exploitation of the basin's hydroelectric potential. Mali receives 52 percent (104 MW) of the electricity generated at Manantali, Mauritania 15 percent (30 MW), and Senegal 33 percent (66 MW). Expansion of irrigation was also divided equitably, with the irrigated area increasing from 20,000 hectares in 1980 to 120,000 hectares after the dams began operating, with most of the increase in the valley between Mauritania and Senegal. Agricultural intensification also helped smooth the unequal balance of payments among the OMVS members. As Assane Diouf, notes, "[The dam] is a project that is not easy to manage because all the decisions have to be made unanimously. But it has lasted for 25 years."

Avoiding armed conflict

Joint ownership of infrastructure has meant that the basin countries have a common interest in safeguarding the works and the benefits that flow from them. As Babacar Ndao, Director of OMVS's national cell (*cellule*) in Senegal states, "OMVS is really an integrating factor for the three countries."

The Manantali and Diama Dams and the relationships established through the OMVS helped pull Mauritania and Senegal back from armed conflict. Ethnic violence triggered by a simmering dispute over animal grazing rights erupted in the valley in mid-April 1989. At least 50,000 people fled their homes as tensions escalated. The Organization of African Unity attempted to mediate the conflict in 1990 but was unsuccessful.

Remarkably, in July 1991 Mauritania and Senegal worked out an agreement themselves, based on recognition of their shared interests in the jointly owned dams. Even though diplomatic ties had been ruptured, the two countries managed to continue to collaborate through OMVS. The lessons the two countries had learned from their OERS experience and the fact that OMVS continued to operate during the conflict gradually eased tensions between them, initiating a process of normalization, with refugees returning to the valley and diplomatic ties resuming in May 1992.

Managing extreme hydrological events

Using their common physical and institutional infrastructure, which includes the shared collection of hydrological data, Mali, Mauritania, and Senegal work together to manage extreme events, such as floods and droughts. Hydrological data are transmitted simultaneously by satellite to

OMVS headquarters in Dakar, to SOGEM at Manantali Dam, to SOGED at Diama Dam, and to the national water companies in Bamako, Dakar, and Nouakchott. Each receiving station has the same modeling software to determine the necessary action in the event of unusual water flows. A coordinated response is critical to minimizing the loss of life and socioeconomic damage.

In 2003 the Senegal Basin experienced floods of a severity not seen in a century. Damage to the basin's economy and the impact on poverty was reduced by OMVS, coordinating the countries' technical efforts, and by using the local radio network to keep communities along the river informed. The handling of the situation contrasts sharply with that in Mozambique in 2000, where real GDP declined 23 percent after massive flooding. Much of the damage in Mozambique could have been avoided by better cooperation among the riparian countries.

Stimulating economic activity

Evidence is growing that reliable supplies of water and electricity encourage income-generating activities, making investments less risky in the OMVS economies (see boxes 2 and 4). As SENELEC's Assane Diouf notes, "Electricity is not a tangible product, it is a service made available to consumers. Permanent availability stimulates economic activities that generate income and reduce poverty among our people."

Reliable electricity and water have encouraged various kinds of entrepreneurial activities:

- Video halls for viewing large events, such as football matches, have opened in Mauritania. The average entrance fee is \$0.08 a person.
- Using water that travels 200 kilometers from Lake Guiers to Dakar's peri-urban area of Sebikotane, farmers in an area of low employment are using modern farming techniques to grow higher value off-season crops (green beans, melon, asparagus, cherry tomatoes), mainly for export to the European Union.
- Irrigation has allowed year-round cultivation and yields that are almost 50 times those of rainfed agriculture.
- In Mauritania an intensive shrimp fishery that employed local fishers was set up in 1997.
- Rice cultivation in the valley has driven the creation of small industrial units, with microenterprises providing key inputs, such as tractors and pumps.

Box 4. Keeping fish cold in Senegal

At Dakar's central fish market, the price of ice is usually \$31 a ton. But when an electrical outage leads to a shortage, the price can rise to \$33–\$37, increasing the price of fish. Seydou Diaw, a fish wholesaler in Dakar, notes, "If electricity continues to be regular—and above all if the costs are reduced and we are assisted with transport—we could deliver fresh fish every day to the smallest village in Senegal."

Environmental and social challenges

Regulation of the Senegal River has created some problems. The Diama Dam changed the ecology and livelihoods along the lower Senegal River in Mauritania and Senegal. The Manantali Dam affected traditional river recessional agriculture in Mali.

Aquatic weeds

The delta's water salinity used to fluctuate daily with the tides and seasonally with rainfall. Local communities had adapted their livelihoods to the dynamic and diverse ecosystem. Before the river was regulated, the ecosystem ensured that no single species of aquatic plant could dominate. The Diama Dam produced a uniform freshwater environment in which one species, *typha australis*, could thrive. The resulting proliferation of the aquatic weed increased the incidence of bilharzia and malaria.

Water hyacinth (*salvinia molesta*), another species of weed that bloomed in the uniform environment, was successfully controlled by introducing the weevil (*cyrtobagous salviniae*) into the Senegal delta in May 2000. It proved a very effective biological control: by April 2002 water hyacinth was no longer a problem.

Biological control does not exist for *typha australis*. The weed can be eliminated only by removing it mechanically, which is expensive and slow, or by altering the river's saline balance by allowing salt water to enter through the Diama Dam, a step that could hurt the valley's agribusinesses and reduce the area's income.

A Mauritanian company, Enterprise des Routes et du Bâtiments, won a bid issued by the Senegalese government to clear stretches of the delta in Senegal. Funded entirely by the government, the \$6.6 million program started in December 2003 and is due to last a year. Using an amphibious mower, the project has already cleared 160,000 square meters of the invasive weeds. The plan is to clear 1.3 million square meters. Productive uses for *typha australis*, as fodder and fuel, are also being researched.

Restoring lost livelihoods and the ecosystem

Work is under way along the river's length to restore livelihoods lost by the drought and the alteration of the river's flow. To restore the valley's ecological diversity and rural livelihoods, Mauritania and Senegal together established Djoudj National Park (in 1971) and Diawling National Park (in 1991) on their sides of the river. Each park covers about 16,000 hectares.

The decline of the ecosystem forced men to leave the area in search of work, leaving behind women, children, and the elderly as permanent residents. To reverse the trend, Diawling National Park aimed to integrate conservation with development. A multidisciplinary team of experts worked closely with local communities, integrating indispensable knowledge of the former ecosystem's functioning into the park's management plan. The team recognized that the pre-Diama Dam flood cycle would need to be restored for local people to resume their traditional

activities or develop new ones, such as ecotourism and market gardening. This activity would need to be supported by transport facilities, such as access roads, embankments to facilitate the economic revival, and adequate supplies of drinking water.

Market gardening proved successful in providing an alternative income source. Women organized themselves into cooperative groups, each contributing about \$2 to a joint fund. The fund provided start-up materials, such as fencing, agricultural equipment, and seeds, to each cooperative, depending on its needs. A local advisor provided technical advice for six months to see the cooperatives through the first season, after which the women managed their activities independently. The area around Birette became a major exporter of vegetables to Nouakchott and now employs agricultural workers, who receive half of the profits.

To support local fisheries, two sluice gates were added. The Berbar gate allows fish migration to and from the spawning grounds in the Diawling-Tichilitt basin; the Lekser sluice gate allows shrimp to migrate. The fishers received help to purchase fishing equipment. Focusing on the hydraulic infrastructures where fish concentrated, fishers harvested 15,000 kilograms in 1996, which sold at \$0.30–\$0.40 per kilogram. Higher water levels and more exchanges with the Diawling Basin increased the catches rose to 400 kilograms a day in 1997.

The ecosystem's regeneration also stimulated wildlife. In 1993 a waterfowl census noted 2,000 waterbirds in the park. By 1995 the figure had risen to nearly 50,000. Subsequent studies have shown a clear relation between maximum flood levels and the number of birds.

Upstream of Diawling and Djoudj National Parks efforts are being made to mitigate the environmental impact of the Manantali Dam. Under the Regional Hydropower Project, a program was designed to mitigate the environmental impacts of the infrastructure, ensure stakeholder participation in determining the transmission lines' routes through local and national coordination committees, and guarantee the annual artificial flood from Manantali under the Water Charter.

Box 5. Resolving conflicts among water users in Diawling National Park

Women's cooperatives in Diawling National Park depend on *sporobolus robustus*, a grass they use to make mats, their main source of income. For the *sporobolus robustus* grasses to achieve optimal lengths, rain needs to fall before the water body is flooded. But fishers in the park did not want to wait for rain. They wanted to flood an area within the park early, because the tilapia were ready to spawn; waiting for the rains would shorten the tilapia's growing season and reduce the fishers' income.

The two groups reached a compromise in which a thin layer of water was released to cover crucial parts of the floodplain in July; it was followed by flooding later. The women harvested grass stems that were more than 2.5 meters high, improving the quality of their mats. Selling at \$50, each mat represented two weeks labor for five women. The fishers harvested sizable catches.

Encouraging stakeholder participation

To encourage public engagement in decisionmaking, the OMVS is reaching out to stakeholders, providing for representation on the Permanent Water Commission, OMVS's consultative arm. Local coordination committees were established in Mali, Mauritania, and Senegal to allow communities to take part in decisions about the transmission line routes from the Manantali Dam.

The Global Environmental Facility (GEF) Senegal Basin Project is doubling the number of such committees in all basin countries, including Guinea. Building on existing institutional structures and experiences in the Senegal Basin under GEF's Small Grants Program, the project will facilitate microfinance opportunities by working with local communities at key sites across the basin. Guinea, Mali, Mauritania, and Senegal will each identify and prepare national priority action plans to guide improving livelihoods and managing the basin's resources.

Working directly with local communities helped resolve conflicts between water users in Diawling National Park (box 5). From the outset in 1991, respected village elders were recruited as "guards" to assist with surveillance, and the park's head of surveillance was a respected local *cherif*. Stakeholder meetings were held, but the composition and procedures were left to the village chiefs.

Increasing investment and social inclusion

The Senegal Basin countries' innovative cooperation has created an enabling climate for investments and social inclusion, opening the door to both large and small private sector enterprises. Several factors were key in creating an enabling environment for investment:

- *Commitment and political economy for change.* In their policies and declarations, the countries have repeatedly shown their commitment to change. The Nouakchott Declaration, issued by the heads of state in May 2003, calls for closer cooperation between Guinea and the OMVS countries. The Cross-Border Initiatives Program was signed by Guinea, Mali, and Senegal in 2001. National policies encourage private sector involvement through deregulation, and privatization is under way in the basin's energy sector. Regional integration is being tackled step by step. (For example, goods landing at the Dakar port en route to Mali can now land tax free.)
- *Institutional innovation.* The OMVS countries created institutions under which member countries give up some sovereignty for the basin's greater good. The countries jointly own the infrastructure. In raising funds the OMVS can commit member countries to terms it negotiates with the international financial community. The decisionmaking process is based on equality, but the benefits and burdens of development are shared equitably based on solidarity.
- *Learning and experimentation.* Since 1962 there have been three different basin organizations, their mandates evolving with experience. The CIE focused on the technical aspects of river basin development. The OERS promoted total integration based on the countries' political aspirations. Recognizing the limitations of both, the countries established the OMVS, politically less ambitious than the OERS but with a broader mandate than the CIE. The OMVS countries understood that to optimize their shared development in the basin, an inclusive decisionmaking framework would have to include Guinea—and all stakeholders. Recognizing that public participation in decisionmaking is essential, the OMVS included representatives from civil society organizations. Realizing the need for closer environmental monitoring of the basin, it has created an environmental observatory.

- *External catalysts.* The countries took advantage of the political opportunities in the postindependence drive for pan-African unity by creating basinwide institutions to jointly develop the Senegal Basin. The severe droughts of the 1970s also served as a catalyst, spurring the OMVS countries to jointly build infrastructure to safeguard their economies. The 2003 floods prompted the OMVS system to coordinate its activities with local communities along the river. Conflict in neighboring countries encouraged the basin countries to establish greater cooperation with each other.

What about Guinea?

Guinea has not benefited from the improved water and electricity supply or the institutional changes within the OMVS space (see box 2). Shortages of electricity and water are common, seriously handicapping economic activity and making life hard for households. As a result, the Guinean government is seeking to establish stronger links with its neighbors in the Senegal Basin.

The weak investment climate in Guinea has hampered growth. With more than 30 percent of the world's known bauxite reserves, Guinea has been the second largest producer after Australia since 1971. But foreign investment is low, due to uncertainties about the fiscal and policy regime for major investments. In the 1990s the water and electricity sectors were opened to private investment, but the Guinean government nationalized them in 2001. According to Mohamed Said Fofana, director of the National Directorate of Trade and Competition, "Guinea had broken up the state monopolies in all sectors and liberalized the energy sector. However, it was necessary to rescind this decision for the energy sector because it is very strategic and the government was not satisfied with the sector's liberalization." Guinea Electric (EDG) was created after the dissolution of the private companies. Although EDG follows commercial rules, it is a public sector entity. The government intends to involve the private sector once again, using the build-operate-transfer (BOT) approach.

Guinea, despite its location in an area where average rainfall is 4 meters a year and 14 international rivers originate, is again experiencing water and electricity shortages. According to Sidy Diallo, a spokesman for EDG, the shortages are due to weak rainfall in 2002. Before 1997 Guinea had outages that paralyzed economic activity. Production capacity increased following construction of the Garafiri generating station (which cost more than \$200 million, or nearly a third of the country's annual budget) and the Tombo III thermal stations, which add 44 MW of power.

Neither station is functioning at full capacity, however, and they are unable to meet Guinea's demand of 138 MW a day. In January 2004, after several months of electricity shortages, with EDG struggling to supply 26 MW, the government had to spend 5 million Guinean francs (\$2,494) a day on fuel to ensure the regular supply of electricity in the country's large urban centers. The expenditures had repercussions for the balance of payments and government budget. The government has called on the private sector to assist in dealing with the

shortage. The Guinean company Futurelec will invest \$8.9 million in the energy sector to buy a new thermal generating station and to repair the Tombo station.

Guinea is looking to strengthen its ties within the Senegal Basin and beyond. Its participation in basinwide decisionmaking will create more cost-effective opportunities to augment existing energy supplies, which could boost the basin's development. Participation would complement the forthcoming West African Power Pool, which is to work on priority issues, such as connecting the Mali and Côte d'Ivoire grids. Because Manantali's production will be saturated by 2005–06, studies are exploring other ways to tap the Senegal River's hydropower potential. Creating dams at Félou and Gouina could potentially add 100 MW of power at each site.

Against the broader background of the New Partnership for Africa's Development's (NEPAD), the four Senegal Basin countries are looking to strengthen their integration through partnerships with each other, with the international community, and with the private sector. Recognizing that a basinwide institution is needed to tap the basin's full development potential, they are already moving toward an inclusive framework for decisionmaking on water management.

The four basin countries have already collaborated in preparing the GEF project on the Senegal River Basin. Significantly, the OMVS was designated as the recipient and executor of the GEF grant, on behalf of the member countries and Guinea. As an indication of its political commitment to cooperate, Guinea was invited to attend the OMVS Heads of State meeting in Nouakchott in May 2003, which Guinean Prime Minister Lamine Sidime attended on behalf of President Lansana Conté. A joint declaration was issued articulating the desire to establish an inclusive framework for managing the Senegal River Basin. Outside OMVS, Guinea, Mali, and Senegal drew up the Cross-Border Initiatives Program in November 2001 to improve trade between the countries by harmonizing customs, facilitating the flow of traffic and people, and joining forces in the fight against HIV/AIDS.

Lessons from the Senegal Basin initiatives

Cooperative development of the Senegal River has benefited the economies of Mali, Mauritania, and Senegal by increasing the reliability of electricity and water. Widespread perceptions of improved services are driving further cooperation within OMVS—and beyond, to Guinea. Although the process is far from over, lessons can be drawn from the Senegal Basin's experience in collectively addressing poverty:

- *Grasp opportunities through cooperation.* The success of Mali, Mauritania, and Senegal in collectively raising external investment for their joint infrastructure shows that more can be done with less if parties cooperate rather than act unilaterally. Even natural disasters, such as the severe droughts of the 1970s, can bring opportunities for change, by focusing attention on key issues. Mali, Mauritania, and Senegal combined national efforts to address the crises with regional ones, facilitating joint operations. Together with the oil crisis of the early 1970s, the

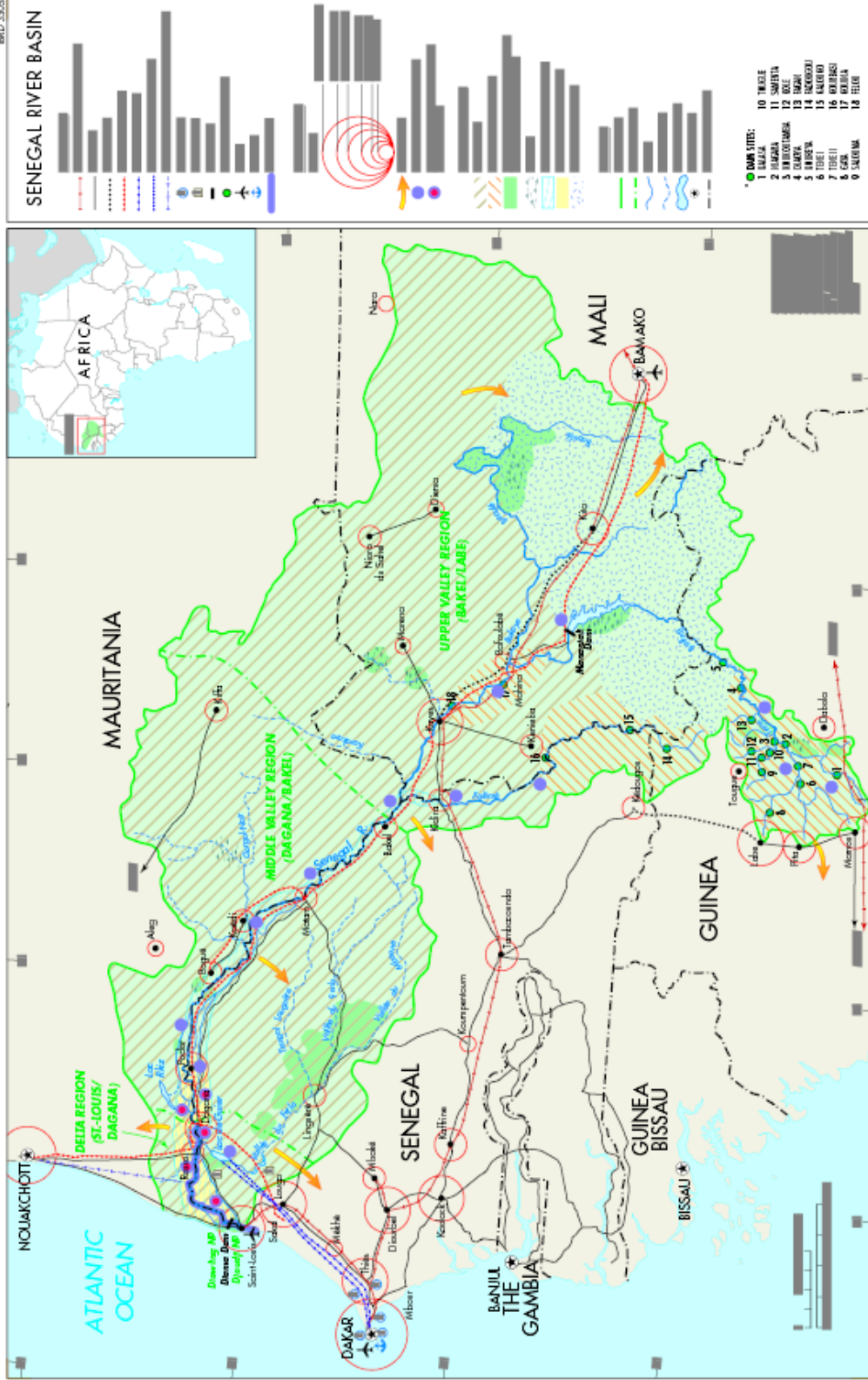
droughts made the countries recognize that they had to jointly develop their shared water resources to mitigate the effects of external shocks on their economies.

- *Engage top political leaders.* From the outset, the basin countries' political leaders committed to jointly developing their shared water resources. The political commitment manifested itself in meetings of heads of state, innovative legal conventions, and joint development and ownership of infrastructure. Political will is fundamental to engendering trust between basin countries and with key partners in the international community.
- *Develop a shared vision for development.* Regional approaches can optimize development of a basin's resources by providing the basin countries with new opportunities and by addressing national limitations and priorities. From the outset, development of the Senegal Basin was based on a plan that reflected country priorities that could be met only through a regional approach.
- *Engage all stakeholders.* To tap regional opportunities, stakeholders at all levels—from governments to communities—need to participate in identifying and developing opportunities and sharing benefits. All four basin countries have maintained a dialogue since OMVS's creation, leading to the current discussions on establishing an inclusive framework for managing the basin's resources. Stakeholder participation in the basin's water resource management has been encouraged by the establishment and expansion of OMVS's Permanent Water Commission.
- *Examine the impacts of infrastructure at the local, national, and regional levels.* As the Senegal Basin countries are discovering in Djoudj and Diawling National Parks, income-generation activities and other outcomes can come from sectors not usually included in impact assessments, such as the environment, fisheries, and recessional agriculture.
- *Bind cooperation with legal instruments.* Successful cooperative processes are underpinned by mutual trust and political commitment, but legal instruments capture the agreements and bind future cooperation. Building on the region's tradition of cooperation, the basin countries signed conventions that were remarkable expressions of international cooperation based on equity, solidarity, and equality. The legal instruments remain open to Guinea's joining.
- *Promote private sector involvement.* Private sector involvement can boost the flow of funds needed to access opportunities and help transfer knowledge to the public sector. Providing an enabling environment for the private sector requires options that target the full range of private sector actors, from market women to large companies. The Senegal River Basin countries understood that having more reliable supplies of water and electricity reduces the risk on investments by small entrepreneurs in the basin. They also understood that national and regional policies necessary to get private companies involved in key sectors. It is critical to maintain a consistent policy for private sector involvement.

Abbreviations

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| CIE | Interstate Committee (for Management of the Senegal River Basin) |
| EDG | Guinea Electric (utility) |
| EDM | Mali Electric (utility) |
| GEF | Global Environment Facility |
| OERS | Organization of the Coastal States of the Senegal River |
| OMVS | Senegal River Basin Development Organization |
| SENELEC | Senegal National Electric Company |
| SOGED | Diana Dam Management Company |
| SOGEM | Manantali Dam Management Company |
| SONEES | Senegal National Water Company |

Map 1. The Senegal River Basin



Source: World Bank. [Need new copy of map with legend text].