



ORGANIZATION FOR THE DEVELOPMENT OF THE SENEGAL RIVER BASIN (OMVS) AND INTEGRATED WATER RESOURCES MANAGEMENT (IWRM):

WHAT BENEFITS AND DIFFICULTIES OF THE OMVS FOR IWRM IN SENEGAL?

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Abstract

This article describes how the role of integrated approach to water resources management (IWRM) for the use of water resources socially equitable, economically efficient and environmentally sustainable and provision of water services is linked to, and can be used as a tool to fight against poverty in Senegal. This present paper is concerned with the consequences of adoption of an IWRM approach to reducing poverty in Senegal, and demonstrates links between the concept of IWRM and poverty. The methodology adopted in this study is based on the collection of data and information from available sources and statistics (organisms and Internet). The results show that Senegal, country located at the extreme west of African continent has many constraints of political, social, economic and environmental hampering the good management of available water resources. These constraints focus on the sectorial approach of water management, the immobility of actors of this management, overlapping responsibilities, lack of financial mains, inescapable scarcity, the constant degradation and the unequal distribution of water. Consequences are dramatic and contribute significantly to the impoverishment of population. Unlike the fragmented water management which has negative impacts on the lives of poor, IWRM approach is an important strategy for reducing poverty. Although poverty reduction is a complex issue requiring targeted actions and specific strategies, water is a major component, and many aspects of IWRM approach are relevant to poverty reduction by maximizing welfare economic and social being.

Key words

Management, Water resources, Basin organization, Arrangements, Senegal River Basin

INTRODUCTION

Water is a major issue for sustainable development. Indeed, as Klaus Toepfler, Director General of United Nations Environment Program (UNEP), « *water is closely linked to health, agriculture, energy and biodiversity. Without progress in the field of*

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water, it will be difficult or impossible to reach the other Millennium Development Goals » (Kouam Kenmogne GR *et al.*, 2006). Faced with the combined pressures of increasing demand and the continuing deterioration of water quality, past management models are no longer sufficient for the task; it is now necessary to break out of the technological mirage and rethink in depth the approaches that will satisfy human needs while maintaining the quality of the natural systems that support the very existence of the human community (Burton, 2001). Many developed countries have understood this and have taken action to manage their water resources efficiently (UN-WATER / WWAP, 2006). In this regard include the European countries that have increased their shares and reinforced ed their political and economic commitments to the implementation structures management (Water Framework Directive; International Office for Water; International Network of Basin Organizations...). This allowed the implementation a balanced management of aquatic environments throughout the watershed (by involving users, experts and local politicians), the fight against pollution, floods and mudflows, improved warning systems and coordination of decision-making bodies. On the other hand, developing countries, although engaged in reforms to achieve national and international goals for integrated water resources management, have unfortunately not been equally successful. Thus, the challenges of water management in these developing countries are numerous: providing drinking water to the population; maintain water quality; create an interactive dynamic water management framework; prevent natural disasters and rationally allocate water resources. In Senegal, in the context of water resources management, the disparities observed both in the distribution of water resources and in their quality are indicative of enormous challenges. Added to this is the need to satisfy growing demand, environmental protection, compliance with regional and international obligations.

Given the degree of dependence on natural resources, it is therefore urgent to put in place a logical management framework that contributes to meeting these water challenges and optimizing the contribution of water to sustainable development. In the Senegal River Basin, the Senegal River Development Organization (OMVS) was set up on March 11, 1972, to implement a program of integrated and concerted management of water resources and ecosystems for a number of years, sustainable development of the basin. In Senegal, as in other state's residents and members of the OMVS, the body Its mission is therefore the safeguarding of the Senegal River, its tributaries and their catchment basins as well as the integrated management of its resources (OMVS, 2002a). The OMVS has as ambition to establish a global vision of the development of the Senegal River Basin integrating the different sectoral objectives, sometimes antagonists, such as hydropower, navigation, development of drinking water and sanitation, transport, rural development, mining and industry, in s based on a thorough analysis of the water resources of the basin and the ecosystems that depend on it.

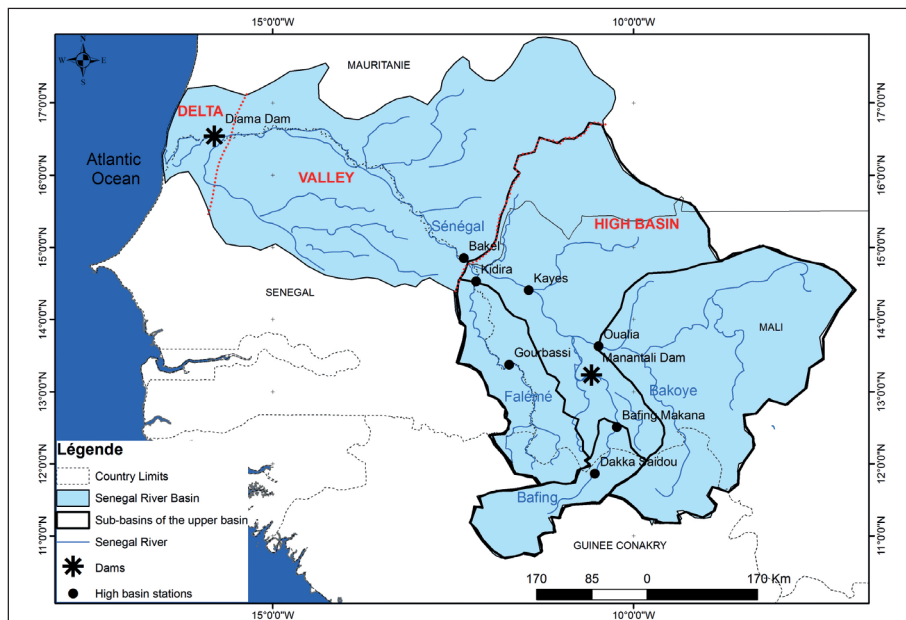


Figure 1 Location of the Senegalese part in the Senegal River Basin

Unlike Guinea and Mali with which it shares the OMVS, Senegal, like Mauritania, has most of its water resources in the Senegal River. In the principles that govern the current distribution of water resources by state within the OMVS, Senegal benefits from 1380 million m^3 / year (of which 4.9% for domestic use, 90.7% for agriculture and 3% for the industry) on a past average annual volume of about 20 billion m^3 at the Bakel station. The river, about 1800 km long, is fed by three main tributaries, the Bafing, the Bakoye and the Falémé (Figure 1). The hydrographic system of the Senegal River constitutes a natural heritage, of exceptional interests, at the disposal of Senegal but also of Guinea, Mali and Mauritania which are also river-side. The Senegal River basin, with an area of 271,573 km^2 , is generally divided into three entities (OMVS, Project FEM / BFS, 2008) : the upper basin, the valley and the delta, and covers 14% of the surface area. total of Senegal. The Senegalese part of the Senegal River basin is vast of 27500 km^2 or 10.1% of the entire basin (OMVS and HYCOS, 2007). The Senegal River and its tributaries, including Falémé, and its tributaries, including Lake Guiers, cross totally or partially five administrative regions of the country (Kédougou, Tambacounda, Matam, Louga, Saint Louis).

An approach of sustainable management of its water resources is implemented by OMVS through Integrated Water Resources Management (IWRM). IWRM is a flexible tool to tackle the challenges of water. Thus, an IWRM approach is a process that promotes the development and coordinated management of water, land, and related resources, with the goal of maximizing economic and social well-being



without compromising the sustainability of water resources. ecosystems (Global Water Partnership, 2009). IWRM is based on the „Dublin Principles“ which stipulate, among other things, that water is a finite and essential resource for life, that water management should be conducted in a participatory manner that includes users and planners of water management and policies, and this at all administrative levels. The real actions undertaken to improve water management in the river basin are to improve knowledge of water resources, communication, information, education and awareness-raising, water, creating an environment conducive to the application of IWRM through legal, organizational and political reforms.

As part of the process of reforming the water sector, since 1981 Senegal has adopted a water code, which was subsequently revised and adapted to the principles of IWRM. The water code determines the water use plans and organizes the preservation and qualitative protection of water resources (Ministry of Hydraulics DGP, 2007). It is with this in mind that the Government of Senegal instructed its ministries involved in the water sector the development of a national integrated water resources management policy, involving all stakeholders in the sector: populations, communities, users and professionals. Thus, a Integrated Water Resources Management Action Plan (IWRM-AP), initiated since 2004, was born of the political will of Senegal to hold a planning tool for priority actions, adapted to the national context. The implementation of this tool and tool is essential for sustainable development and coordinated water management, and improves the management of water resources by taking into account all the resources in the face of current and future needs, by preserving the environment. Thus, it is in line with the recommendations of the various international conferences in which Senegal has participated and the orientations defined by the government, to achieve the Sustainable Development Goals (SDG).

The management of water resources in Senegal suffers from poor governance, the fragmentation of its institutions and the absence of a determined policy aimed at improving water resources. It results Today, there is increasing degradation and exploitation of water resources in the face of increasing demand. This has a negative impact on the socio-economic and environmental level, hence the need to establish better water resource management that would constitute a guarantee for the improvement of living conditions of the population and the fight against poverty. For this purpose, as part of this study, we will focus on water resources management carried out by OMVS.

OBJECTIVES

The purpose of this article is to present the various advantages and inconveniences of the OMVS for water resources management in the part of the Senegal River in Senegal.



THEORETICAL FRAMEWORK

This study focuses on the issue of integrated management of water resources of the Senegal River within the framework of the basin organization. It proceeds by analyzing the various advantages and disadvantages of the model of water resources management of the Senegal River applied by the OMVS, at the level of Senegal. She answers different questions:

- What the body bassi No OMVS is an integration framework under regional example for IWRM?
- How is the OMVS a testing ground for IWRM in which Senegal, a member country, can learn a lot?
- What are the advantages and disadvantages of water management operated by OMVS in the Senegalese part of the Senegal River Basin?

To do so, the combined approach of observations and interviews for the collection of information on the socio - economic and environmental aspects of water management in the Senegal basin is preferred here. Other information used comes from the OMVS, the Directorate of Management and Planning of Water Resources and the Ministry of Hydraulics.

DATA AND METHODS

This work is based on two parts: data collection and document analysis. For data collection, a multidisciplinary literature search and semi-structured interviews were conducted with stakeholders. The scientific articles were searched through different databases to cover a range of unpublished documents (books, reports, dissertations, theses, articles ...) on the issues of integrated water resources management in the Senegal River within the framework of the OMVS ' organization. This in-depth review of the literature has enabled us to collect various available data and information on the problem of IWRM in Senegal River Basin and in basins where similar studies have been conducted. This information was supplemented by the study of reports and glossaries from the International Network of Basin Organizations (INBO), national official documents and statistical data from the organization for the development of the Senegal River (OMVS), the Direction of Management and Planning of Water Resources (DGPRE), the Ministry of Hydraulics and other Ministry.

Finally, to complete the database, interviews were conducted with some strategic institutional and non-institutional actors of the issue. The use of these interviews allowed respondents' opinions to be probed and their interpretation of the problems to be clarified. Other sources of data included consultant reports, strategic planning documents, legislation and policy documents. A number of consultant studies have been completed for the study area and this rich database is



available for review. These reports verified the interview data. The research method produced a rich range of opinions from different stakeholders.

RESULTS AND DISCUSSION

The benefits of IWRM as part of the OMVS

In the Senegal River Basin, various concrete actions, ranging from the physical realization of structures, to sensitization and capacity building, are led by OMVS in the field of water resources development, some of which are covered by IWRM. The realized works are essentially the anti-salt dam at Diama in the delta, the regulator dam multipurpose Manantali, embankments in banks right and left in the delta, the interconnected network of high voltage lines, the link roads. OMVS also carried out enhanced hardware capabilities (restored measurement network, computer equipment acquired, dashboard needs / resources and website implemented, simulation and management software created), financial (increased budget) and human (enhanced national services, continuing training program and scientific advisory committee at the observatory level set up). Several information and awareness-raising efforts are being carried out by OMVS, such as the creation of TV and radio programs, the publication of articles in the print media, the publication of project bulletins and the publication of the journal. OMVS, the establishment of a flood warning plan. These actions or initiatives also concern different aspects (Ndiaye, 2007) Legal (Conventions, Charters, Codes...) and institutional (Conference of Heads of State and Government, High Commission, Societies of Management, Commissions...).

The OMVS, a transversal development and resource management structure

The OMVS is a transversal structure (covering several countries and aspects) which favors a global vision of development and resource management in the Senegal River Basin. From his cross, she manages to guaranteed management of integrated water resources management, better than the industry structure development of the riparian countries (national services). It is able to gain the confidence of sectoral structures to foster the harmonious development of all development sectors through coordinated management of water and related non-biased resources (OMVS, 2002a). The control of water resources is a good tool for sustainable socioeconomic development (Gray and Sadoff, 2007).

OMVS is an exemplary integration framework for IWRM in Senegal, Bachelor of 1972, in cooperation with other States bordering the river (Mali, Mauritania), was granted an on developing a program joint and several development (Ministère de l'Hydraulique/DGPRE, 2007). This resulted in the realization, in full co-operation and co-ownership, of hydraulic works (Diama and Manantali



dams in particular) for multiple purposes and consequences, but mixed (some are positive and others negative). Availability of fresh water against a decrease in recession space; prevention of the drying of the river facing impaired water quality; an integration of local populations facing a value upheaval and land tenure (Tab. 1). Through these major developments, OMVS has introduced a rational use, integrated and coordinated water resources of the basin, which allowed him to reach their mastery. In a climate of transparency, good understanding, dialogue and mutual respect, the idea of a Water Charter for the Senegal River Basin was adopted in May 2002.

Table 1 Impacts of large dams on the economic, environmental and social

At the plan	Positive impacts	Negative impacts
Economic	<ul style="list-style-type: none"> • The availability of fresh water and agricultural development (crop production, livestock, fisheries...); • the production and supply of energy and drinking water in Dakar and Nouakchott (but with a delay in the energy component); • Tourism and shipping (with a delay or neglect of this sector). 	<ul style="list-style-type: none"> • Reduced recession space and pastoral and the difficulty of the traditional agro-pastoral economy; • The weakness of the irrigable crop potential; • Invasion of aquatic plants disrupting navigation (impeding traffic) and agriculture (by obstructing irrigation pumps and canals); • Falling diversity and quantity of fish; • A rich valley that has become a very poor area: increased poverty, famine and debt.
environmental	<ul style="list-style-type: none"> • Permanent flooding of important ecosystems; • The restoration of vegetation; • Revitalizing wetland ecosystems; • Preventing the drying of the river bed (with the support of low flows by Manantali) and the regular intrusion of salt water (with Diama). 	<ul style="list-style-type: none"> • The proliferation of harmful aquatic plants; • The modification of the hydrological regime with the imbalances and profound ecosystem upheavals; • Soil salinization and shoreline erosion; • Modification of sediment transport; • The silting / sedimentation; • Biological and chemical pollution of river waters through the misuse of fertilizers and pesticides; • Alteration of water quality and salinization.
Social, health and cultural	<ul style="list-style-type: none"> • Opening up and the integration of local populations; • The appearance of associations; • Mitigation of the exodus and the arrival of a workforce from the south of the country. 	<ul style="list-style-type: none"> • The proliferation of vectors and the recrudescence of waterborne diseases (malaria, bilharzias, cholera); • A profound upheaval in value and the land tenure system through hydro-agricultural developments; • The loss of homes.



Citing in its preamble the *United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses*, this Charter emerges as an emulation of IWRM, stressing „ *that the sharing of water resources between uses, their management and their development will have to take into account the objective of sustainable development, by associating the different actors: users, managers, decision-makers, developers and experts concerned, in a global and integrated approach* „ (OMVS, 20 2b). This Water Charter, a key element of regional stability, is a text that shows the progress of the OMVS in the integrated management of river water (OMVS, 2002b). Through this Charter and other related programs, the OMVS is therefore a testing ground for IWRM in member countries such as Senegal.

Freshwater, as a limited and vulnerable resource, mostly shared between multiple uses and actors and here political entity, requires, for its protection and sampling, an integrated management that implies a neutral and transversal structure (like the OMVS). The joint management of the Senegal River, within the framework of the OMVS, allows the riparian States to federate and give more strength to their common interests. OMVS more credit in the collection of water charges that el es other organizations samplers and water *polluters*.

It is the only entity specifically able to take into account the interdependence between states on the shared resource in their own context. A place of dialogue, even small, even limited, its implementation is an essential stage of cooperation to better manage transboundary water (Vanessa, 2009).

The OMVS Charter defines a number of rules relating to the preservation and protection of the balance of ecosystems in the basin (Ndiaye, 2003). It also calls on Senegal, like the other riparianStates, to work towards the harmonization of its national legislation in this field (Article 16 of the Charter). Moreover, while almost all basin organizations in Africa do not attach any importance to the notion of ecological flow (minimum flow required for the protection of fish and their habitats) (Varis, 2004), Article 2 of this Charter recognizes the environment as a sector of resource use.

The OMVS, an institutional and administrative framework adapted to the basin scale

In contrast to the sectoral development structures that respect the limits of the administrative division in the regions, departments, districts and even communes, OMVS offers, at the scale of the Senegal River and its tributaries, a global vision of the resource to be used for the economic and social well-being of all the administrative entities of the Senegalese part of the basin. For example, the network for sharing information on water through the hydrological structures of the Member States is more promising at the basin scale than at the level of administrative divisions (ABFN, 2010).



To give shape and content to the cooperation between the three States, the OMVS has an institutional framework that governs the activities to be undertaken in connection with the development of the Senegal River and the concerted and coordinated development of its resources. To do it, she is equipped with four types of organs: 1. deliberative (the Conference of Heads of State and Government); 2. executives (the Ministers Council); 3. Participatory (Locals Coordination Committees: LCC and Nationals: NCC); 4. Advisory (the Standing Water Commission : SWC). These LCC and NCC follow the OMVS programs (such as the Environmental Impacts Mitigation and Monitoring Program, the Regional Health Program, the Integrated Water and Environmental Management Project of the Basin Senegal River: GEF/OMVS). These consultative structures (NCC and LCC) include local authorities, professional associations and cooperatives, representatives of the administrative authority and representatives of associations / NGOs (Ndiaye, 2007). They allowed the coordination of the activities of the program at national and local level and the participation of the populations of the basin (OMVS, Haut-Commissariat 2007). As for the SWC, it is responsible for issuing opinions and recommendations on the equitable use of water resources between different uses, while its composition reflects the concern to better involve the public in the management of water. In addition to the representatives of the States and technicians who are full members, users, local authorities, NGOs and decentralized management committees have been granted observer status. The institutional architecture of the OMVS is in conformity with the integrated management principle.

The OMVS is a suitable policy framework across the Senegal River Basin. Because water exceeds territorial sovereignty, according to organizations such as UNESCO, the OMVS which manages it in the Senegal River Basin is a supranational body independent of riparian states. Indeed, important consequences derive from this, such as overcoming national sovereignty issues and the search for new forms of governance.

The OMVS, a transversal collaborative framework for consultation between stakeholders

The OMVS is a complex organization that seeks, as much as IWRM, to federate a multiplicity of actors and interests (Le Goff *et al.*, 2005). In the basin, it allows the creation of a consultation framework between actors and sectoral structures of development. OMVS allows improved and fixed a number of problems arising from the management at the local, community, county, regional, in the more organized in a collaborative framework adapted to the pelvis (ABFN 2010). To be in line with the objectives set by the *Dublin Declaration*, e character Coordinated and Equitable Management of Water Resources in the Senegal River Basin by OMVS is based on the equitable distribution of resources from the basin and is based



on three principles: equitable and reasonable use and participation, the obligation not to cause significant harm and the obligation to cooperate. Despite the achievement of an extraordinary integration point in the common management of the River, water sharing can sometimes generate conflicts (Kipping, 2005). Indeed, it was during this period of watershed under OMVS that the Senegal-Mauritania conflict of 1989 was one of the most violent related to water. To remedy this, the OMVS has for some years been laying the foundations for IWRM. This one, through the Charter of the river (OMVS, 2002b), through an effective and broader involvement of all water stakeholders, through the emergence of endogenous and dynamic participatory structures (which are responsible for IWRM), in a global and integrated approach. Beyond endogenous and dynamic participatory structures such as LCC and NCC years of the Senegalese part of the Senegal River Basin, two drinking water supply offices, eleven water user associations, two Unions Water User Associations and a Local Water Committee have been set up (Cissé, 2008).

The establishment of User Associations in the Senegalese part of the Senegal River Basin facilitates the mobilization of local populations around the management of water resources in the basin. Two types of User Associations have been created: those for IWRM in the fight against harmful aquatic plants in the Delta and those for the management of Drinking Water Adduction (case at Thiagar and Khor at Senegal). In addition, it is noted the reinforcement of the capacities of the actors at different levels (agricultures, breeders, fishermen, mining, industrial, etc.), the establishment of frameworks of dialogue between actors and their participation in the construction of the IWRM, the strong involvement of women and the strong representation of water users in the grassroots bodies...

The OMVS, a regulatory framework for a shared vision of the resource between users

Within OMVS, sustainable water management in the transboundary basin of the Senegal River can not do otherwise than in a shared vision of water resources between users. The OMVS therefore promotes the development of such a vision among Senegalese, Mauritanian, Malian and Guinean users through the dialogue that is essential to prevent conflicts and preserve the basin's resources. For this sharing of the resource, it is not the volume of water that is distributed according to the states (it is the benefits of regional development that are distributed and not the resource itself), but rather an assessment of the needs of different users of a state, according to water availability and priorities. These needs are assessed, on the basis of the expression made by the States and the users of the basin, by the SWC which enacts measures of management of the structures for an optimized operation of the hydrological system. As for the priorities, they are clearly defined by the Water Charter which stipulates that „the *distribution of water between uses is based in particular on the following general principles: the ob-*



ligation to ensure the balanced management of water resources, fair and reasonable use of the waters of the river, the obligation to preserve the environment [...]„(Article 4) (OMVS, 2002b). The OMVS is therefore an appropriate framework for the planning, mobilization, management and protection of the water resources of the Senegal River Basin. This framework is expected to be further developed through the PGIRE (Integrated Water Resources Management Program) and the development of multipurpose uses.

Today, the Senegal River basin is experiencing an increase and a great diversity of users who are often competitors and whose interests are contradictory (Faye, 2015). However, this multiplicity of users leads to a more complex sharing and more probable tensions. In addition, the lack of direct participation of all categories of users of the resource generates a gap between the OMVS water needs and the actual water needs of users. Moreover, effective concerted management stems from complicated negotiation between local actors and users (if the management actions are harmful to users' needs), but also from the difficult conciliation (in case of conflicts) between competing users.

To fight against conflicts of use and better distribute resources between users, the a management participative and inclusive approaches different (Irvin and Stansbury 2004) are now frequently encountered in the sectors of the Senegalese part of the basin. The OMVS has in the sense of a set of mechanisms of prevention are conflicts between users that share its waters and resolution of conflicts when they occur. She wears also a special focus on promoting good governance of water resources in the Senegal River Basin through IWRM. It mobilizes also to facilitate the understanding, support and participation of users in the database in the process of shared vision. Although a set of benefits related to the management of the waters of the Senegal River applied by the OMVS is noted, many environmental, economic, social and political problems arise.

The difficulties of OMVS water management in Senegal

Despite OMVS ,more inclusive attitude towards improving the situation in the basin, the situation is far from perfect, both on the left and right bank. Although effective and efficient management of water resources is a major challenge at the dawn of the third millennium, many internal and external factors hinder it in Senegal. A diagnosis can raise the constraints of IWRM applied by OMVS in senegalese part of the Senegal River Basin.

Insufficient support to the management framework best suited to IWRM

If, in an IWRM context, water is used as a vector of development, the development of the basin's water resources in a perspective of sustainable development rather faces several difficulties. Thus, Senegal may be trapped by its low economic level or meet technical, institutional and financial limits (Sadoff and Grey, 2002). The causes



of the problems of water control in the basin are ultimately multiple and generally due to the relatively low economic level of riparian states. Although, the water resources basin is not the basis for sustainable development, its division or fragmentation between the territories of the four basin states becomes a further obstacle (Julien, 2006).

Although the OMVS is useful, the overlapping of responsibilities with offices leads to conflicting decisions, duplication, wastage of already inadequate financial, human, technical and logistical resources. Although the joint management of the Senegal River, through the OMVS, allows the riparian states to federate and give more strength to their common interests, it also faces divergent interests (Le Goff *et al.*, 2005). At the level of Senegal, we can highlight:

- The primary objectives given to the OMVS (which are the irrigation crop) different from that of Mali (which are the electricity and the realization of the project of opening up by navigation);
- The difficulties related to the abandonment of national sovereignty over the Senegal River, its tributaries, its distributors and its works of common interest built by the OMVS (For example, the project to revitalize the fossil valleys that wanted to divert the waters of the Senegal River to Senegal could sign the return of state sovereignty and suspicious noises. This project was finally abandoned in the face of the refusal of Mauritania who feared that this shared water resource is considered a national property as Senegal).

In general, OMVS may face serious challenges related to insufficient institutional development, domestic and external political pressures, inadequate budgets, poor management and technical capacity. The objectives and strategies of the OMVS come often in conflict with the policy priorities of different States members. According to Vanessa (2009), there is a significant gap between the texts that establish the interstate basin organizations and the reality, hence their failure in the role of director of management. In Senegal, a failure of management by OMVS can be due to three reasons:

- The lack of means of control enabling it to guarantee the implementation of the commitments of Senegal as those of the other riparian States of the river and to establish this governance;
- The significant influence of donors like the World Bank and the fund money international on the directions taken by the OMVS (or by Senegal) that can cause the a dispersion of decision-making power of the OMVS in planning activities and how it works;
- The lack of direct participation of all categories of users of the resource, which generates a gap between needs and activities, detrimental to the legitimacy of the OMVS.



By making use of private investment to finance projects in the Senegal River Basin, an investment negotiated and obtained individually (without consulting the other States bordering) and escapes thus the control of other States, Senegal can s overstepping of vision coordinated and cooperative sharing of resources within the OMVS. In addition Despite the recognized priority of concerted water resources management within OMVS, water resources management is often done on a sectoral basis. Very few actions are done in a concerted manner and very often there is an overlap of skills of local actors. To this is added a legislative, legal and regulatory vagueness (Kouam Kenmogne *et al.*, 2006) and the weak association of populations to projects. However, these populations are the first to suffer from the procession of environmental, economic, social, political and health calamities that flow of the major developments in the basin (example of the outbreak of malaria and schistosomiasis in the river valley). In addition, private companies such as Sugar Company Senegal (SCS) and Senegalese waters, which are very active in the field, are often marginalized from the management of water resources under OMVS.

Even if the participation of the populations of the basin is envisaged within the framework of the OMVS, it is generally less so within the national framework in Senegal. Moreover, few agreements in the river's charters provide for procedures allowing the population to participate in decision-making within the OMVS. Despite the various charters OMVS has adopted over the years, it is clear that an institutional vacuum persists. Moreover, some decisions taken by the OMVS are not in line with the local reality. Indeed, the availability of fresh water, relative to the installations, was accompanied by a decrease of the recess space and pastoral and a failure of the traditional agro-pastoral economy. As a result, OMVS not only failed to achieve certain goals set for it, but the programs implemented also resulted in many negative externalities in social, economic and environmental terms (Boinet, 2011).

Another major bias in the process is the lack of integration of the integrated management plan. Indeed, if the plan is compiled and centrally drafted by the OMVS, it is put in place by each locality of the riparian states of the watershed. This return to administrative rather than hydrological units is debatable because consultation between localities may be generally non-existent despite the presence of a basin organization to ensure overall coordination of management. The basin management and development plan may not contain sufficient data and information to plan for the proper use of water resources. Furthermore, integrated management does not always guarantee its primary goal of managing the necessary water resources that is to protect biodiversity in this basin.

The management of watershed resources usually generates tensions between different user groups (Julien, 2006) even though Senegal is generally subject to



the same sovereign jurisdiction as the other countries of the basin : they share the same official language, their systems political and legal are similar, and both colonial history and religion (Islam) share a unifying role (Kipping, 2005). And the difficulty of managing a notch further increases when states will share several basins (Sadoff and Grey, 2002) : this is the case between the Senegal and Guinea, which shares not the basins of the Senegal and Gambia. The maximization of immediate national interests or difficult diplomatic relations may indeed run counter to the benefits that can be derived from co-operative management at the hydrological system level, as has been the case in the past in the basin (Gould and Zobrist, 1989). International tensions around the resource are as likely as many. In fact, the Senegal Basin is on the list of 17 transboundary watersheds that are most at risk of international conflict worldwide (Wolf et al., 2003).

The others types of problem of water management in the Senegal River Basin

Although watershed management advocated by the OMVS, while water a territorial element, can treat the diverse questions interactions between water users, physical and natural resources socio-economic systems (Miaillier, 2007), many internal and external factors impede the sound management of water resources in the Senegal River Basin. From the point of view of its content, the basin management plan may encounter serious deficiencies and significant errors and inaccuracies of data and of information provided to the database, which the their sharing has a negative impact on the joint management of the Senegal River. The asymmetry of data and information between riparian states is also reflected in their mistrust and reluctance to conclude international agreements on shared water resources (Banque africaine de developpement, 2000). In the basin, this asymmetry is linked to the fact that the institutions responsible for the collection, processing and dissemination of data and information in the States bordering did not autonomous financially and operationally.

The water of the Senegal River basin, although constituting the basis of reflection and intense planning (major developments), is particularly insufficient because of the presence of three aggravating factors : its great spatial and temporal variability, its sharp decrease and the weak „second-rate resources“ (the meager means) of the basin societies (OMVS and WHYCOS, 2007). The Senegal doit usually accommodate a hydrology „difficult“ (Sadoff and Grey, 2007) because it rested on of low resources (institutional, financial, human, technological) to dedicate to managing its water (Durand-Dastès, 2005), compared to developed countries. In the riparian states of the basin, as in southern countries, water management is therefore carried out in an „extreme environment „ (Giordano and Lautze, 2009) : extreme dependence on shared waters between four sovereign states, extreme poverty of the populations.



Informal management of pond water is also a problem. However, this informality does not cover the entire basin but strictly natural tributaries (sections of Bakoye and undeveloped Falémé) represents 40% of the flow of the river, 60% controlled (conditioned by the Manantali releases) are the result of the management of the basin which is also based mainly on the management of the two dams). In addition, the technology transfer of Watershed Management (setting up reliable observation networks and effective management platforms, mobilizing human and material resources, exchanging information, monitoring and evaluating projects and programs) are increasingly difficult (Julien, 2006).

Another failure appears at level of the participatory aspect with d are local residents of the River, given the cultural and political context, which have a low level of participation in management bodies. The administrative units to facilitate participatory planned phases in the process of realization of the watershed plan suffer as a lack of skills and manage difficult ment to mobilize are people for consultation with stakeholders. More, the satisfaction of the uses (ecological, domestic and industrial) and the hydroelectric production, thanks to the good availability of the water resources of the river, are to the detriment of other axes like the improvement of the agricultural productivity, the development of the farming and fish farming, or the development of forestry. The multiplicity of actors and issues (agricultural, industrial, hydroelectric, tourism) on the basin can be a source of incompatibility between the optimum needs of each of them.

Generally, the are major constraints to the management of water basin are related to the physical environment (climate factors of order, irregularity and low rainfall), environmental economic (weak basic infrastructure traditional control and management methods, low funding and lack of resources), the institutional framework (still weak capacities of the actors, insufficient regulatory frameworks) and legislative, legal and regulatory uncertainty.

Given the difficult socio-economic and environmental contexts (Shah *et al.*, 2006; Schulze, 2007), the challenges the people of the Senegalese part of the basin are facing s, are multiple and very overwhelming: they are demographic, economic and hydroclimatic. In this extreme environment and following the guiding principles adopted by the internationally recognized Dublin Conference, the current issues of IWRM are of several kinds (Institut International D'INGENIERIE de l'Eau et de l'Environnement, 2010). In the basin, they are linked to the guarantee of water for the populations and the production activities to limit conflicts of use, the protection of the ecosystems and the biodiversity, the management of the great spatial variability time, the a public awareness and establishing the legitimacy of the OMVS.



CONCLUSIONS

At the end of this study, it should be considered that in the water resource management issue, a basin organization constitutes a frame of reference for the implementation of integrated management of water resources by basin. In the Senegal River basin, the OMVS has shown a remarkable ability to adapt to the changes and realities of the environment, which gives every reason to be optimistic about the management of the river's waters. However, while the legal and institutional framework of OMVS appears solid, the consequences of its actions are at least mixed.

The OMVS, through its transversality, provides integrated management of water resources in the Senegal River Basin. Through its action, the confidence of all development sectors, through coordinated management of water and related resources without bias, can be gained. As a neutral structure, OMVS thus manages to secure and manage in an integrated manner the basin water resources although limited and vulnerable. In the Senegalese part of the basin, the OMVS administers a global and shared vision of the resource for the economic and social well-being of all the administrative entities. It is a neutral and credible transversal institution that has created a framework for dialogue between stakeholders and users, which has made it possible to preserve the basin's resources and also to prevent and manage the conflicts that are linked to them. In sum, OMVS is an appropriate framework for planning, mobilizing, managing and protecting water resources. Nevertheless, problems remain.

The joint management of the Senegal River is fraught with divergences of interest due to a difference of objectives and difficulties related to the abandonment of national sovereignty over the river, OMVS management failures due to weakness of its means and the direct participation of all categories of users, the negative externalities of the large developments in the basin. Added to a lack of monitoring mechanisms and control compliance, insufficient own resources OMVS, an insufficient support to the management framework best suited to IWRM, the results of some programmatic components remained well below expectations. However, this cruel record does not hinder the fact that OMVS remains one of the most advanced and armed basin organizations.

These different problems noted cannot be solved sectorally and separately from one another, and must be addressed as part of an approach to IWRM. However, in terms of IWRM, Senegal has, through the OMVS, an institutional framework and regulation of the hydrological sector. However, the improvement of this water policy based on IWRM will serve as a framework for the improvement of the water sector in Senegal. As a result, the state must obtain, in the basin, water resource projects for which the political, socio-economic and environmental issues have been reasonably examined by the OMVS. To remedy the various problems and issues noted in the Senegalese part of the basin, the OMVS,



in addition to the implementation of major developments and the definition of conventions and charters for the control of water, must strengthen the framework, institutional, legislative, regulatory and financial management and financing for good water policy in the basin. This requires a harmonization of the legislative and regulatory framework of water resources management favorable to the implementation of IWRM. In the, we must plan the use, protection, conservation and sustainable and rational management of water resources based on needs and community priorities. OMVS would benefit from creating channels of direct communication with other actors in the management and protection of the resource.

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