

SENEGAL – ESTABLISHING A TRANSBOUNDARY ORGANISATION FOR IWRM IN THE SENEGAL RIVER BASIN CASE #45

This case describes the institutional and legal infrastructures created by 3 out of the 4 riparian states of the Senegal River basin namely Mali, Mauritania and Senegal to jointly manage the water resources to meet their socio economic development needs and ensure the integrity of the environment. Guinea the fourth Member State, did not join because of political reasons. It presently has an observer status

Description of Case

The Senegal River is about 1800 km long with a basin area of 289 000 km² and a mean annual runoff of 24 billion m³. The population of the basin is about 16% of the total population in the three countries. The basin has seen considerable migration of people in view of worsening drought and desertification which the region has been subjected to in the past two decades. Annual rainfall varies from 800 to 200 mm over the basin, with high variability between wet and dry season and also from year to year. The past two decades has witnessed a phenomenon of decreasing mean annual rainfall as in the rest of West Africa, particularly the Sahel region. The environmental threats include persistent drought, desert encroachment, loss of arable and pasture land, and pollution from industrial and domestic wastes. The potential of the basin include 375,000 ha for irrigation and 200MW for hydropower generation and navigation is 900 km.

To address the problems and to realize the potential of the basin, the Senegal River Development Organisation (OMVS) was established by the three of the four riparian states in 1972. The aims were to jointly:- (i) promote inter-country co-operation; (ii) co-ordinate technical, economic studies and other activities related to the Senegal river development such as navigation, irrigation, hydropower generation, environmental protection and conservation. (iii) regulate river flow for irrigation, navigation, flood control, power generation, domestic and industrial water supply and other purposes.

The Secretariat is financed jointly by the three countries following an agreed formula. Also the loans for the two dams are being repaid on a formula based on the proportion of benefits of the project to the three countries. Presently power is being generated. It is being supplied to Mali and it is about to reach Mauritania and Senegal. The irrigation is in the hands of local communities who are organised and assisted with finance and other facilities to carry out their farming activities.

Lessons Learned

This successful project offers many valuable lessons:

- The declaration that a shared basin is an international one, and must be jointly managed by the riparian states as a common resource for their equitable benefit helps to create a common vision among the states, and encourages their co-operation and need to consult in managing the water resources for socio-economic development and the maintenance of environmental integrity anywhere in the basin.
- If not all the riparian states are able to participate in the programme, it is expedient to start the process with those who are can with a view of eventually obtaining full participation.
- The Convention establishing a river basin organisation needs to focus on integrated regional development of the riparian countries using the management of the common water resources.
- The provisions should be flexible and forward looking
- It is important when building infrastructure to be clear about the geographical area it is going to serve and who the beneficiaries will be.
- The Conventions which were put in place to define in Status of the Common Works and their modalities for financing provide useful lessons about establishing the interest of Member States right from the beginning.

- The environmental issues should include the maintenance of the integrity of the aquatic ecosystems as well as specific environmental impacts from infrastructure
- A river flow simulation model is useful for planning, and for maximising operations of facilities. It can also be used as a decision support tool as for the Permanent Water Commission.
- The establishment of a credible regional planning and development programme early in the life of the organisation enables it to focus on implementation rather than spending too long carrying out studies.
- Commitment of Member States is easier to obtain when they are aware that their financial sacrifices will soon lead to physical development.
- Projects will take time to become viable economically and financially, and Member States need to appreciate that they will be responsible in servicing debts which the organisation may owe.
- The provision of knowledge, infrastructure, information, markets and finance are important for local people to succeed. The institutional arrangements to get water users like farmers involved should take account of these.

Importance to IWRM

The case demonstrates how an institutional and legal infrastructure can be built in stages from the time of regulating the flow of a shared water resource to the time of managing it and making it available to various sectors in the riparian member states to the stage where water is used for farming, power generation, navigation, etc. and to meet ecosystems needs and combat negative impacts of development on the environment.

Main Tools used

- A1.2 Policies with relation to water resources
- A3.1 Investment policies
- B1.2 Transboundary organisation for water resources management
- B1.6 Service providers and IWRM
- C6.1 Regulations for water quality
- C6.2 Regulations for water quantity

MAIN REPORT

1. Background and Problems

The Senegal River Basin is shared by Guinea, Mali, Mauritania and Senegal. It has a total surface of 289,000 km². Its main tributaries are the Bafing, the Biakoye and the Faleme Rivers. The Senegal river takes its source from the Futa Jalon mountains in Guinea and enters the Atlantic Ocean at St. Louis in Senegal.

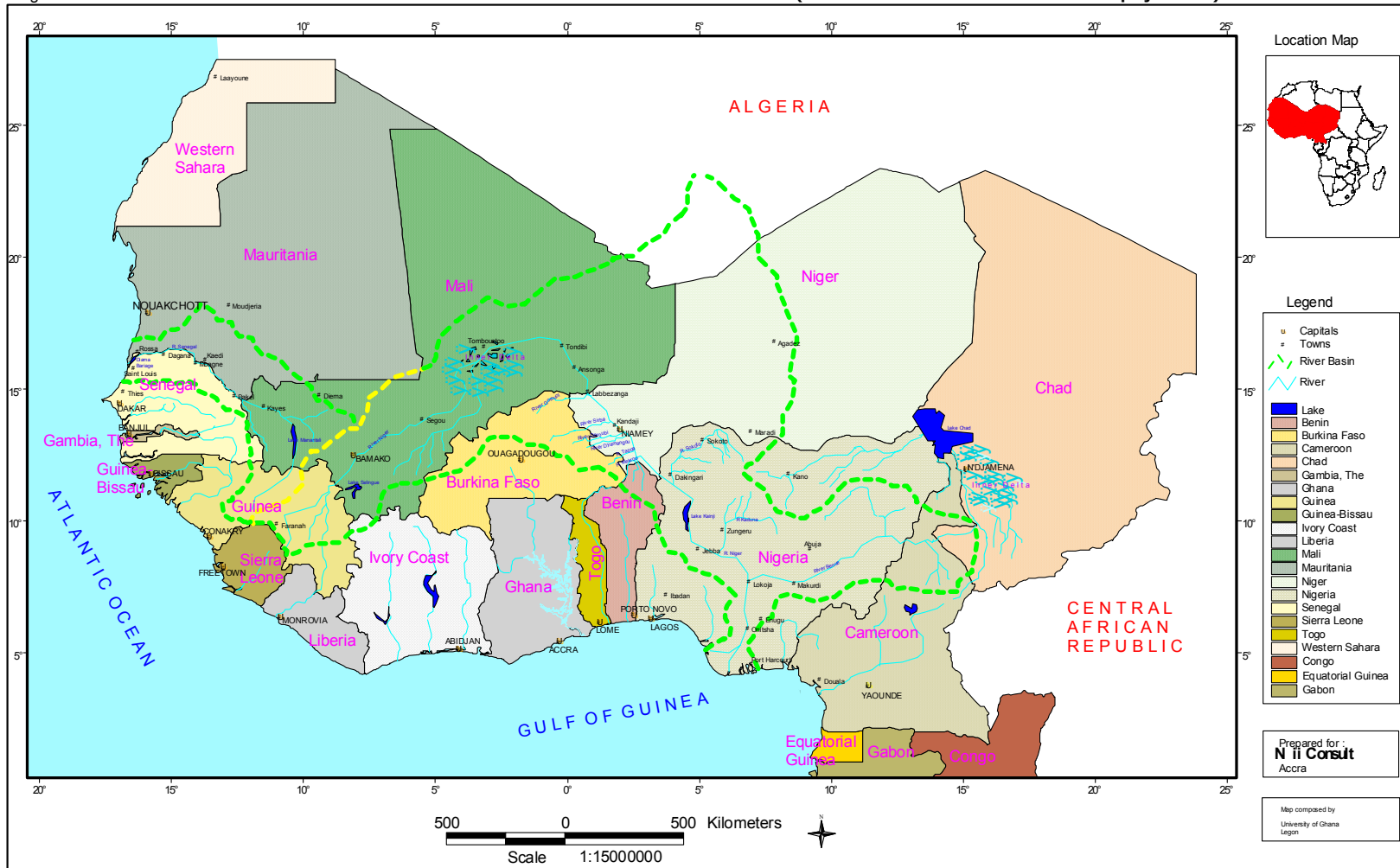
The OMVS Member States viz Mali Mauritania and Senegal share 90% of the area of the Senegal basin with 10% taken up by Guinea. About 16% of the population of the countries are estimated to live in the basin. See Fig.1. Guinea the fourth riparian country did not join because of political reasons. It now has an observer status and it is expected that it will become a member in the not too distant future.

Mean annual rainfall varies from 800 to 200 mm over the basin. The mean annual flow is about 850 m³/s, corresponding to an annual volume of 24 billion m³. Mean monthly flows vary between 3,320 m³/s in September in the wet season and 9 m³/s in May in the dry season. Flow is very variable and in addition to variability between the wet and dry season there is inter-annual variability. The variation in average annual flows between the most humid and the most dry years has been estimated to be in the ratio of 6 to 1. This inter-annual variability of floods used to constitute a serious constraint to agricultural production in the valley.

The environmental threats include persistent drought, desert encroachment, loss of arable and pasture land, and pollution from industrial and domestic wastes.

Fig 1.1

MAP OF WEST AFRICA SHOWING NIGER AND SENEGAL RIVER BASINS (Tributaries and locations of some selected project sites)



Development Potential and History of Co-operation to Develop Basin

The potential of the basin include 375,000 ha of irrigable land (of which 240,000 ha is in Senegal, 126,000 ha in Mauritania and 9,000 ha in Mali); livestock rearing; 800 MW of hydroelectric power; navigation all year round from Kayes to St. Louis (900 km), floods and drought control and mitigation, mining of iron ore, phosphates and copper. It was clear to the Member States that regulation of the river downstream and upstream would lead to increased production in the agricultural, industrial, transportation and energy and health sectors. The co-operation to develop the basin on an integrated basis started in the colonial era when the Senegal River Basin Development Mission was set up in 1935. Achievements were limited until the countries gained independence in 1960s. After independence, the four countries (Guinea, Mali, Mauritania and Senegal) signed the Bamako Convention in 1963 for the global development of the Senegal River Basin. Under this Convention the Senegal River was declared an international waterway in 1964 and an Inter-States Committee realized the need for the Senegal River to be accorded and international river status and to regulate the river upstream by building a storage reservoir.

To achieve the goal of integrated development of the basin a regional development plan was developed over the years (1963-1972). This plan defined the objectives, areas of emphasis to achieve the objectives, the productive activities to be promoted, the needs for regional and national economic integration, and corresponding integrated management of the water resources.

2. Decisions and Actions Taken

To implement the Developments which were conceived between 1963-1972, the Heads of State and Government in 1972 to decide to terminate the 1963 Convention on the global development of the Senegal River Basin. The purpose was to replace it with an organisation and charge it to raise the necessary resources to build the common works, exploit works to meet production in the social and economic sectors, and ensure that the environment retains its integrity.

2.1 Policy and Objectives for Co-operation

The policy and objectives of co-operation and how to achieve them were set out in two key enabling Conventions and signed by Mali, Mauritania and Senegal on March 11, 1972. These were contained in the:-

Convention on the Status of the River Senegal (March 1972)

The tool for setting the goals of water use, protection and conservation- A1.2- was applied. This Convention defined the Senegal River together with its tributaries as an international river on which navigation is free and the users are accorded equal treatment. This created the river and its basin as a common resource to be managed jointly by the Member States. The Convention also provided that: "No Project likely to noticeably modify the characteristics of the river regime, its conditions with respect to navigability, farm or industrial exploitation, the sanitary quality of its waters, the biological characteristics of its fauna or flora (biota), its water level, cannot be carried out without prior approval by the contracting states and subsequent to discussions and justifications of possible objections". This article allows the elaboration of a legal instrument for the pollution, allocation of water for the aquatic environment and also for maintenance of minimum water levels for navigation. A further provision was made to the effect that a number of special conventions (defining the conditions regarding construction and operation of structures of common interest) shall be signed by the three Member-States. This provision helped the Conference of Heads of State and of Government to approve in 1979 and 1982 the legal instruments relating to Diama and Manantali Dams respectively.

Convention to establish OMVS

This is an example of using the tool for establishing a transboundary organisation for water resources management (B1.1).

The goals of the Organisation were the application of the 11 March 1972 Convention on the status of the Senegal River; the promotion and co-ordination of studies and construction of works for the development of the Senegal River basin and joint action by the Member States in all technical and economic missions.

To achieve the goals, the organization was given legal existence and was endowed with the capacity to conclude contracts; to acquire and dispose of chattels and real assets as may be necessary for its normal operation; to receive donations, subsidies, legacies or other concessionality; and to subscribe to loans.

The Council of Ministers is the legal representative of the Organization and can delegate to the High Commission powers to conduct the above listed legal activities.

Under the Objectives, the Organisation is charged with:-

- 1) Development of policy;
- 2) Planning and programming of construction works;
- 3) Execution of studies and construction works relating to the regional infrastructure
- 4) Management of the regional infrastructure headworks;
- 5) Utilization of water resources;
- 6) Allocation of the Senegal River Water Resources;

2.2 Creation of OMVS

Following the signing of the Conventions on the Status of the Senegal River and the establishment of the OMVS in January 1972 the following actions were taken, namely to establish and operationalise the Statutory Agency the mobilization of resources for pre-investment studies, and the adoption of Conventions on common works. The IWRM tools used were mainly those of institution building, legal provisions for carrying out stated functions and capacity building particularly of staff.

This was carried out with bilateral assistance grants from (USAID, France, Italy) and with UNDP grants under institutional support for the organisation. Some of the grants were in the form of technical expertise to backstop the activities of the OMVS departments and build up their capacity. The organizational structure of the OMVS consisted of:-

- *Conference of Heads of State and Government*
The OMVS is placed under the supreme authority of the Conference of Heads of State and of Government which is responsible for the general policy orientations of the organisation.
- *The Council of Ministers*: Planning and supervision body of the Organization. It elaborates the global development policy for the Senegal River Basin with respect to the exploitation of its resources.
- *The High Commission*: The convention, “the High Commission has been set up as the organisation’s executing body”.
- *Co-ordination and Consultation bodies*: Consultation has been institutionalized with the establishment of specialized advisory bodies sitting with the Council of Ministers and composed by representatives of the Member States.
- *The OMVS Consultative Committee*: This was established in July 1976. The mission of the Consultative Committee is to assist the OMVS High Commission to find ways and means to implement the organization’s programme, namely, to mobilize the required financial and human resources; Its role is advisory.
- *The Permanent Water Commission*: This is one of the most important organs established by the OMVS from the IWRM point of view as described in paragraph 2.4.3

2.3 Pre-investment Studies, Financing and Execution of Common Works

Side by side with the establishment of the High Commission, the organisation set out to mobilize funds to complete studies and also pre-investment studies started by the Interstate

Committee from which it took over in 1972. By 1974 \$12 million had been mobilised for prefeasibility studies, \$20 million on the engineering studies of the Diama and Manantali Dams. For the construction the dams a financial package of \$700 million was raised from bilateral and multilateral financing sources.

Adoption of Conventions on Common Works

In the Development plan for the basin certain projects were planned for execution as Common Works which were considered critical for the regulation of the Senegal River for integrated water resources management to meet the regional development needs of Member States.

To accomplish this, two Conventions were prepared and signed on 21 December 1978 and 12 May 1982 respectively to define the Status of the Jointly Owned Structures (Common Works) and also their Financing Modalities. The policies to be followed to invest in the common works are formulated with Tool A3.1(Investment policies)

i) The Convention on Status of the Jointly Owned Structures

Defined Joint Ownership and the structures constituting the joint ownership (the Manantali Dam; the Diama Dam; the River-sea port of Saint Louis; the River port of Kayes); and also Management of the Jointly Owned Structures.

ii) The Convention on Financing Modalities for the Jointly Owned Structures

An elaboration of one of the enabling articles in the OMVS establishment Convention of 1972, provided that for the purpose of constructing or operating the jointly owned structures, the OMVS may resort to the following financing arrangements:

- contributions by the organisation's Member States;
- loans contracted by the Member States and on lent to the Organisation;
- guaranteed or unguaranteed loans contracted by the Organization;
- grants and subsidies to the organization.

The two main regulation structures viz:

Diama Dam was constructed between 12 September 1981 and 12 August 1986 with the maintenance period expiring in March 1988.

Manantali Dam was constructed between June 1982 through 31 March 1988. The maintenance period expired in 1990.

Costs incurred under the two dam construction works amounted to CFA F 180 billion (US \$ 620 million under 1981 economic conditions) and were financed by Saudi Arabia (Saudi Fund), Kuwait (Kuwait Fund), Abu Dhabi (Abu Dhabi Fund). The OPEC Fund, the Islamic Development Bank (IDB), Italy, France (for Diama only), the Commission of the European Communities (CEC), the ADB Group, Canada, USAID and the UNDP.

2.4 Integrated Development of the Senegal River Basin

After the completion of the Dams, the following actions had to be taken to realize the benefits of the flow regulations:-

- Establish mechanisms and procedures at regional and national levels for integrated socio-economic development.
- Set up agencies to manage the common works (barrages) and associated works in terms of operations, maintenance and renewals.
- Operationalise the Permanent Water Commission.
- Establish a Unit to deal with the environmental problems created by the construction of the dams, creeping desertification and land degradation of the headwaters of the Senegal River in the Futa Jalon mountains.

The tools used to implement this decision were essentially institutional instruments. They are briefly described below as subsidiary organs of the OMVS to provide specific services. Tool B1.5 (Service providers)

Establishment of Regional and National Planning Committees

The Regional Planning Committee was created as a consultative body of the OMVS Council of Ministers to co-ordinate and integrate national sectoral activities within the framework of an overall regional economic integration perspective.

At the country level National Committees were set up to liaise with the regional committee, coordinate public and private investment in agriculture, industry, navigation, energy, etc. and assess the impact of development on the socio-economy and ecology of Member States.

***Management and Exploitation of the Common Works:
the Diama and Manantali Dams***

In order to manage and exploit the common works, the following agencies were created by Convention dated 7 January 1997:- As can be expected the tools used are institutional and legal.

i) Convention for Creation of an Agency for the Management Operation of the Diama Dam

Under Article 3, a company by name Societe de Gestion et d'Exploitation du Barrage de Diama (SOGED) was created and given the exclusive right to sell the water of the Senegal River for various uses except for the production of electricity. However, the principles and mechanisms of fixing water tariffs and the commercialization of water and the services rendered by SOGED are to be agreed upon by the Member States.

ii) Convention for the Creation of an Agency for the Management of Energy from Manantali Dam

Under Article 3 a company for the production of energy at Manantali called Societe de Gestion de L'Energie de Manantali (SOGEM) was created to operate and maintain the common works for the production and transmission of electrical energy. SOGEM is allowed to carry out its functions by itself, or through individuals, legal entities in the public or private sector. Principles and mechanisms for establishing tariffs and the commercial of energy and other services rendered by SOGEM are to be agreed upon by Member States.

Integrated Management of Water Resources for Socio-economic Development and Ecosystem Needs

To meet the requests for water to meet social and economic development and maintenance of ecosystem integrity as recommended by the Regional Planning Committee with the support of the National Committees, the work of the Permanent Water Commission established under the 1972 Convention came to the fore. Here regulatory tools (C6.1) for water quality and (C6.2) for water quantity are used.

i) Permanent Water Commission

The allocation of water or apportionment of water to meet various needs viz irrigation, power, industry, health and nature etc, is handled by the Permanent Water Commission under the Council of Ministers. This Commission meets three times in a year to discuss and arrive at the best way to use the water from Manantali and Diama Dams. The advice is based on the demand for irrigation water at Bakel in the irrigation season, and therefore the amount of water that must be released from Manantali Dam to satisfy the demand. Similarly Diama is advised about the water level it must maintain behind the dam to enable farmers have water for their irrigation and other farming activities.

The Commission also advises on the sanitary conditions in the river as it affects the biological characteristics of the flora and fauna.

The forecasts of the Permanent Water Commission are made using a River Flow Simulation Model as a tool. The simulation model is operated by OMVS with the assistance of ORSTOM. The details of the flow simulation model including documentation are presently with ORSTOM and are yet to be handed over to OMVS. OMVS has a data collection, transmission, processing, archiving, retrieval and dissemination system, it has developed with ORSTOM and

the Member States. The data is used for simulation of flow to forecast flow at various stations along the river, such as Kayes and Bakel.

ii) Environmental Impact Mitigation and Follow-up

After the construction of the dams a number of environmental problems arose such as proliferation of weeds (Eg. water hyacinth); water borne diseases (Eg. schistosomiasis, guinea worm, mosquitoes); loss of breeding grounds for birds; soil salination, etc.

To deal with the environmental problems a Department for Environment has been established in the Secretariat of the Organisation.

The environmental programme consists of seven parts as namely:-

- Mitigating the impacts of the energy project;
- Adaptation of affected persons;
- Study of optimization of the management of the reservoirs;
- Environmental health;
- Accompanying measures for rural electrification, micro projects to generate revenue;
- Co-ordination of the studies;
- Environmental monitoring.

The amount of US \$18 million has been mobilized to finance an "Environmental Impact Mitigation and Follow-up programme. It will be used on environment associated measures and studies on the negative impacts of the constructions so far undertaken and to deal with other environmental issues.

3. Outcomes

The following are the key outcomes of the co-operation.

3.1 Benefits

- With the management of the flood waters behind the Manantali Dam and the control of sea water intrusion at the Diama Dam, hydroelectricity is generated at Manantali from one out of five turbines with a total capacity of 200 MW. Presently power is being supplied to Bamako (Mali) while the transmission lines and sub-stations to connect to Nouachott (Mauritania) and Dakar (Senegal) are nearing completion. It is estimated to start supplies to the remaining member states by middle 2002.(Update this statement-has this been done?) The agency responsible for managing Manantali is SOGED.
- Irrigation water is supplied to the Valley and Delta areas for farmers to irrigate their farms in the dry season or to supplement rain water in the poor wet seasons. SOGEM is the agency to manage Diama. The water is supplied to SAED, SODAGRI and SONADER which are public, private companies operating in the basin since 1965, 1974 and 1975 respectively. These organizations acquire land, develop them, share the land and water to various Irrigation Water Users Associations including livestock farmers. The farmers are supported with information, infrastructure, market access and credit. SAED and SODAGRI operate within Senegal while SONADER operates within Mauritania.
- Domestic and industrial water supply to towns and villages by the control of sea water intrusion into the river.
- River navigation from Bakel to St. Louis. The port and other landing and navigation infrastructure are being upgraded.
- Flood control in the upper valley and delta areas of the basin. When forecasts are not good they lead to unexpected flooding with serious consequences as occurred in 1994 at Manantali and in 1998, 1999 at Diama.
- Release of water for ecosystem functions in the Delta area which has been environmentally disturbed by the building of the Diama Dam.
- The Permanent Water Commission established in 1978 has been provided with Regulations to support it, to advise and make recommendations on:-
 - Principles and modalities for the fair distribution of the Senegal River waters between Member States on the one hand, and on the other, between water use sectors (power, irrigation, navigation), before and after the river training.
 - The construction of water utilization infrastructure of development projects likely to sensibly modify characteristics of the Senegal River flow, its conditions of navigability,

- agricultural or industrial exploitations, sanitary condition of its waters, biological characteristics of its fauna and flora, its water level;
- Regulating the fair use of water after river training.
- Control over the utilization of the Senegal River waters with respect to quality and quantity before and after the river training.”

3.2 Problems

The following problems have arisen since the two dams were constructed.

Cost recovery and loan repayment

Since the successful mobilization of funds to put up the common works at Diama and Manantali, it has taken more time to mobilize funds to complete the infrastructural works to exploit fully the benefits brought about by the two dams. For instance, it has taken over 10 years for the power generation and supply component to be realized even if partially. The irrigation development has gone on too slowly, for out of a potential of 375,000 ha only about 10% of it has been developed. The price of imported rice and sugar are lower than those produced by the local farmers and factories. The flow of benefits have accordingly been delayed. Revenue to pay for loans has also been delayed and the burden is being borne by the Member States.

Political:

Another problem which has delayed the mobilization of funds to keep activities on programme is the political and ethnic conflict which occurred between Mauritania and Senegal.

Environmental:

Probably this is the most serious one facing the OMVS. It consists of:-

- Water borne diseases – schistosomiasis, guinea worm, mosquitoes, etc., proliferation of water weeds such as water hyacinth, pistia and salvinia.
- Land degradation (due to loss of vegetation, erosion and sedimentation in the headwaters of the river in Guinea.
- Encroachment of the desert southward due to population pressure.

4. Lessons learned and replicability

Many of the rivers in the West African region are shared. Four of them have RBOs for co-operation. The economic integration policies which the countries are presently pursuing will require that they co-operate in the use of the natural resources particularly water resources to support their developments. It will be necessary that those countries which are yet to co-operate through RBOs are made aware of how countries in similar situations have successfully solved their problems. The OMVS has been more successful than the rest of the RBOs in the sub-region and the African region, and the following lessons can be of value to other countries facing similar problems.

The following lessons can be noted:-

- The declaration that a shared basin is an international one, and must be jointly managed by the riparian states as a common resource for their equitable benefit helps to create a common vision among the states, and encourages their co-operation and need to consult in managing the water resources for socio-economic development and the maintenance of environmental integrity anywhere in the basin.
- Where all of the riparian states are unable or unwilling to participate in the transboundary basin institutions, then it is expedient to start the process with those who are able to participate with a view of eventually obtaining full participation.
- The Convention establishing a river basin organisation need to focus on integrated regional development of the riparian countries using the management of the common water resources. The provisions should be flexible and forward looking so that the institutions and the legal arrangements to achieve the management objectives are put in place as and when progress is made with implementing the development plan. The timely establishment of the following institutions is worthy of note:-

- The Permanent Water Commission for water allocation;
 - SOGED for the management and exploitation of the Diama works for irrigation, navigation, domestic and industrial water supply;
 - SOGEM for the management and exploitation of the Manantali works for hydro-electric power generation.
 - The Regional Planning Committee;
 - The National Planning Committees.
- It is important when building infrastructure to be clear about the geographical area it is going to serve and who the beneficiaries will be. This helps to allocate costs for pre-feasibility and feasibility studies in a manner satisfactory to the Member States.
 - The Conventions which were put in place to define in Status of the Common Works and their modalities for financing provide useful lessons about establishing the interest of Member States right from the beginning.
 - The environmental issues should not be seen within the narrow limits of mitigating the impacts of construction of the various infrastructures, but should include the maintenance of the integrity of the aquatic ecosystems as in the Delta area (habitat for migratory birds) and the terrestrial ecosystem (the vegetation cover in the Futa Jalon mountains in Guinea).
 - A river flow simulation model is a tool that needs to be developed for the river, so that it can be used for flow forecasting at various stations of the river and also in evaluating the response or impact of various development scenarios on the river flow. This is useful for planning, and for maximising operations of facilities. It can also be used as a decision support tool as for the Permanent Water Commission.
 - It is important that a credible regional planning and development programme is established early in the life of the basin organisation so that it becomes focused on its implementation and not spend too long carrying out studies. Commitment of Member States is easier to obtain when they are aware that their financial sacrifices will soon lead to physical development.
 - Contrary to expectations, projects will take time to become viable economically and financially. During this period, it is important for Member States to appreciate that they will be responsible in servicing debts which the organisation may owe.
 - The provision of knowledge, infrastructure, information, markets and finance are important for local people to succeed. The institutional arrangements to get water users like farmers involved should take account of these.

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