



# MAURITANIA: *MANAGED FLOOD RELEASES AND LIVELIHOODS - LOWER DELTA SENEGAL RIVER*

O. Hamerlynck<sup>1</sup> and S. Duvail<sup>2</sup>

**Abstract.** Information is provided about managed flood releases to allow traditional recession agriculture in the flood plains of the Lower Delta of the Senegal River in Mauritania. This is done in order to reduce the negative impact of dams constructed on the quality of life of the traditional flood plain users. Of particular interest is the information on the 12 principles of ecosystem management approach presented in the study, the list of good practices related to stakeholder participation and involvement, and the guidance and principles for project management

## 1. Location

Before discharging into the Atlantic Ocean, the Senegal River forms the border between Senegal and Mauritania, practically on the farthest western part of the African continent. The case study area - the *Diawling National Park* - is located in the lower delta of the Senegal River in Mauritania. The Park has a surface of 16,000 ha.

## 2. Nature of floods

Plans to control the floods of the Senegal River have been in existence since the nineteenth century. The Sahelian drought of the seventies incited the governments of Mali, Senegal and Mauritania to create the "*Organisation pour la Mise en Valeur du Fleuve Sénégal*" (OMVS) and to proceed with the construction of two major dams in an attempt to develop irrigated agriculture, hydroelectric power and river navigation.

The first dam to be completed (in 1986) was the Diama dam, located 27 km upstream from St. Louis (Senegal). It was built to stop the dry-season intrusion of seawater. The impoundment reservoir became fully operational in 1992, after the completion of the embankment on the Mauritanian side. The second is the storage dam at Manantali in Mali (completed in 1990) on the main tributary of the Senegal River. The reservoir is theoretically capable of stocking the strongly seasonal rainfall in the mountains of northern Guinea. The water can then be gradually released over a longer period than the natural flood. The two dams should provide enough water to achieve the following development objectives: (i) irrigate 375,000 hectares of former floodplain, especially for rice production; (ii) produce hydropower (800 Gwh per year); and (iii) make the river navigable all year round between Saint Louis at the river mouth and Ambibédi in Mali.

Managed flood releases from Manantali have allowed traditional recession agriculture in the floodplains to continue to some extent, especially in the years of important natural floods (1988, 1994, 1995, 1999). This compensatory measure has attenuated the negative impacts of the dams on the quality of life of the traditional floodplain users, even though there have been some problems with double peaked floods (1989 and 1991) that washed away the first recession plantings. The artificial releases were expected to be rapidly phased out, as irrigation would replace traditional uses. This not being the case, and with increased understanding of the economic, social and environmental benefits of the artificial floods, it is envisaged to continue the managed flood releases.

There remain some outstanding issues with regard to the original objectives for the development of the Senegal valley. The traditional uses, dependent on the flood regime, such as recession

<sup>1</sup> IUCN Wetlands and Water Resources Programme, 28 rue Mauverney, 1196 Gland, Switzerland. [miromao@hotmail.com](mailto:miromao@hotmail.com)

<sup>2</sup> Centre for Ecology and Hydrology, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB, United Kingdom. [sduvail@hotmail.com](mailto:sduvail@hotmail.com)



agriculture, fisheries, livestock keeping, gathering and forestry have been curtailed and adverse socio-economic, health and environmental impacts have been substantial.

Within the context of this sectoral and centralised programme an ecosystem approach was tested in the Mauritanian lower delta since 1993. Excluded from the Senegal River floods since 1991, the Diawling National Park and its surrounding area had been confronted with a spectacular collapse of productivity, the loss of most of its natural resources and the area was characterised by large-scale emigration of its population. Through managed flood releases an attempt was made to rehabilitate the deltaic ecosystems.

### 3. Flood management strategies – an ecosystem approach

In 1994 a multi-disciplinary team, which included local representatives of the lower delta, made an assessment of the priorities of the local communities. To revive the traditional activities of fishing, gathering and livestock keeping it was decided to restore the pre-dam flood regime. Hydraulic infrastructure had to be built to emulate the natural system by abstracting water from the Diama dam reservoir. Quantities taken are much smaller than the natural floods and therefore have to be temporarily contained in two basins. Once the flood is established they are released downstream into an artificial estuary. The overall approach adopted was to apply for the whole exercise the 12 principles of ecosystem management (see below).

Managed flood releases were tested in 1994 and 1995 and their livelihood impacts were assessed through in-depth interviews with the stakeholder groups. In 1996, the information thus gathered was synthesized into a management plan, which was circulated among local partner institutions for comments, presented to a wide audience of stakeholders and government institutions and approved by the *Ministry of Rural Development and the Environment* in 1997.

In summary, the operational objectives of the management plan for the Diawling National Park project and its peripheral area are grouped under the following main themes:

- *Restoration of the hydrological functioning and of the natural resources*, which comprises the restoration of hydrological functioning and of the characteristic vegetation of the Lower Delta, dune fixation and protection of embankments, and restoration of the fisheries and ornithological potential;
- *Optimisation of the Management of the Diawling National Park* through, among others, the restructuring of its organisation and establishment of field infrastructure, equipment and budget, development of a detailed land use plan, development of internal communication and establishment of a technical and scientific council;
- *Community development*, comprising the strengthening of traditional resource use practices and of new activities compatible with ecosystem restoration, and improvement of the quality of life of the local communities.

As more and more hydraulic infrastructure became operational (completed in 1999), flooded area and flood height were progressively increased. Concomitantly, the income of fishermen and traditional gatherers/mat makers increased substantially and the number of livestock using the restored floodplains boomed. The out migration trend was inversed. Ecologically, the rehabilitation effort resulted in a revival of the mangrove and other characteristic vegetation and numbers of wild animals (migratory and breeding water birds) increased. Problems were encountered because of inadequate emptying of the basins at recession, and with increased pressure from outsiders on the local resources.



#### 4. **SWOT<sup>3</sup> analysis of the application of the 12 principles of ecosystem management**

The main identified strengths and weaknesses of the Diawling National Park project as regards the principles of ecosystem management are summarized as follows:

1. The objectives of management of land, water and living resources are a matter of societal choice.

At the local level this was strength of the project: the cultural diversity, the traditional rights and needs of various local user groups were taken into account; local livelihoods are virtually totally dependent on ecosystem productivity

2. Management should be decentralised to the lowest appropriate level.

Strength of the project: the appropriate, and initially the only workable, level was dealing directly with the natural resource users and their traditional, informal organisations.

3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

As the project was concerned with the establishment of the Diawling National Park, its management plan explicitly treated all areas that could be influenced by the flood releases (some 50,000 ha in the lower delta and the connected coastal lagoons to the north) and the adjacent dry lands.

4. Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.

The project did not have the capacity to apply this principle fully and therefore it has been a weakness. Building hydraulic infrastructure for an artificial wetland is an onerous undertaking and the recurring costs of operation and maintenance are not negligible.

5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Strength of the project: The whole management plan was constructed around functions, with the expectation that biodiversity would return under favourable conditions.

6. Ecosystems must be managed within the limits of their functioning.

The cautious approach of the project, gradually increasing the height and duration of the artificial flood releases to observe the reactions of the ecosystems was a strength.

7. The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

The drafting of the management plan, through a participatory approach, allowed the stakeholders to operationally define the appropriate scale. The management plan was for an initial five-year period and is to be revised soon.

8. Recognising the varying temporal scales and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.

Because of the flood related strong seasonality of the Sahelian floodplain and delta ecosystems many species groups reacted very rapidly to improved management, i.e. flood release, notably fish and annual and perennial grasses important for local livelihoods.

<sup>3</sup> Strengths, weaknesses, opportunities and threats



#### 9. Management must recognise that change is inevitable.

The need for adaptive management was incorporated in the progressive implementation and the close monitoring of the results, ecological and livelihood wise, of the managed flood releases.

#### 10. The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.

Possibly the main strength of the project: the presidential decree that created the National Park explicitly allowed sustainable resource extraction by local users in certain areas, and also gave mandate to the protected area managers to promote sustainable resource use and target livelihood enhancement.

#### 11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

Very substantial time and effort were spent on collecting historical information, on in-depth interviews with the village elders, on transect walks with resource users, etc. The combination of intensive contacts between observant locals and young dynamic scientists of various origins and disciplines contributed to the formalisation of the traditional knowledge.

#### 12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

Strength of the project: a good mix was always sought between natural and social sciences. Capacity in the different disciplines was built with Park staff, locals, members of the municipal council and the decentralised administrations. Involvement of a wide range of gender groups (ethnic group, tribe, caste, age, sex) in project activities, monitoring and research was actively pursued. At national level, a major step forward came through a field visit with all the relevant ministries and technical departments involved in the drafting of the *Integrated Coastal Zone Management Plan*. This brought some of the important decision-makers of the nation into contact with the ecosystem restoration and livelihood enhancement approach.

### **4. Main lessons learned**

The Diawling National Park project experience has shown that:

- Involving local communities in the management of a protected wetland is feasible and beneficial and the ecosystem approach, applied to managed flood releases to restore the structure and function of a severely damaged wetland ecosystem, can have positive impacts on biodiversity and livelihoods.
- The fundamentals of the approach have been: (i) an open-minded and respectful listeners' attitude, permeated by an appreciation of the local historical and socio-cultural background; (ii) development issues have to be taken as seriously as environmental issues; (iii) the management plan development process targeted the entire Lower Delta, links with, rather than boundaries of, the protected area were emphasized; and (iv) continuous presence in the field is a prerequisite; in this way, the signals, emitted by both the ecosystem and the stakeholders, can be read and flexible responses provided.
- In the relationships with the local communities, key concepts are trust, benefits and the integration of indigenous knowledge.