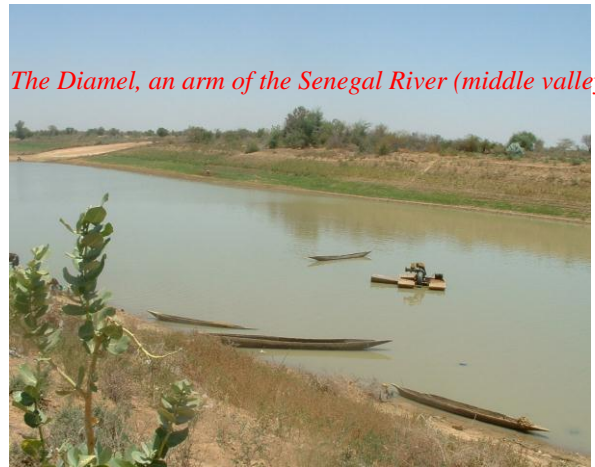


The Dame de Mali in Guinea



The Diamel, an arm of the Senegal River (middle valley)

Strategic Action Plan

for

The Management of Priority Environmental Problems in the Senegal River Basin

Final Version

Date: 29 July 2008

Acknowledgements

The *Strategic Action Program (SAP)* for the management of priority problems in the Senegal River Basin is the result of teamwork with the participation of many individuals and institutions. In addition to the team of consultants (see below), the OMVS leadership and experts have made ongoing contributions to facilitate and orient the SAP formulation process at the local (LCC), national (NCC) and regional levels. Annex 5 of the SAP presents profiles of those who contributed to the various organized workshops and illustrates the highly inclusive and participatory character of the SAP process. The commentaries and observations on the provisional SAP report made by the OMVS High Commission, basin stakeholders as well as the financial and technical partners of the GEF-SRB projects, who include the Global Environment Facility, the World Bank, the UNDP and the IUCN, have all made it possible to substantially improve the quality of this document. The TDA-SAP expert from the GEF-SRB projects deserves special mention. We would like to express our profound gratitude to all of our contributors.

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The SAP is based on reports entitled “National Contribution to the SAP” written by the following consultants: Alérény Diallo (for Guinea); Nampaa N. Sanogho & Mamadou Satao (for Mali); Bah Ould Sid’Ahmed (for Mauritania) and Samba Yade (for Senegal).

Executive Summary

A Strategic Action Program (SAP) is a negotiated document for an environmental policy. It defines the priority domains for action and the necessary reforms to solve urgent environmental problems identified in the Transboundary Diagnostic Analysis (TDA) of this river basin environment.

The SAP's overall objective is to provide the OMVS and its partners with a tool for *sustainable transboundary environmental management* for the Senegal River Basin. Specifically, the SAP aims to: (a) propose priority actions and measures with a view to solving the most urgent environmental problems identified in the TDA; (b) identify the roles and responsibilities of various actors in the implementation of retained actions; (c) define the institutional and regulatory framework—and necessary reforms as needed—to create an enabling environment for implementation of the suggested measures; and (d) define a plan for investment and mobilization of financial and human resources to implement the proposed actions.

The TDA, which preceded the SAP, identified among the myriad of environmental concerns confronting the Senegal River Basin five particularly urgent problems. They are: (i) land degradation and desertification; (ii) decreased water supply and degradation of water quality; (iii) proliferation of invasive species; (iv) prevalence of waterborne diseases; and (v) threats to biological diversity.

When the trends observed in the TDA for each of these problems are projected into the future, prospects are far from reassuring for the Senegal River Basin environment. While not inevitable, the possibility that both the ecosystems and communities will slide downward toward a catastrophic scenario is a strong one. The SAP's goal is to help avert this course and direct the basin's evolution toward a more viable future.

The approach used to formulate the SAP was as participatory as possible. Stakeholders from the basin from all levels (local, national and basin-wide) participated in consultations on the long-term vision and objectives, the targets to achieve and the measures to be implemented to achieve this vision.

The SAP Vision for the Senegal River Basin is based on the OMVS foundational texts, the Water Charter, the 2003 Nouakchott Declaration (OMVS Strategic Orientation), etc. This vision links the basin's current status (as described in the TDA) with the future that its stakeholders envisage. It was agreed upon by stakeholders brought together at a regional workshop in Nouakchott in Mauritania. The Vision states that in 2030, ***the basin's resources will be managed in a integrated, concerted and sustainable way to: (a) guarantee food security, social well-being and high and sustained economic growth; (b) ensure restoration and conservation of ecosystems and biological diversity in the basin; and (c) consolidate the community, ensure its future and establish a deep-seated spirit of solidarity, sharing, equity and peaceful coexistence between the basin's peoples and states.***

At the same regional workshop, the participants came to consensus in formulating a Long-Term Environmental Quality Objective (LTEQO) for each of the five environmental problems mentioned above. An LTEQO establishes the level of resolution of the environmental problem deemed acceptable to the stakeholders. Many options for measures (105) were

discussed during the SAP regional start-up workshop. They were debated and classified by order of priority during SAP national start-up workshops organized in each of the four basin countries and subsequently during the meetings held with the 28 LCCs that comprise the basin. Based on the suggestions and priorities expressed by national and local stakeholders, a total of 22 measures were retained that must be implemented to achieve the LTEQOs and to realize the SAP's Long-Term Vision. These LTEQOs and the retained measures to achieve them are as follows:

LTEQO 1. The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization

- Measure 1: Develop alternative energy sources;
- Measure 2: Awareness raising, education and information on land degradation and desertification;
- Measure 3: Development and application of an action program for the restoration and protection of riverbanks and headwaters;
- Measure 4: Prevention and management of bush fires;
- Measure 5: Promotion of sustainable agro-pastoral practices;
- Measure 6: Implementation of an enabling legal environment for sustainable use of water and land resources; and
- Measure 7: Identification and restoration of land that has undergone the most exposure to erosion, siltation and desertification.

LTEQO 2. Optimally controlled water resources are managed through integrated and sustainable systems to ensure good water quality and adequate availability to users

- Measure 1: Awareness raising/education/information on water quality;
- Measure 2: Ensure better control of improvements in water quality; and
- Measure 3: Promote innovative approaches to water management that alleviate poverty while protecting the environment.

LTEQO 3. The prevalence of waterborne diseases is reduced to a level that no longer poses a public health problem

- Measure 1: Health education and awareness raising on the causes of waterborne diseases;
- Measure 2: Epidemiological monitoring;
- Measure 3: Combat disease vectors;
- Measure 4: Improve access to drinking water; and
- Measure 5: Reduce water pollution caused by household garbage and domestic waste.

LTEQO 4. No aquatic, animal or plant species proliferate to the point of threatening ecological equilibrium and economic activities in the Senegal River Basin

- Measure 1: Integrated program to combat *Typha australis*;
- Measure 2: Implement a monitoring and early-warning system; and
- Measure 3: Economic valorization of invasive plants.

LTEQO 5. Areas with high biodiversity value are identified, restored and sustainably preserved

- Measure 1: Strengthen capacities/environmental education;
- Measure 2: Establish biodiversity baselines;
- Measure 3: Reduce fishing pressure; and
- Measure 4: Establish conservation and land-management policy for wetlands.

Since climate is a cross-cutting and omnipresent factor among the root causes for most of the highly urgent environmental problems in the basin, the SAP will also be an opportunity to launch a Special Initiative on Climate Change. This will aim to increase the Senegal River Basin's resilience to the impacts of climate variability and change while contributing to efforts to mitigate greenhouse gas emissions. This special initiative comprises these four components: (i) improve the quality of climate information, particularly as it relates to predicting future climate and its impacts on water resources; (ii) promote adaptation measures to reduce the vulnerability of production systems for basin communities; (iii) ensure climate proofing for the basin's hydraulic and hydro-agricultural infrastructure in the face of risks related to climate change; and (iv) develop capacities of basin actors to obtain carbon funds.

Implementation of the SAP requires implementation of a favorable legal and institutional environment. Therefore, one of the SAP pillars will be to help improve this framework; in other words, to lift institutional and legal barriers that could potentially hinder the SAP. The SAP emphasizes three aspects: First, it will capitalize on the potential of the Senegal River Basin Water Charter. Adopted in 2002 by the four governments of the basin countries, this Charter is the first of its kind in Africa. It takes into consideration the values and principles of good governance for shared water resources. The challenge now is to put the Water Charter's pioneering provisions into effect. In its efforts to extend this legal text, the SAP will operationalize and facilitate effective application of the Charter's provisions, particularly concerning protection of water quality, combating pollution and invasive species and taking into account ecosystem needs in the allocation of the river's water resources. While simultaneously promoting the Charter, the SAP also aims to encourage the riparian countries to update, harmonize and effectively implement their laws and policies through political dialogue. The relevant domains include regulations for water, the environment, forests, mining, livestock herding and land tenure as well as their national policies for water resources management, combating desertification, etc. Lastly, implementation of an enabling environment will also require that the capacities of actors responsible for SAP execution are strengthened. Capacity building for actors envisaged as specific measures to establish an enabling institutional environment will consist of: (a) support for the operationalization and coordination unit for the SAP process (in 2–3 years this unit will oversee the conversion of the SAP into specific, operational and executable projects and programs); (b) capitalization of relevant experiences, particularly those related to micro-projects funded within the framework of the GEF-SRB Project and the Dutch co-financing for the GEF-BFS that address *Typha* proliferation and riverbank degradation, among other things; (c) strengthening mechanisms for actor participation by strengthening national platforms for coordination and consultation (NCCs and LCCs) and consolidating the process to involve civil society and the scientific community by supporting OMVS efforts to set up a Basin Committee; and (d) training stakeholders for effective SAP implementation, through their own initiatives or through agents contracted with the OMVS (current approach used by the OMVS for PGIRE implementation).

The funding needed for the SAP for the first five years has been estimated close to 100,000,000 euros including approximately 5,000,000 euros allocated for urgent measures for immediate implementation. The budget for the second phase (6–10 years) will be completed and refined one year before the end of the priority phase; it is temporarily estimated at approximately 80,000,000 euros, which brings the provisional amount over 10 years to just over 180,000,000 euros. Since the vision's achievement is set for 2030, or in 20 years, the possibility that the planned budget to realize the vision for the basin environment may double over 10 years must be anticipated.

Potential funding sources first include those that are internal, particularly public resources from riparian states, the OMVS's own resources, in addition to those from decentralized collectivities, the private sector and private individuals (resources that require lifting institutional and legal barriers to ensure optimal mobilization). It is anticipated that approximately 30% of the investments required to implement the planned measures in the SAP could be supported through internal resources from the aforementioned actors. External funding must be sought in the amount of approximately **70,000,000** euros for the project's first five years and approximately 56,000,000 euros for the following five years (this amount may increase once more detailed planning for this phase has been completed).

The SAP will use innovative mechanisms to ensure sustainable funding for the planned measures. Within these mechanisms, opportunities arise to apply for carbon funds since many of the recommended measures in the SAP contribute to mitigation of greenhouse gases. Another possible mechanism is setting up a fiduciary fund to protect the basin environment (such a fund could be fed by, among other things, a modest percentage of the income generated from hydro-electricity in the basin or from water withdrawal rights).

Therefore, SAP operationalization planned for the first two years of its implementation will include an in-depth funding analysis that better specifies the costs for proposed measures and the potential funding sources for each measure. The preliminary feasibility analysis of the measures, for which summaries are presented in Annex 3, will be carried out in the SAP operationalization phase. Moreover, before measures are implemented, the required economic and financial feasibility analyses and the appropriate social and environmental impact studies will be conducted under conditions identical to similar OMVS programs and projects.

This SAP was approved by the 59th Ordinary Session of the Council of Ministers of the OMVS held in Bamako (Mali), 6 and 7 July 2008. Hence, the SAP remains a "living" document and, consequently, will require periodic updating. These updates will make it possible to take into consideration changes in the basin environment as well as those in the political or economic situation.

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Acronyms and Abbreviations

AGRHYMET	Regional Center for Training and Applications of Agrometeorology and Hydrometeorology (Centre Régional de Formation et d'Application en Agrométéorologique et Hydrologie Opérationnelle)
BC	Cereal Bank (Banque Céréalière)
CBO	Community-Based Organization
CODESEN	Coordination for Civil Society Organizations to Protect the Environment and Development of the Senegal River Basin (Coordination des Organisations de la Société civile pour la Défense de l'Environnement et le développement du bassin du Fleuve Senegal)
CREPA	Regional Center for Low Cost Water Supply and Sanitation (Centre Régional pour l'Eau Potable et l'Assainissement)
CSS	Senegalese Sugar Company (Compagnie Sucrière Sénégalaise)
DGH	Directorate of Hydraulics (Direction Generale de l'hydraulique)
DWS	Drinking Water Supply
ECOSAN	Ecological Sanitation
FAO	Food and Agriculture Organization of the United Nations
FOSA	Forestry Statistics and Outlook Study for Africa
GEF	Global Environment Facility
GRDR	Research and Realization Group for the Rural Development Groupe de Recherche et de Réalisations sur le Développement Rural
GWP/WA	Global Water Partnership in West Africa
IEC	Information, Education & Communication
IGA	Income Generating Activity
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
LCC	Local Coordination Committee
LDC	Least Developed Country
LTEQO	Long-Term Environmental Quality Objectives
NAPA	National Adaptation Programme of Action
NBA	Niger River Basin Authority
NCC	National Coordination Committee
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-operation and Development
OMVS	Senegal River Development Organization (Organisation pour la Mise en Valeur du fleuve Sénégal)
PAD	Project Appraisal Document, WB
PDIAM	Rural Integrated Development Project Downstream of the Manantali Reservoir

	(Projet de Développement rural Intégré en Aval du barrage de Manantali)
PGIRE	Program of Integrated Water Resources Management and Development of Multi-purpose Uses (Programme de Gestion Intégrée des Ressources en Eau et de Développement des Usages à Buts Multiples dans le Bassin du Fleuve Sénégal (OMVS))
PM	Périmètre Maraîcher
SAED	Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé (National Company for Land Management and Use in the Senegal River Delta and Senegal River and Falémé Valleys)
SAP	Strategic Action Program
SBDT	Société de bauxite de Dabola-Tougué (Dabola-Tougué Bauxite Company)
SEMOS	Société d'Exploitation des Mines d'Or de Sadiola (Sadiola Gold Mining Operations Company)
SMK	Société Minière aurifère de Kalinko (Kalinko Gold Mining Company)
SOE	Environmental Observatory (Service de l'Observatoire de l'Environnement)
SOGED	Société de Gestion et d'Exploitation de Diama (Diama Management and Operations Company)
SOGEM	Société de Gestion de l'Energie de Manantali (Manantali Energy Management Company)
SONADER	Société nationale pour le développement rural (National Rural Development Company)
SRB	Senegal River Basin
TDA	Transboundary Diagnostic Analysis
TEA	Transboundary Environmental Analysis
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF WCARO	United Nations Children's Fund – West and Central Africa Regional Office
USD	US Dollar
WARN	West Africa Roll back malaria Network
WB	World Bank
WHO	World Health Organization

Introduction

The development of the Strategic Action Program (SAP) followed and is based on the Transboundary Diagnostic Analysis (TDA) of the Senegal River Basin. The TDA and the SAP are the 3rd component of the GEF Senegal River Basin Water and Environmental Management Project (hereafter designated as the GEF-SRB Project).

The Transboundary Diagnostic Analysis has allowed for identification and analysis of environmental issues and problems that arise in the basin and their links with transboundary dynamics. Based on the analysis of identified problems, their impacts on biophysical and human environment and their root causes, the TDA provides a better understanding of the basin's most affected regions and the priority transboundary environmental problems that must be solved.

The goal of the Strategic Action Program is to provide the OMVS with a document that can serve as a basis for *sustainable transboundary environmental management* of the Senegal River Basin, in other words, priority environmental problems identified in the TDA. Specifically, the SAP goal is to:

- Propose priority actions and measures with a view to solving the most urgent environmental problems identified in the TDA;
- Identify the roles and responsibilities of various actors in the implementation of retained actions;
- Define the institutional and regulatory framework—and the necessary reforms as needed—to create an enabling environment for implementation of the suggested measures; and
- Define a plan for investment and mobilization of financial and human resources for the implementation of the proposed actions.

The Strategic Action Program is based on a Long-Term Vision for what the environment of the Senegal River Basin should be. This vision is founded on the Long-Term Environmental Quality Objectives (LTEQOs). These LTEQOs refer to the most urgent specific environmental problems identified during the TDA. The LTEQO defines the acceptable solution level for the corresponding environmental problem. For each measure, a series of activities have been outlined in addition to the identification of concerned actors and possible intervention areas. The SAP provides the estimated costs and presents the justification for the identified measures in the Annex. Effective implementation of the measures—and therefore achievement of all the LTEQOs—is intended to ensure that the Long-Term Vision for the basin is realized.

Methodology for developing the SAP

While the TDA is a non-negotiated document drawn from established facts and the most reliable scientific data, the SAP is a consultative process during which stakeholders are encouraged to express their priorities and preferences regarding not only environmental problems that require a rapid solution, but also options for possible solutions. For this reason, the SAP is said to be a negotiated process.

The approach used to formulate the Senegal River Basin SAP was designed to be as participatory and inclusive as possible.

The diagram below illustrates the SAP's main development phases. The process began with a meeting of the consultants involved in the process. They include: (a) the four national consultants, each responsible for leading wide-reaching consultations with stakeholders at the national level and with each of the local coordination committees (LCCs) for their respective countries (Guinea, Mali, Mauritania and Senegal); and (b) the regional consultant (author of this report) assisted by a socio-environmental expert specializing in gender issues and public participation and an environmental expert (plant biology). Experts from the OMVS (from the GEF-SRB Project and the Environmental Observatory) also took part in this meeting to prepare the regional workshop to launch the SAP. This meeting made it possible to harmonize approaches and the national process for the SAP, discuss the underlying fundamentals for the Vision and the Long-Term Environmental Quality Objectives (LTEQOs) and engage in a brainstorming session regarding options for formulating the Vision and the LTEQOs. Based on the priority-actions matrix included in the TDA, the start-up workshop also required a proposal for a series of possible measures for each LTEQO. The outline for writing the regional SAP was also discussed and improved. This workshop was also an opportunity to exchange ideas regarding the principles and modalities related to participation from the public and national and regional stakeholders.

The regional workshop to launch the SAP process, held in Nouakchott (Mauritania) 25–26 August 2007 included participation from experts from OMVS member countries, the High Commission, the SOGED, the SOGEM, the UNDP, civil society, consultants responsible for the SAP national studies in the four basin countries, the regional SAP consultant and his assistant. The workshop goals encompassed formulating the Vision, defining the quality objectives and proposing measures to achieve these objectives. Participants also discussed and agreed upon an outline for writing the SAP, modalities for consultations with stakeholders and a timeline to guide the SAP formulation process.

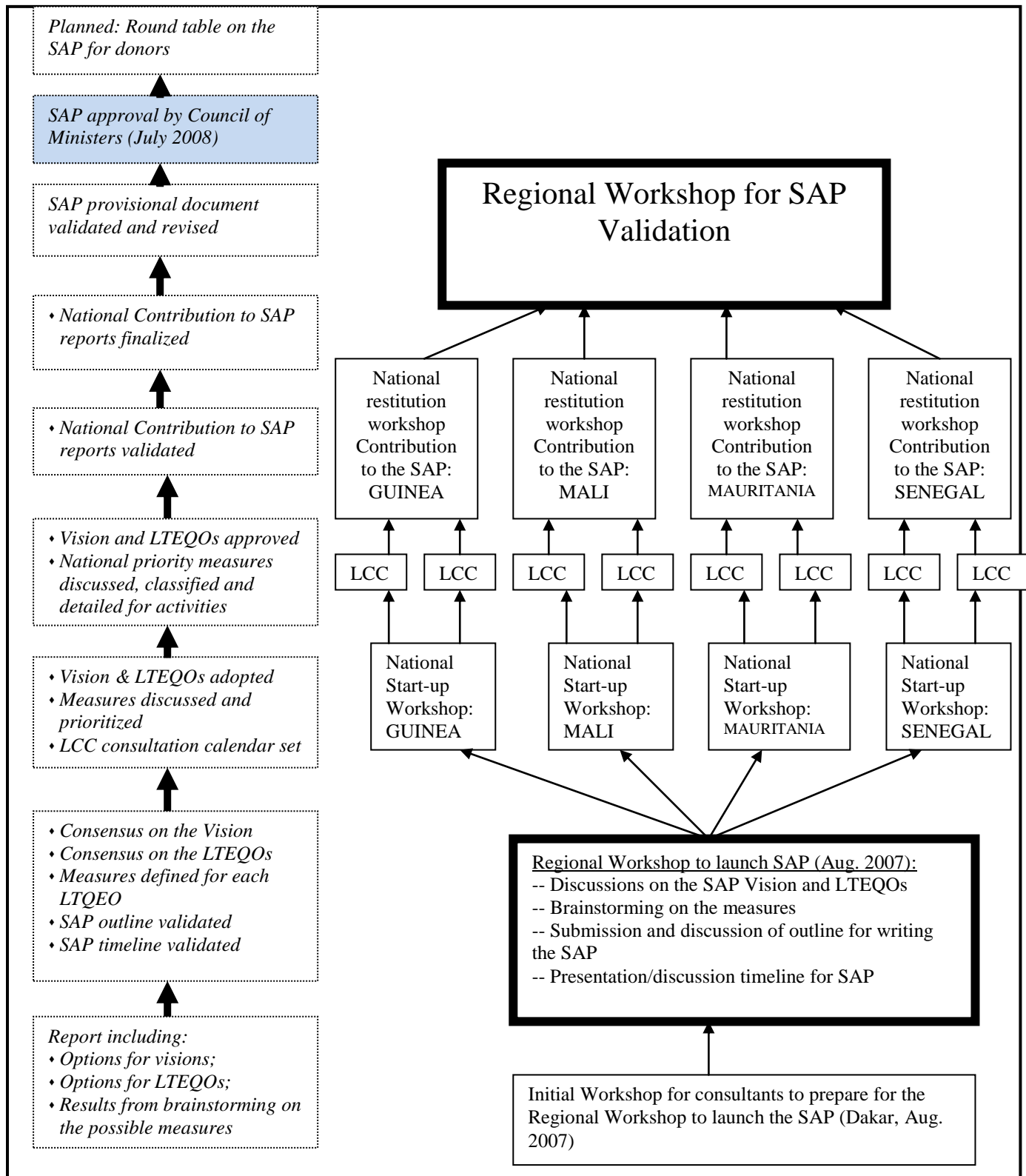
The national process following the start-up workshop consisted of holding another start-up workshop at the national level in each of the four basin countries. The workshops were represented by national stakeholders involved in water use and management and representatives of the local coordination committees (LCCs) for their respective countries. After receiving the necessary background on the Vision and the LTEQOs adopted during the regional workshop, the stakeholders in each of the national workshops approved and adapted them. Based on each country's realities and priorities, the national workshops prioritized and even enriched the measures recommended during the regional workshop. For each LTEQO, a maximum of 10 measures were retained by each national workshop.

Following the national start-up workshops, each of the national consultants visited the various LCCs in his or her country. The Senegal River Basin is made up of 28 LCCs: 4 in Guinea, 10 in Mali, 7 in Mauritania and 7 in Senegal. For each LCC, the consultation consisted of explaining the Vision, the LTEQOs and results from the national start-up workshops and, in particular, the 10 retained measures for each LTEQO. Then, participants at the LCC meetings had to choose a maximum of five measures per LTEQO based on the priorities of the area covered by their LCC. For each measure, the relevant interventions currently in progress or planned (development projects, for example) were inventoried before identifying the activities necessary to achieve the LTEQOs. Next, the local administrative sub-units that might be affected were identified as well as actors who should be involved in implementing the selected activities.

Based on the consultations held during the national and local workshops and additional information on the institutional and legal system and relevant projects and programs, each of the national consultants had to prepare a report, entitled “National Contribution to SAP.” These reports were then restituted during national workshops that brought together essentially the same stakeholders who took part in the national start-up workshops to launch the SAP process.

This SAP document draws mainly from these national contributions. Additional consultations with the OMVS were also needed along with consideration of regional initiatives that could affect the basin environment and/or implementation of the selected SAP measures. The preliminary version of the SAP was revised once to take into account observations and comments from the SAP regional validation workshop held in Dakar (Senegal) in April 2008. The current version is a new revision taking into account observations and additional suggestions from the World Bank, UNDP and the GEF. Following its approval by the OMVS Council of Ministers, the finalized document will serve as a basis for a round table of donors to discuss the funding mobilization needed for SAP implementation.

Figure 1. Diagram of the approach used to formulate the Senegal River Basin SAP



1. Context of the Senegal River Basin

With a length of 1800 km and a basin of 300,000 km², the Senegal River is the second largest waterway in West Africa after the Niger River. It is formed where the Bafing and the Bakoye meet in Bafoulabé in Mali. The Bafing, the Senegal River's main component, is 800 km long; its source is in the central plateau of the Fouta Djallon Massif, near the city of Mamou (Guinea). Along its Guinean course, it receives inflows from the Téné and about 60 other small tributaries.

In Bafoulabé, downstream from Manantali, the Bafing is joined by the Bakoye, which originates in the Monts Ménien in Guinea at an altitude of 760 m. After joining the Bafing, the Bakoye receives the Baoulé on the right. Here the Senegal River is formed at the junction of the Bafing and Bakoye and receives the Kolimbiné then the Karokoro on the right and the Falémé on the left, 50 km upstream from Bakel. The Falémé's source is in the northern part of the Fouta Djallon in Guinea, at 800 m in altitude. At Bakel, the mean annual volume of the Senegal River's flow is 22 billion m³ (reference period: 1904–1999).

Downstream of Bakel, the inflow has been relatively reduced. The Oued Ghorfa, the Niorde and the Gorgol (the Mauritanian side on the right bank) are among the notable downstream Bakel inflows. These waterways actually act as tributaries (with relatively reduced inflow) during the rainy season and as distributaries for most of the year (dry season).

The Senegal River Basin is generally divided into three distinct parts:

- The upper basin: the river's sources (the Fouta Djallon) at the confluence between the Senegal River and the Falémé (downstream from Kayes and upstream of Bakel). Roughly speaking, it comprises the Guinean and Malian parts of the river basin.
- The valley extends from the confluence of the Senegal River and Falémé to the usual boundary of the saltwater wedge (Rosso Mauritania); the valley itself is sometimes divided into three sections: the upper valley (between the Senegal River and Falémé confluence and the Senegal River-Oued Gharfa confluence up to Maghama in Mauritania), the middle valley (from the Senegal River-Oued Gharfa confluence to the western boundary of the Ile à Morphil in Podor) and the lower valley (from Podor to Rosso Mauritania).
- The delta, from Rosso Mauritania to the mouth of the river.

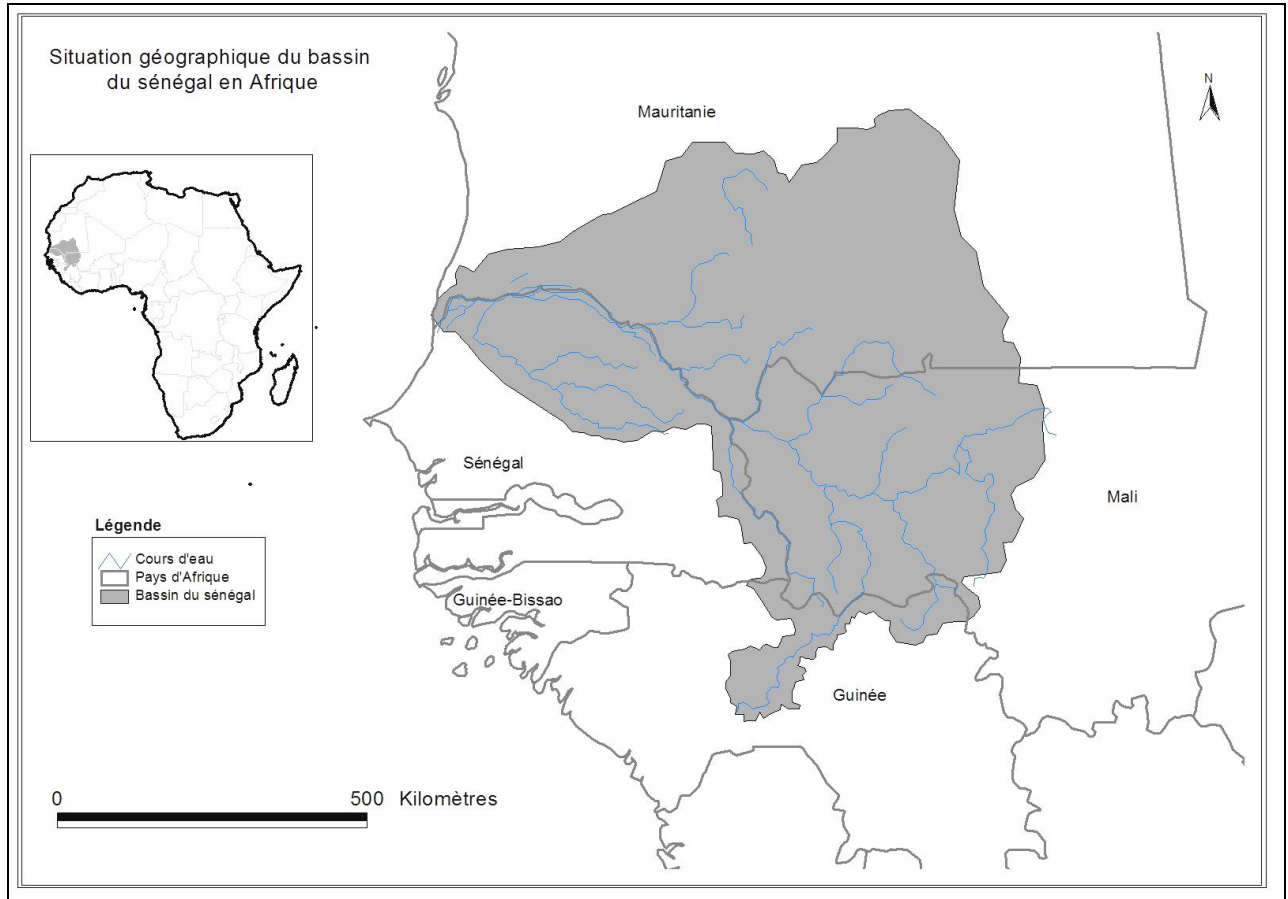
Climate conditions

The average annual rainfall in the Senegal River Basin is 550 mm/year. The Guinean part records close to 1500 mm/year as opposed to only 200–250 mm/year in the northern part of the basin. This contrast in rainfall that characterizes the basin is somewhat attenuated by the fact that the river transfers billions of cubic meters of water from regions with plentiful rainfall in the upper basin to the dry Sahelian regions of the valley and delta. This particular system explains the basin's considerable biophysical richness and the broad diversity of production systems for some 3.5 million people who live in the basin.

Due to the aridity that predominates in most of the basin, water supply (surface and groundwater) and its spatial and temporal distribution plays a major role in the evolution of the river ecosystem and the basin's development. Two major factors have exerted pressure on the basin's water resources in recent years: (a) climate variability and change; and (b) the

dams. These pressures on water resources, added to those linked to runaway demography and various productive activities, has had repercussions on the basin's natural environment and its ecological diversity.

Figure 2. The Senegal River Basin



Along with contrasting climates in the upper basin and lower valley, high inter-seasonal and inter-annual variability poses another rainfall factor. During the last 30 years, a sharp drop in rainfall has caused the region's countries to suffer a succession of chronic annual deficits. Despite a modest recovery over the last decade, it cannot be asserted that the drought has really ended.

This chronic decrease in rainfall in the basin is accompanied by a comparable, but amplified, decrease in the river's hydraulicity. The river's average annual flow has corresponded to a continuously decreasing cycle since the beginning of the last century.

Biological diversity

The stark contrast in landscapes in the Senegal River Basin is a reflection of the basin's contrasting climate conditions. This leads to significant differences in fauna and flora status between the highlands upstream of Bakel and the river valley downstream.

In terms of flora, notable differences occur between the upper basin and the lower basin. In the upper basin, which generally corresponds to the Fouta Djallon highlands, the type of vegetation found there is a function of the type of ecosystem in place. Hence, the gallery forests of the dry forest ecosystems are marked by persistent deciduous species such as *Mitragina stipulosa*, *Alcornea cordifolia*, *Raphia gracilis*, *Uapaca somon* and *Cola cordifolia*. In forest islands, the most frequent woody species are: *Ceiba pentandra*, *Adansonia digitata*, *Cassia sieberiana*, *Cola cordifolia*, *Parkia biglobosa* and *Vitellaria paradoxa*. Today, the forest cover of the Fouta Djallon Massif extends over 13% of the region, or 800,000 ha of dry dense forest and 50,000 ha of patches of forests, remnants of the former dense cloud forest.

The Sudano-Guinean savannah ecosystems are marked by species such as *Andropogon ascinodis*, *Sorghastrum bipennatum* in the grassland savannah. The shrub savannah is notable for the presence of *Hymenocardia acida* and *Andropogon gayanus*. In the woody savannah, the most frequent woody species are: *Parinari excelsa*, *Erythrophleum guineensis*, *Parkia biglobosa*, *Isberlina doka* and *Daniela oliveri*.

Mountain ecosystems, specifically at high altitude, are found in the Fouta Djallon central plateau and have many headwaters. The floral composition of these ecosystems is: *Afzelia africana*, *Trema guineensis*, *Parinari*, *Fagara macrophylla* and *Erythrophleum guineensis*.

Freshwater ecosystems, including lentic and lotic ecosystems, also contain interesting flora diversity with lower plants or thallophytes (bacteria, mushrooms, algae and lichens) and higher plants or cormophytes (bryophytes, pteridophytes, angiosperms and gymnosperms).

This floral potential is in clear regression following increases in population and livestock, which causes overuse and resorting to unsustainable pastoral and hunting practices. Close to 140,000 ha of forests are destroyed annually for agriculture. Of the 88 plant species considered native, 36 are considered under threat of disappearing (FAO, 2004).

Downstream from Bakel leads into the lower basin (where the climate becomes Sudano-Sahelian and then Sahelian). The vegetation cover here depends on soil type, water supply and landform. Sudano-Sahelian formations are characterized by species such as *Sterculia setigera*, *Combretum glutinosum*, *Sclerocarya birrea* and *Acacia seyal* (in soil with higher clay content) and *Adansonia digitata* (in rich soil). The Sahelian formations are generally open landscape dominated by *Balanites aegyptiaca*, *Boscia senegalensis* and *Acacia senegal*; herbaceous plants are represented by *Cenchrus biflorus*, *Schoenefeldia gracilis* and *Indigofera senegalensis*. The alluvial formations located on riverbanks and the flooded alluvial plains include the floodplain forests of gonakiers (*Acacia nilotica*). The salty soil of the delta and the lower valley are the preferred domain of *Tamarix senegalensis*. However, mangrove formations amount to several hectares of mangrove stands in the delta (around Dakar-Bango near Saint Louis, the Mauritanian delta, the Tiallakt mouth and the confluence of the Bell and Ndioul). They are represented by *Avicennia nitida*, *Rhizophora racemosa* (Source: Projet Biological Diversity Conservation through Participatory Rehabilitation of the Degraded Lands of the Arid and Semi-Arid Transboundary Areas of Mauritania and Senegal, 2005).

Throughout the entire lower basin, the shrub savannah and the steppes occupied by groves of trees have become sparser. The gallery forests of gonakiers in the immediate environs of the river have greatly regressed since the early 1970s due to chronic water deficits.

As for fauna, the same contrast between the upper basin and lower basin holds. In the upper basin, mammals such as large ungulates, rodents and primates live in the savannah ecosystems as well as small antelopes. The forest ecosystems are hosts to species such as the lion (*Panthera leo*), the Guinean baboon (*Papio papio*) and various colobi (*Colobus sp.*). In the gallery forests, most of the vertebrates are birds and reptiles. In terms of invertebrates, this ecosystem is also rich in frondicolus and xylophagous insects.

The mountain ecosystems are characterized by particular and varied wildlife: vertebrates include mammals (chimpanzee, red colobus, bongo), birds (fracolins, white-necked Picathartes) and reptiles (green mamba, *Dendroaspis*). The existence of invertebrates must also be noted, including an abundance of insects.

In terms of fish fauna, the Guinean part of the upper basin numbers close to 30 species of fish divided between 15 families.

Many birds live in and exploit the Guinean groundcover and ligneous fruits. The most frequent species are pigeons and doves, green pigeons and parrots, various waterfowl and terrestrial birds.

The depth of arable land is generally shallow on the boval, limiting soil fauna in this environment. However, termites (microtermes) are found there. In wooded areas, the soil is quite deep and rich in organic matter. It is a favorable habitat for considerable soil fauna, made up of earthworms, insect larva, scolopendra, acadians and xylophagous species, notably beetles. Numerous insect species (frondicolus) mainly belonging to the Orthoptera (locusts and grasshoppers) and Hymenoptera (such as bees, ants and wasps) and Lepidoptera (notably butterflies) live in plant foliage in savannah woodland and dry and gallery forests. Aquatic vertebrates include fish, frogs, freshwater turtles and hippopotamuses. The most frequently caught fish are mainly from the genus *Tilapia*, *Sarotherodon* and *Clarias*.

The aquatic invertebrates represented by the Guinean part of the Basin separate into three categories: the shellfish (crabs, shrimp and mollusks); the entomocoenoses or aquatic worms such as the leech *Hirudo medicinalis* and insects belonging to the diptera, trichoptera, ephemeroptera plecoptera, odonata, coleoptera and heteroptera insects.

Nevertheless, this rich wildlife diversity is subjected to various threats. Expansion of human settlement sites, cultivated land and mining operations reduces fauna and flora habitats while bush fires and poaching decimate wildlife species. Recently the fauna and flora of the Senegal River Basin has seriously decreased. In the upper basin, although the fauna is still rich and diversified, it has sharply declined. Due to its richness and avifauna, the Senegal River delta remains one of the most important wetlands along the immediate border of the Sahara Desert. All along the river, the decreasing fish fauna population continues to be diversified despite profound changes in the river regime due to the dams.

Socio-economic context

The Population of the Senegal River Basin—approximately 16% of the total population of the four riparian countries¹—numbered over 3.5 million persons in 1990 and is close to 6 million today.² It is estimated that nearly 85% of the basin population lives along the river and its tributaries.

The riparian countries of the basin are among the poorest in the world. From the point of view of their Human Development Index, Mauritania, Senegal, Mali and Guinea are ranked at 137th, 156th, 160th and 173rd respectively for the 177 countries in the last UNDP report (2007–2008) on human development.

The countries in the Senegal River Basin depend highly on agriculture, which accounts for more than 30% of their average gross domestic product and occupies three-fourths of the active population. This dependence on agriculture is even more pronounced for communities living in the Senegal River Basin.

Rain-fed and subsistence agriculture has prevailed in the Senegal River Basin with little variation relative to hydro-climatic conditions in the area. In the Guinean part of the basin, slash-and-burn itinerant grain cultivation (rice, fonio, millet and sorghum) and groundnut and tuber (cassava, sweet potato and yam) predominate along the small streams that converge at the Bafing, the Falémé or the Bakoye. Tapade farming, particularly prevalent among the Peul, is an intensive form of agriculture based on extensive use of manure and other organic matter. Flooded and flood-recession agriculture (potato and rice) is also practiced in the shoals.

In the Malian part of the basin, agricultural production systems closely resemble those of the Fouta Djallon Massif and include itinerant slash-and-burn farming, tapade farming and flood recession farming in the shoals. In addition, the expansion of cotton farming has been quite extraordinary there. For example, in the *cercle* of Kita (Kayes Region), where cotton farming was introduced in 1995, over 42,000 ha had already been used for cotton crops in 2006.

In the Senegalese and Mauritanian parts of the basin, the role of rain-fed agriculture has diminished (particularly in the northern reaches of the basin) due to increasing aridity, while becoming random and nearly nonexistent in the lower valley and the river delta. Rain-fed crops (millet and groundnut crops) are yielding more and more to flood-recession crops in the middle valley and irrigated farming in the lower valley and delta.

Flood-recession agriculture, also known as *waalo* farming, is practiced along the riverbanks and in the rich soils of the troughs after flooding recedes, October to March. In its natural regime (before the construction of the dams), the Senegal River's main channel overflowed during high waters in the rainy season to engulf the wide depression of the middle and then lower valley to flood hundreds of hectares in low-flood years and more than 500,000 ha in wetter years. For Gibbs et al (1987: 3/19), when climate conditions were normal, flood-

¹ Conversely, a recent study from the French Ministry of Foreign Affairs calculates the Senegal River Basin population as 10% of the total population of the riparian countries (Le Goff et al, 2005).

² In 1990, the population of the four basin countries was estimated at 21,875,000 persons including 3.5 million living in the *cercles*, departments and Moughata located along the river, or 16% of the four countries' total population (source: Statistiques OCDE/Club du Sahel). In 2004, the population of the four basin countries was estimated at 36,700,000 persons (source: UNDP - *Human Development Report 2007-2008*), which corresponds to 5,880,000 persons living in the basin based on the assumption that 16% of the total population for the four basin countries are living in the basin.

recession farming substantially contributed to achieving self-sufficiency—for 50% in the upper valley (the Bakel area) and 68% in the middle valley (Podor area). Over the last decades, this farming system was profoundly affected first by drought and chronic water deficits and then the dams, particularly the Manantali dam, which regulated the river's flow. The flood management from the Manantali dam, which used to be fairly consistent, has become less frequent since 2003 when this dam began producing electricity.

Currently, irrigation farming remains limited in the middle and lower river valley between Mauritania and Senegal, with 42,000 ha and 95,000 ha managed, respectively. In the upper basin, the Tolo and Mafevol dams on the Bafing enable irrigated farming on about 1000 ha in Guinea. Downstream from Manantali in Mali, just over an estimated 800 ha of land is serviced for irrigation. Thus, less than half of the irrigation potential for the basin, estimated at 375,000 ha, is currently serviced. Of the 130,000 ha to 140,000 ha that are serviced, only 90,000 ha are really usable, including 60,000 actually cultivated in the rainy season and between 10,000 ha and 15,000 ha cultivated in the off-season (AGRER et al, 2003; Le Goff et al, 2005).

Livestock farming continues to be an important activity in the basin. In the Sahelian part of the basin, transhumant livestock farming and nomadic herding predominate. The Mauritanian national livestock population is concentrated in the Mauritanian part of the basin, with 33%, 44% and 23% of its cattle, small ruminants (sheep and goats) and camels, respectively. In the Senegalese part of the basin, the cattle, small ruminants and camels account for 25%, 21% and 41%, respectively, of the country's national livestock population. In Mali, the Senegal River Basin hosts 35% of the national cattle population and 16% of the small ruminants. In Guinea, 36% of the cattle and 33% of the small ruminant population are concentrated in the nine Prefectures there. Since the human population of the basin only accounts for 16% of the total population for the four basin countries, the figures above illustrate the river basin's quasi-specialization in livestock.

The high concentration of livestock—accentuated by the massive influx of additional livestock during the dry season and years with rainfall deficits (and consequently, fodder shortages)—results in high pressure on natural resources. In the upper basin, early fires, a technique used by livestock farmers to regenerate pastures, are sometimes the start of uncontrolled bush fires. Throughout the basin, overgrazing depletes and denudes land, thus accelerating wind and water erosion. Pruning (lopping) trees also continues to be widespread at the end of the dry season when the grass cover recedes and throughout the season to respond to livestock needs. Just when the need for grazing land increases, a simultaneous expansion of cultivated land occurs (due to increased population, resorting to cash crops and depleted soil). This leads to increased conflicts between farmers and herders.

For the entire river basin, it was estimated in the early 1970s that there were close to 10,000 fishermen working full time and as many working part time, accounting for a total of 6.1% of the active population in the basin at the time (Reizer, 1974). Over recent years, the fisheries potential has been profoundly modified, not so much in terms of biological diversity—fish species inventoried before the great ecological crisis of the 1970s are for the most part still present in the river—as in available stocks. Even in terms of stock, noted changes vary depending on river reaches: a 50–70% decline for stocks downstream of Diama; stock increases in the Diama reservoir and the Lac de Guiers; substantial decreases in the middle valley (particularly following disturbances in the flood cycle of the alluvial plain, which is a preferred area for fish reproduction). Today the Manantali reservoir is Mali's third largest

fishing area after the Niger Interior Delta and the reservoir at the Sélingué dam. Despite these contrasts in evolution, fishing is still an important activity today throughout the basin where it is the main source of income for more than 6300 fishermen. Close to 2000 fishermen depend on fishing as a supplementary source of income. These fishermen are divided as follows: 79% in Senegal, 16% in Mauritania and 5% in Mali³ (Roche International, 2000).

The basin communities, and particularly those living along the river or its tributaries, greatly depend on forest products and other natural resources from the ecosystem. Harvesting these natural resources provides them with food complements and sizable sources of income. Plant gathering and hunting are subsistence activities as much as they are commercial. The use of wood illustrates this high dependence on natural resources. In Guinea, the most widely consumed energy sources are firewood (77%) and wood charcoal (3%), accounting for 80% of total energy consumption. A similar situation has been noted in the other basin countries. In Mali, demand for wood energy (4.7 million tons per year) accounts for 96% of the national energy needs (Konate, 2001). In Mauritania, despite the low level of wood cover, wood and wood charcoal constitute 20% and close to 8%, respectively, of national energy consumption (Ould Taleb, 2001). In Senegal, wood accounts for 67% of energy consumption (including 25% for wood charcoal) compared to just 5% for butane gas (Boye, 2000). Consequently, forests and woody areas have significantly regressed nearly everywhere in the basin.

In the Senegal River Basin, mining is especially active in the upper basin. In the Guinean part of the basin, there are industrial mining sites for bauxite (Société de bauxite de Dabola-Tougué, SBDT) and for gold (Société Minière aurifère de Kalinko (SMK) and Société Minière de Gagnakali). In Mali, the largest industrial gold mining sites are located in Yatéla and Sadiola (mine operated by the SEMOS Company). Alongside industrial gold mining, artisan mining (gold washing) is a widespread and ancient practice. In Guinea, the main sites where traditional gold mining exists are: Diatiféré, Naboun, Franwalia, Gagnakaly and Kintinian. In Mali, the main gold washing sites are located east of Faléa and southwest of Faraba. In the Senegalese part of the basin, gold washing occurs on the banks of the Falémé.

The waters of the Senegal River contribute substantially to solving problems related to drinking water supply for basin communities and beyond. For example, the city of Dakar depends on close to 75% (or 130,000 m³/s) of conveyed water from a tributary of the Senegal River, the Lac de Guiers, about 250 km away. Work underway along the right bank will make it possible to supply water to the city of Nouakchott from the Aftout-es-Sahel, a tributary of the Senegal River: water consumption in the Mauritanian capital could potentially increase from 50,000 m³/day now to 170,000 m³/day in 2020 (Alam & Dione, 2004). The Senegal River also contributes to water supplies for the cities of Saint Louis, Rosso, Richard Toll, Dagana and Kaedi. Additionally, most of the villages in the valley are supplied with water from the alluvial layer by wells 2–15 meters deep.

³ Guinea was not taken into account in the Roche International study.

Recent changes in the river regime and basin environment

Over the last three decades, a considerable decrease in rainfall has landed the region's countries in a series of deficit years. This chronic decrease in rainfall in the basin is accompanied by a comparable but amplified decrease in the river's hydraulicity. The river's average annual flow fits in with a continuous downward cycle since the beginning of the last century. The average flow module in Bakel decreased by more than half between the two halves of the last century and then by half again between the two last quarter centuries. In other words, the annual average flow in Bakel went from 1374 m³/s for the period 1903–1950 to 597 m³/s for the period 1951–2002; and an average of 840 m³/s for the period 1950–1972 to only 419 m³/s for the 1973–2002 period (OMVS, 2003). Deteriorating hydro-climatic conditions before the construction of the dams is also illustrated by the fact that for the reference period 1904–1972, 8 of the 10 years recording the lowest hydraulicity are concentrated in the 1970s and 1980s. When the dams were built, the river regime was undergoing profound changes. Similarly, the physical setting was experiencing rapid encroachment of desertification.



Fig. 3. Rice fields located at the source of the Bafing (Photo: Niasse, Oct. 2007)



Fig. 4. Degraded riverbanks, 1 km downstream of the Bafing source (Photo: Niasse, Oct. 2007)



Fig. 5. Degraded riverbank on the Senegal River – Kayes Area (Photo: A. Cissé, 2007)



Fig. 6. The Diamel, tributary of the Senegal River, middle valley, right bank (Photo: Niasse, 2007)

The program to realize major developments in the Senegal River Basin, for which the Diama and Manantali dams were the cornerstone, was designed in response to this drought and its impacts. With a height of approximately 70 m from the foundation and a reservoir of 11 million m³, the Manantali dam, built on the Bafing, controls 40–50% of the river's flow at Bakel. The Diama dam is 17 m high. Levees surround the catchment on the left and right banks, extending for about 100 kilometers. By regulating river flow, they enable management of 375,000 ha of irrigated land on both banks of the river, the production of 800 GWh/year of electricity and navigability between Ambidedi in Mali and Saint Louis at the mouth of the river. Since their activation, (1986 for Diama and 1988 for Manantali), these two large dams have had a significant effect on the water regime of the Senegal River. The Diama dam blocks the extension of the saltwater wedge in the dry season and prevents large quantities of freshwater from flowing to the mouth in the low-water period. The Diama dam has also contributed significantly to modifying water quality in the river with a noticeable decrease in salinity. Thus, the ecological system of the lower valley and delta of the Senegal River Basin has transformed from a salty and brackish aquatic environment with significant seasonal changes to a freshwater ecology with continuous moderate flux. The Manantali dam has facilitated flood reduction and sustained minimal flow due to electrical production and maintaining irrigation farming. Consequently, during years of good hydraulicity, this causes a decrease in land area of flood-recession farming in the basins and on the riverbanks. During years of decidedly average hydraulicity, artificial flood releases from the dam enable flood management. Damping high flooding and raising dry-weather flow levels added to disruptions to the flows by the dams pose significant impacts on ichthyology (though still poorly defined in terms of form and extent).

2. Priority environmental problems

The TDA has identified 16 priority environmental problems.⁴ These problems are: 1. Surface water availability problems; 2. Groundwater availability problems; 3. Water quality: pollution/siltation; 4. Water quality: pollution/mining operations; 5. Change in estuarine hydrodynamics; 6. Deforestation; 7. Erosion/sand invasion; 8. Erosion and degradation of riverbanks and headwaters; 9. Soil salinization; 10. Overgrazing; 11. Bush fires; 12. Desertification; 13. Degradation of fish fauna; 14. Wetlands degradation; 15. Invasive species; 16. Waterborne diseases

During the TDA phase, a tentative classification by order of priority was conducted for these 16 problems using the criteria below:

1. Extent and severity of the problem's impact on the Senegal River Basin ecosystem;
2. Extent and severity of the problem's impact on socio-economic activities and human and animal health;
3. Level of interaction between the problem and other environmental and socio-economic factors; and
4. Difficulty in finding local and/or national solutions to the problem, and thus the relevance of a transboundary approach to resolve the problem.

The 16 identified environmental problems have been assessed for each of the four criteria. For each criteria, the assigned scores range from 1 to 3:

- 1 = Undocumented, zero or low impact (uncertain or undocumented relevance: criteria 4).
- 2 = Moderate impact (medium relevance: criteria 4).
- 3 = Serious impact (very high relevance: criteria 4).

For simplicity, the scores have not been weighted; adding the derived scores for the various criteria results in a total value for priority ranging from 4 to 12. The results from this exercise produced Table 1 (below).

Based on these criteria, the level of priority has been established as follows:

- ☞ The most urgent problems (in other words, environmental problems raising the most concern): invasive plants, desertification and bush fires, wetlands degradation and change in estuarine hydrodynamics.
- ☞ Serious environmental problems (covering a broad range): the problems of surface water supply, deforestation, overgrazing, erosion and siltation, riverbank degradation and degradation of fish fauna.
- ☞ Major environmental problems but determined by other factors (waterborne diseases) or occurring locally and/or not necessarily needing a transboundary solution: groundwater supply and quality; water quality (pollution from mining operations); soil salinization, especially in the delta.

⁴ Identification of these problems refers back to the Transboundary Environmental Analysis (TEA) conducted during the PDF-B phase of the GEF project.

Table 1. Classification of environmental problems by order of priority

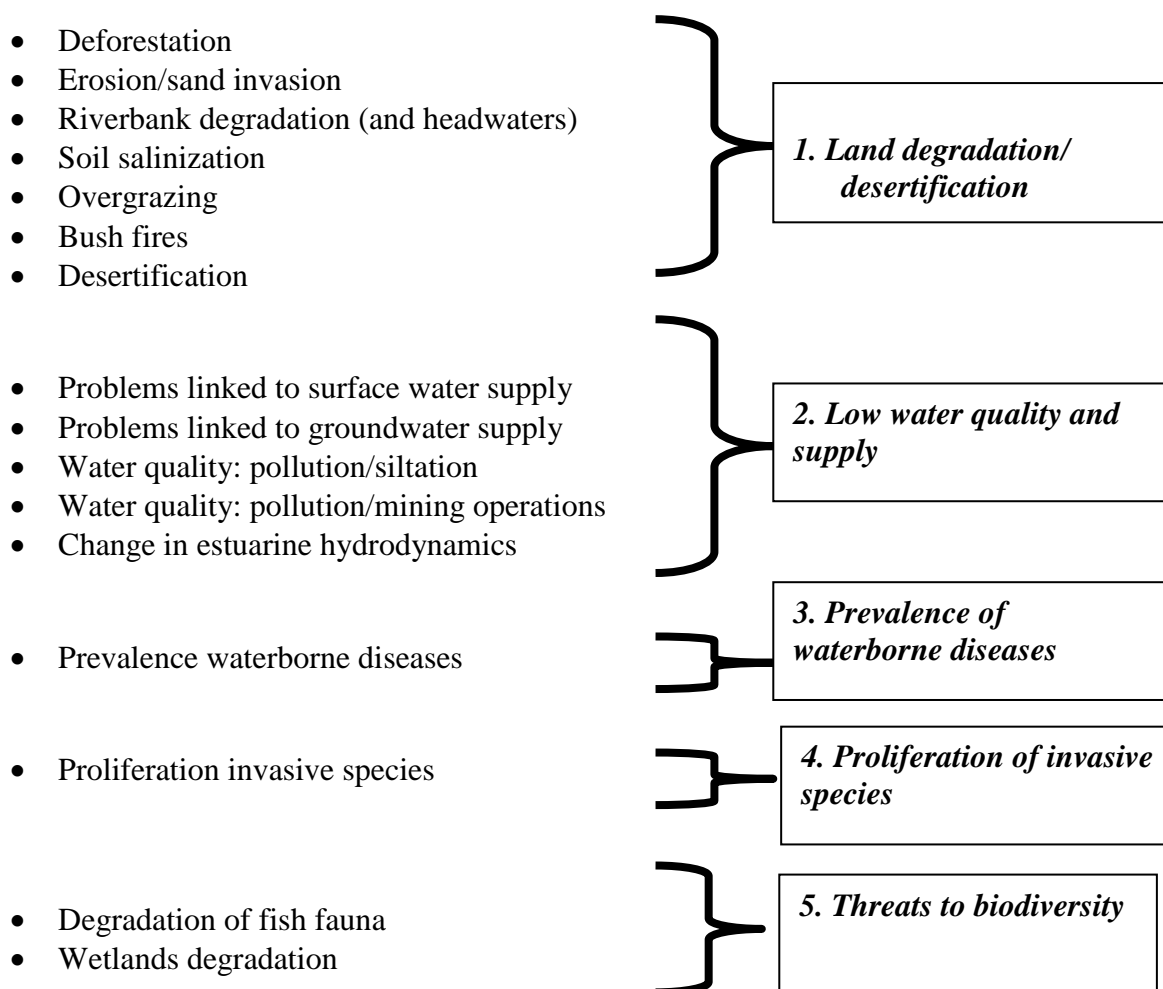
Environmental problem	Criteria 1 Impact on ecosystem	Criteria 2 Socio-eco impact	Criteria 3 Effects on other env. problems	Criteria 4 Need for transboundary solution	Total score
1. Surface water availability problems	2	2	3	2	9
2. Groundwater availability problems	1	1	1	1	4
3. Water quality: pollution/silting up	2	2	2	2	8
4. Water quality: pollution/mining operations	1	2	2	2	7
5. Change in estuarine hydrodynamics	3	2	3	2	10
6. Deforestation	3	2	3	1	9
7. Erosion/sand invasion	2	2	3	2	9
8. Degradation of riverbanks	2	3	1	3	9
9. Soil salinization	1	2	1	1	5
10. Overgrazing	2	3	2	2	9
11. Bush fires	3	2	3	2	10
12. Desertification	3	3	3	2	11
13. Degradation of fish fauna	2	3	1	3	9
14. Wetlands degradation	3	3	2	2	10
15. Invasive species	3	3	3	3	12
16. Waterborne diseases	1	3	1	3	8

As noted, the SAP phase is a negotiated phase where stakeholders establish their own level of priorities and urgency based on their perceptions about the problems confronting them. Based on the ideas expressed by all parties in the SAP phase, the following changes were made to the TDA classification:

- Regrouping problems into general topics. Given the extensive overlap between topics, it was suggested to regroup the 16 priority problems into 5 general topics: (1) land degradation and desertification; (2) low water quality and supply; (3) prevalence of waterborne diseases; (4) proliferation of invasive species; and (5) threats to biodiversity (see Figure 7, below). It should be noted that this regrouping process began with the TEA, which grouped a series of priority problems under the topic “land degradation.”⁵

⁵ See also the TDA document for a more detailed discussion on the identification of priority environmental problems and their regrouping into general topics (Niasse, M. 2007. *Analyse Diagnostique Environnementale Transfrontalière du Bassin du Fleuve Sénégal. Synthèse régionale*. OMVS. Dakar. June)

Figure 7. Reorganization and regrouping of priority environmental problems



- Change in the estuarine hydro-dynamics was not perceived by many stakeholders as highly urgent. This attitude can possibly be explained by the fact that it is still too early to clearly define the exact extent of disturbances that ensued from the combined effects of opening the breach in the Langue de Barbarie, the existence of the Diama dam and signs of rising sea levels (a phenomenon often associated with climate change).
- Degradation of riverbanks was a topic of long discussion especially concerning its extent and impacts and whether or not this issue is a transboundary problem. Following discussion, it was selected in combination with headwaters degradation observed in the Guinean part of the upper basin and considered as one of the most urgent problems to solve in the basin. However, this problem remains in the general topic of land degradation.
- Desertification was also a topic of long discussion during the SAP formulation process. It was determined that its importance was such that it would not be considered as a simple sub-phenomenon under the heading of land degradation. Hence, it was agreed that the topic “Land Degradation” would be revised with the addition of “Desertification.”

This chapter sums up the immediate and root causes for each of the five priority environmental problems as analyzed in the ADT.

2.1. Land degradation/desertification

Land degradation concerns the decrease or disappearance of biological or economic productivity of cultivated land, livestock routes, forests or woody landscapes. It results in decreased capacity of land to produce biomass. Desertification is the final stage of land degradation.

Land degradation is caused by the following factors: deforestation, overgrazing and erosion. The effects of these processes contribute to desertification. Mining also causes deforestation and soil mobilization that promotes erosion.

The findings in the TDA regarding each of these sub-problems of land degradation and desertification can be summarized as follows:

Deforestation

Deforestation—reduced wooded cover—is one of the manifestations and causes of land degradation. Deforestation is widespread in the Senegal River Basin. The 2005 Environmental Observatory estimates that on a national level, forested surfaces were reduced by 800,000 ha in Senegal between 1981 and 1990, and Mali and Mauritania reported losses of 100,000 ha and 10,000 ha per year, respectively (SOE, 2005). In Guinea, the Fouta Djallon Massif, the source of the Senegal River, was among the regions affected by deforestation. In the Malian part of the basin, gold washing (in the Kéniéba area surrounding the Manantali reservoir) and encroachment of the cotton farming (downstream from Kita) contribute greatly to deforestation.

Deforestation leads to loss of natural habitat and thus significantly contributes to decreased biological diversity of both wildlife and plants. Moreover, deforestation exposes soil, making it vulnerable to water and wind erosion, thus accelerating siltation in the riverbed and degradation of riverbanks.

Both natural and human causes are at the root of deforestation. The natural causes involve hydro-pluviometric conditions that were quite unfavorable in the basin (as well as in the rest of the Sahelian and Sudanian region). Human causes of deforestation are: land clearing for agricultural purposes; use of lumber, firewood and wood charcoal; overgrazing; expansion of residential areas into urban and rural settings; mining; bush fires; greater open access to wooded areas, etc.

Erosion and sand invasion

The Senegal River Basin has undergone intensive erosive activity, yet the extent of the problem varies from one area to another. The river valley and delta are the areas most affected by soil erosion in the basin.

The most acute manifestation of sand invasion in the Senegal River Basin affects the right bank of the lower valley of the river (Wilaya du Trarza in Mauritania) where the landscape is marked by many active sand dunes. The 20–30 km of active dune fronts threaten the Senegal River valley in Moughataas⁶ de Rosso, R'Kiz and Boghé. Some of the waterways on the right bank of the delta are also subject to sand invasion caused by wind erosion: for example, the intermittent streams and depressions of Diovol, Djeuss, Nietti Yone and Ndiael (AGRER et al, vol. 1, 2003:22).

Both natural and human factors lie at the root of erosion. Natural causes of erosion are drought and intense wind activity. Human factors causing erosion include annual slash-and-burn farming, bush fires, deforestation, etc. These processes have greatly contributed to soil destruction.

Degradation of riverbanks and headwaters

Riverbank degradation is caused by receding or gulying of riverbanks and displacement of the riverbed. Riverbank erosion occurs with greater severity on certain river reaches in the upper basin. The most affected sites are located in the reaches between Bafoulabé (Bafing-Bakoye confluence) and the confluence between the Karakoro and Senegal Rivers, slightly downstream from Ambidedi. Degradation of riverbanks can put villages and cultivated areas along the river in danger. Besides loss of housing and physical investment in villages along the river, sapping of riverbanks can impede the goal to make the river navigable from Kayes to Saint Louis, which is one of the pillars of the OMVS program. Riverbank degradation can be caused by heavy flow from the river but also by soil degradation processes along the river caused by poorly adapted agricultural practices, deforestation, bush fires, intensive soil compaction by livestock, etc. These factors make the riverbanks more vulnerable to gulying and sapping.

The headwaters of the hydrographic network in the Guinean part of the Senegal River Basin are seriously degraded or threatened by erosion. Although a very real threat, the current extent of the damage has been insufficiently studied. The causes of headwaters degradation are deforestation, bush fires, expansion of agricultural land, production of clay bricks, etc. High degradation of headwaters in the upper basin not only affects the river's hydraulic flow and water supply but also water quality and, in particular, turbidity.

Land salinization and loss of agricultural lands

Land salinization in the Senegal River Basin is caused by the capillary action of the superficial salt layers. This phenomenon mainly takes place in the hot and dry season when evapotranspiration conditions are particularly high. Within the basin, the river delta has been most affected by land degradation caused by salinization. Over the last few years, the level of the salt layer has increased, on an order of 0.4 to 0.8 meters between 1991 and 1998. The salt, which rises up to the plant's roots, eats away at the plant tissue and prevents photosynthesis, contributing to decreased crop yields. When salinity increases, salt plates end up covering the soil. This leads to the abandonment of large expanses of land managed for irrigation (and particularly land with no drainage system) in the lower valley and river delta each year. Poor drainage in some irrigated areas is one of the main causes of salinization of cultivated land.

⁶ The Moughataa corresponds to the district in the Mauritanian territorial division

Overgrazing

Overgrazing occurs when the actual animal load for a given space exceeds its load capacity, that is, the maximum quantity of livestock that a specific space is assumed to be able to support without deteriorating. The entire basin is affected by overgrazing. In the upper basin, the nine Prefectures of the Guinean part of the basin host one-third of the cattle herds in Guinea and just over 25% of the small ruminants. In the Malian part of the basin, the areas of Koulikoro, Kita, Kéniéba, Manantali and the vicinity of Lake Magui are the most exposed regions. In Mauritania, three main areas have high concentrations of livestock: (a) the El Aft reserve in the Gorgol sub-basin; (b) the Guidimakha (Oued Yeyi); and (c) and the Trarza (Aoulig depression, between Keur Macène and Rosso). On the right bank (Senegal), statistics indicate that cattle, small ruminants and camels account for 25%, 21% and 41%, respectively, of Senegal's national livestock population, illustrating an overload on the basin compared to the country's other regions.

Overgrazing results in intense soil compaction by herds. Compacted soil is then easily mobilized by wind (wind erosion) and becomes more vulnerable to water erosion. With the depletion of fodder in overgrazed areas, herders often resort to pruning trees for animal food supplements. Conflicts between farmers and herders multiply. Among the causes of overgrazing are: degradation of vegetation cover, resulting in a decreased load capacity for livestock routes; concentrations of livestock around water points during the dry season (including riverbanks) regardless of whether or not there is sufficient quantities of fodder; extraordinary increase in the livestock population throughout the Sahel including the basin countries; expansion of agricultural land, which reduces pastoral areas; and uncontrolled installation of irrigation systems that greatly impedes livestock access to the river. The cramped corridors leading to the river and riverbanks that are accessible to livestock are heavily compacted and thus exposed to wind erosion and gullying.

Bush fires

Bush fires are one of the main factors in the degradation of land and ecosystems. They disturb the natural cycle of plant mortality and regeneration, and they cause or accelerate water (runoff) and wind erosion and long-term losses from soil erosion (Mbow, 2004). In the upper basin, particularly in the Fouta Djallon Massif, bush fires occur with the highest frequency. In Guinea, according to the national report conducted as part of the Forestry Statistics and Outlook Study for Africa (FOSA), between 1,500,000 ha to nearly 5,000,000 ha of surface area is burned annually (figures for the 1987–1994 period), especially in 11 Prefectures, including Siguiri, Dinguiraye and Dabola, which partially lie in the Guinean part of the Senegal River Basin (Djiramba, 2001). For Mali, the only available figures (SPOT images) show that the affected area within the country amounts to about 9,200,000 ha for 1987–1990.⁷ All countries in the region are subjected to bush fires each year. Bush fires have many causes, one of which involves the agro-pastoral practices in the upper basin that depend on seasonal bush fires. Herders also resort to fires (generally from November to March) to promote the growth of nutritious grass preferred by livestock. Hunters also sometimes hunt their prey using bush fires.

⁷ Ministry of Environment and Sanitation (Mali). 2006. *Rapport national sur l'état de l'environnement 2005*. Bamako. March.

Desertification

Desertification is the final stage of land degradation, resulting from deforestation, soil erosion and overgrazing. The Mauritanian and Malian parts of the basin are affected more by this phenomenon. In the Mauritanian part of the Senegal River Basin, desertification mainly affects the marginal areas surrounding the ecosystems of Trarza's drylands. In the basin's Malian part, desertification is most intense in the *cercles* of Kayes, Yélimané, Diéma, Kolokani and Banamba where it causes rainfall deficits and destruction of flora. Desertification's main impacts, which are also its manifestations, are decreased soil productivity, declining vegetation formation, loss of habitats for some species and subsequent loss of biological diversity. In addition to these effects on the environment, desertification results in social costs caused by lowered food production leading to food insecurity, malnutrition, famine, civil unrest and conflicts regarding access to resources. Desertification has both climate and human causes. Climate causes relate to the recent evolution of unfavorable climate conditions that cause chronic annual rainfall declines with increased variability. The frequent droughts are a manifestation of the basin's degraded rainfall conditions. The most common human causes of desertification are land overuse, overgrazing, deforestation, bush fires and extension of poorly adapted agricultural practices. The combined effects of these factors denude the soil and expose it to water and wind erosion.

The general causes for the various forms of land degradation can be summarized as follows:

Immediate causes:

The immediate and direct causes of land degradation in the Senegal River Basin are the following:

- Land clearing for agricultural purposes;
- Use of lumber, fire wood and wood charcoal;
- Expansion of residential areas in urban and rural settings;
- Mining;
- Unsustainable farming practices and techniques (slash-and-burn farming, little or no time for fields to lie fallow);
- Soil salinization (from capillary action of salt or lack of a drainage system);
- Overgrazing and intensive soil compaction (caused by increased numbers of livestock; scarcity and/or poor distribution of water points; transhumance); and
- Bush fires (slash-and-burn farming technique, early fires set for livestock farming purposes, bush fires as a hunting or poaching technique).

Root causes:

The root causes (inherent to the direct causes above) of land degradation are:

- Demographic growth: the basin population grew from 3.5 million persons in the early 1990s to close to 6 million today: this results in intense land-tenure pressure and also increased demand for natural resources such as wood;
- Poverty causing "mining" of the basin's natural resources: cutting and selling timber for survival, poaching, etc.; communities prefer to destroy their natural environment so they can postpone their own demise;
- Lack of effective enforcement of laws and policies for forest management: as shown below, the basin countries have laws (forest regulations) that are supposed to protect basin

forests, if not ensure their sustainable use. In general, these laws have limited, if any, effectiveness in the field;

- Improved access. Investments made over recent years to improve transportation infrastructure have facilitated access to the last forest reserves and have accelerated agricultural encroachment (notably with the expansion of cash crops such as cotton and groundnuts);
- Increased agricultural areas along the river; and
- Degradation of hydro-climatic conditions.

2.2. Decreased water supply and quality

This environmental problem involves the physical supply of surface and groundwater but also an assumed degradation of its quality.

Surface water supply

Average flow from the Senegal River has been greatly affected by climate variability and change over the last decades. Thus, the current average flow (from the early 1970s to present) is only equal to 50% of the average flow between 1950 and 1970 and 25% of the average flow for the first half of the last century (between 1903 and 1950). Since the basin population has significantly increased (it has multiplied by three since the beginning of the 1960s), per capita water supply from the river has seen an extraordinary reduction over recent decades. This sharp decrease in per capita water supply is not always noted, given the actual low level of mobilization of this resource. The only two large dams in the basin have improved supply for some uses (domestic consumption, irrigation, energy production) on the one hand, but have hindered other uses (such as water previously intended for flood-recession crops) due to the effects of flood-peak reduction on the other hand.

Groundwater supply

Although no cases of groundwater depletion have been noted in the basin (affecting water supply in wells and boreholes, for example), some places report a decrease in groundwater in the Continental Terminal layer. This phenomenon is explained by worsening rainfall conditions, but also by a recharge deficit causing a reduction in how much land is flooded and how long flood plains remain submersed. From the upper basin to the delta, the surface waters of the Senegal River Basin contribute to groundwater recharge—for both the sub-surface and deeper Maastrichtian aquifers. For example, in the valley (downstream from Bakel), the groundwater supply highly depends on the extent and duration of flooding on the alluvial plain. Thus, it is conceivable that flood-peak reduction affects conditions for groundwater recharge.

Water quality

Water quality has been altered in the following ways: (a) chemical pollution (effects of toxic chemical products such as pesticides and persistent organic pollutants resulting from human activities such as disposal of pesticides used for agriculture); (b) microbiological pollution (microbial pollution from household and industrial waste disposal into basin waters); (c)

eutrophication (artificially increased primary production due to increased nutrient availability or inputs, resulting in reduced dissolved oxygen levels in the water); (d) suspended solids (particles suspended in water that can increase due to water activities, erosion, etc.); and (e) solid waste (solid matter introduced to the water, particularly from various human activities).

However, current conditions and the extent of possible water pollution at the basin level, particularly in the valley, due to pesticides and mining has not been sufficiently documented. In some cases, the causes of water quality degradation in the Senegal River are related to natural factors such as changes in the overall hydro-climatic conditions (decreased water supply and changes in the river's hydrodynamics). However in many cases, changes in water quality stem from human activities (agriculture, mining, household-waste disposal, etc.).

The immediate and root causes of decreased water supply in the Senegal River Basin and degradation of the quality of water resources are as follows:

Immediate causes:

- Changes in the river regime due to reservoirs making water available in larger quantities during the dry season but reducing the amount of flooding; these reservoirs also affect water quality (temperature, discharge velocity, etc.);
- Low frequency and duration of flooding of the alluvial plain (which affects conditions for groundwater recharge);
- Proliferation of invasive plants that are hosts to disease vectors and contribute to water eutrophication;
- Pollution from domestic wastewater (from cities but also from many villages located along the river and its tributaries);
- Disposal of pollutants from industrial and artisan mining sites;
- Disposal of insufficiently treated or untreated drainage water from agricultural irrigation, causing water pollution in the river from fertilizers and pesticides; and
- Opening of the channel downstream of Saint Louis in 2003, which changed the estuary's hydrodynamics.

Root causes:

- Lack of quality standards, standardized laws and regulations on good water management;
- Non-enforcement of regulations on water pollution;
- Rainfall deficit due to climate change;
- Demographic growth;
- Urban growth along the river;
- Education and awareness-raising deficit among communities;
- Lack of rigorous and coordinated monitoring/control of water quality in the river; and
- Climate variability and change resulting in decreased average annual rainfall and consequently decreased runoff into the river, both upstream and downstream.

2.3. Prevalence of waterborne disease

Following changes to the river regime, the prevalence of certain waterborne diseases saw an extraordinary increase. Waterborne diseases with the highest prevalence in the Senegal River Basin are malaria, bilharzia (urinary and intestinal) and diarrheal diseases.

Bilharzia or schistosomiasis exists in two forms in the Senegal River Basin. The urinary form was present in the four basin countries before the dams. It was not very widespread in the delta but had a high prevalence rate in the middle valley (Podor, Matam) and the upper basin (Bakel, Kayes, Bafoulabe, etc.)⁸ Today, along with urinary bilharzia, the intestinal form of bilharzia has become a major public health problem in the delta, notably where prevalence rates of 90%, and even 100%, among children and extremely high infestation rates in the Lac de Guiers area were recorded. The rapid increase in intestinal bilharzia three years after the dams started operating clearly demonstrates the causal link between the development of this disease and modification in the river regime.

In terms of malaria, before the opening of the dams, transmission of the disease primarily occurred during the rainy season. Currently, a sharp increase in the number of persons suffering from malaria in the valley has been noted between December and May, or in the off-season. Fields of irrigated crops, invasive aquatic plants and stagnant water throughout the year offer ideal conditions for the development of anopheline mosquitoes.

Diarrheal diseases are the greatest cause for medical consultation almost everywhere in the river basin, and particularly in the valley (on the right and left banks); malaria and bilharzia are the second and third causes. These high rates are linked to the quality of water for domestic use that is mainly supplied by the river and ponds. Added to this is the notorious lack of a drinking-water supply system, sanitation infrastructure and behaviors that negatively affect hygienic conditions.

Among the consequences of high prevalence of waterborne disease are: (a) diminishing the work capacity of the rural population, which negatively affects goals to develop basin resources and thus, development in general; (b) low academic performance among children; and (c) high health costs for populations with already limited resources.

The immediate and root causes of waterborne diseases are as follows:

Immediate causes:

- Invasive aquatic plants;
- Reduced water salinity after stopping periodic up-flow of the salt wedge;
- Inadequate water supply system and sources for drinking water;
- Inadequate sanitation in residential areas;
- Unsuitable drainage systems for rainwater; and
- Water stagnation causing an increase in the number of reproduction sites for waterborne disease vectors.

Root causes:

- Flow regulation (by the Manantali and Diama dams);

⁸ Diop & Jobin, 1994

- Rapid growth of urban population;
- Poverty (resulting in low levels of access to drinking water and sanitation and in malnutrition);
- Weak and poor condition of health infrastructure; and
- Lack of awareness-raising programs.

2.4. Proliferation of invasive species

The volume of land occupied by invasive aquatic plant species and their growth rate is one of the most troubling environmental problems in the Senegal River Basin. Over the last decade, invasive plant species have spread at an extraordinary rate in the river basin, particularly in the lower valley and delta. These species were mainly reeds (*Typha* and *Phragmites*), kariba weed (*Salvinia molesta*) and water cabbage (*Pistia stratiotes*). The total surface area invaded by plants was estimated at just over 100,000 ha in 2001 (SOE, 2005). In less than 10 years, harmful aquatic plants have invaded most of the active waterways. Invasive plant proliferation has clearly been fostered by the presence of nutrients (sufficient quantities of nitrogen and phosphorous), calm waters, low currents and stopping the up-flow of saltwater (AGRER et al, 2003: 5, vol. 1). These factors are due to large infrastructure projects: the two large reservoirs upstream (Manantali) and downstream (Diama) and their connecting structures (levees, irrigation systems) that together have changed the river's hydraulic regime and water quality (AGRER, 2003, vol. 2). Invasive species disturb the overall functioning of the fluvial ecosystem and disrupt socio-economic activities such as irrigated agriculture, fishing and livestock farming.

The immediate and root causes of proliferation of invasive species are as follows:

Immediate causes:

- Change in the river's water regime (lack of/low tidal fluctuation);
- Water softening (blockage of saltwater up-flow);
- Development of irrigated crops and nutrient disposal in the river's water (nitrogen, phosphorous); and
- Importation of non-native species (case of *Salvinia molesta*, which was accidentally introduced in the outskirts of Saint Louis before proliferating in the rest of the delta and lower valley).

Root causes:

- Dams/regulation of the fluvial flow;
- Non-enforcement of laws related to the introduction of non-native species;
- Lack of a clear policy on the importation of non-native plant or animal species; and
- Lack of an early-warning and ecological surveillance system.

2.5. Threats to biodiversity

Even though no inventory or systematic monitoring has been set up for the basin's animal and plant species, the threats to biological diversity have been illustrated through the degradation of natural habitats and, particularly, plant formations (included under the topic "land degradation and desertification") and wetlands, frequently known for their high biodiversity value. Over the last few decades, these wetlands have shrunk considerably. This phenomenon combined with alteration of the river regime and the occasional deterioration of water quality has greatly affected the ecological benefits and functions of these areas. Degradation of natural habitats puts the basin's biological diversity in danger.

The basin's ichthyological fauna illustrates this well. The Senegal River's ichthyologic fauna includes freshwater species but also brackish-water species. In 1998–1999, 63 fish species belonging to 18 families were inventoried in the river (Roche International, 2000). However, the study also noted a decrease in fish quantity and therefore the river's halieutic productivity. Downstream from Diama, this decreased productivity resulted in fewer fish catches on the order of 50–70% (AGRER et al, 2003:76, vol. 1). Among the main causes of an assumed decrease in fishing productivity in the valley are decreased flooding regulated by the dams and lowered water quality due to aquatic plant species invasion (AGRER et al, 2003:75, vol. 1). On the other hand, the Diama and Manantali reservoirs host rich and varied fish stocks. The Roche International survey (2000, op. cit.) estimates that fishing contributes to feeding a population between 350,000 and 600,000 persons living along the river. Hence, the decrease in ichthyologic fauna in some areas of the river can have significant social and economic impacts on the basin population.

Immediate causes:

- Fauna and flora habitat loss following deforestation, bush fires and mining operations;
- Decrease or suppression of annual flooding resulting in a loss of spawning grounds for fish fauna;
- Non-adapted fishing techniques (capture of juveniles);
- Poaching in protected areas; and
- Proliferation of monospecific species such as *Typha* and other invasive species.

Root causes:

- Poverty resulting in few or no alternative income sources to poaching and the destruction of natural habitats (particularly in the relocation areas for displaced Manantali residents);
- High dependence on primary natural resources and agricultural income;
- Climate variability and change (decreased river hydraulicity);
- Weak enforcement of policies and laws to protect species and ecosystems hosting a rich biological diversity (wetlands, for example);
- Lack of regulations on fishing practices;
- Misunderstandings about biodiversity issues and the advantages of conservation; and
- Rising demographic pressure on natural resources.

3. Possible evolution if nothing is done (scenario: no action)

If the current trends of environmental degradation are maintained in the basin, what will be the future of the Senegal River Basin, for example, in 30 years? The response to this question is difficult not only because of the multiple exogenous and endogenous factors affecting the basin environment's evolution, but also the extreme complexity of the internal dynamics affecting the life cycles of natural ecosystems and river basins. Although the summarized prospective exercise below is deliberately pessimistic, the projected future remains within the realm of possibility.

If the current alarming trends are maintained, the Senegal River Basin population will reach 12 million individuals in 25 years, or twice as many people as now. Close to 10 million people will live along the river's main course and its tributaries.

In a quarter century, ongoing land degradation processes will amplify the conversion of grass cover into denuded land, and forest loss will accelerate considerably. FAO statistics⁹ indicate that the surface area of forests in the basin's four countries decreased by 10% from 1990 to 2005, which means they will decrease by at least 15% over the next 25 years. In Mauritania, if trends in forest loss observed between 1990 and 2005 (35%) should continue, close to 60% of the existing 260,000 ha of this country's forests will be decimated. With the loss of shrub vegetation in the Mauritanian and Senegalese parts of the basin, the active dunes, after engulfing the river, are expected to colonize riverbanks up to the northern reaches of the upper basin.

Bush fires, wood use and expansion of cash crops will significantly shrink the natural habitats of large mammals currently found in the Fouta Djallon. Excavations will become necessary to locate some headwaters for our large rivers because they will be buried under sand and rocks. Water in the Manantali dam, known today for its clarity, will become turbid; the sedimentation accumulation rate will reach levels that will considerably shorten the reservoir's lifespan (the time it takes to fill up), currently estimated at 450 years. Downstream from Manantali, a large part of the city of Kayes will be stripped away by riverbank loss. Many other villages will clear out entirely. Millions of inhabitants and social infrastructure will be destroyed.

Annual flooding will no longer be more than a vague memory. Flood recession agriculture will be abandoned and fishing will essentially disappear in the middle valley. The rare gonakier groves that subsist around ponds in the alluvial plain will be decimated. The deep aquifer will no longer be fed annually and will collapse and dry up in some places.

Water pollution—caused by mining operations sites in the upper basin, domestic wastewater discharged into the river and drainage water discharge from irrigated areas and agro-industry in valley and delta—will reach a level making river water unfit for even animal consumption. Costs to treat water taken from the Lac de Guiers and the Aftout es-Sahel will be so high that alternatives will be necessary to supply the cities of Dakar and Nouakchott.

Invasive plants will make extraordinary gains in conquering the basin. *Typha* will occupy between 300,000 and 400,000 hectares, extending continuously from the delta to the threshold

⁹ <http://www.fao.org/forestry/site/countryinfo/en/>

of the Manantali dam.¹⁰ In addition, *Salvinia molesta* and *Pistia stratiotes*, which are now controlled, will take on renewed strength. Following the same scenario as the accidental introduction of *Salvinia molesta*, the pernicious water hyacinth will replace *Salvinia molesta* in the Manantali reservoir and overtaking the basin in the opposite direction from *Typha* invasion, together conquering the entire basin. Invasive plants will then occupy most of the managed land for irrigated farming, including waterways.

The new environment will promote proliferation of disease vectors better than the current one. Prevalence rates for bilharzia bordering on 100% will be the rule rather than the exception not only in the lower valley but throughout the basin. A high prevalence of malaria, dracunculiasis and cases of diarrheal disease will be added to the plague. The morbidity rate will thus be one of the highest in the sub-region, crippling the basin population for productive activities. Prospects for escaping poverty will be remote for these communities.

The OMVS's overall program itself will be compromised. Rapid filling of the Manantali reservoir with sediment will raise doubts about the long-term viability of electricity production. Riverbank instability, siltation of the riverbed and disturbance of the hydro-dynamics will continue to impair the component to introduce river navigability. Irrigation, overtaken by *Typha* and other invasive plants, will decline while flood recession agriculture will disappear and rain-fed agriculture will no longer be practiced in the upper basin. Fishing, currently a sporadic activity, will disappear while herders will take their animals far from the river to ensure their survival.

This scenario probably presents *the most pessimistic conceivable scenario*. Other scenarios lead to a less dismal future. For example, when taking into account other initiatives in progress or planned by the OMVS (PGIRE, GEF co-financing, etc.), the riparian states' capacity to respond and, especially, the ingenuity of basin populations, we will possibly know how to avoid hitting the iceberg. However, the risk of devolving into a catastrophic environmental scenario has not been completely evaded.

This environmental Strategic Action Plan aims to strengthen the capacities of basin actors so that the pessimistic scenario described above can be avoided. The SAP seeks to deviate from and even reverse the current trajectory of the basin's evolution. The willingness to do so is reflected in the Long-Term Vision and the Environmental Quality Objectives defined by stakeholders through consensus at the beginning of the strategic action plan's development process.

¹⁰ It was estimated that in 2004–2005 *Typha*, which covers 100,000 ha in the river basin, is increasing at an annual rate of 10% (OMVS, 2005). At this rate, *Typha* will occupy 340,000 ha of land in 2030.

4. Strategic plans for restoration and sustainable management of the basin environment

This chapter describes the strategy that will be implemented in the medium (0–10 years) and long (20 years) term to solve the most urgent environmental problems in the Senegal River Basin. It includes a declaration of the vision of desired environmental conditions that stakeholders wish to project into the future. To realize this dream, one Environmental Quality Objective has been defined for each priority environmental problem. This quality objective refers to the envisaged level of resolution for the specific environmental problem. One or more indicators have been defined for each quality objective to aid in measuring progress made toward achieving the qualitative objective and thus, manifesting the vision. Next, measures were proposed and broken down into activities to achieve the qualitative objectives. These measures and objectives are a synthesis of those considered high-priority by stakeholders at the regional, and then national and local (LCC), level.

4.1. Long-Term Vision for the basin environment

The formulation of a Long-Term Vision for the river basin environment was the first step in the SAP development process. The Long-Term Vision is a *clear representation of the envisaged characteristics for the future environment*. It takes into account the concerns of various actors at the basin level.

During the formulation of a Long-Term Vision for the Senegal River Basin environment, the parties represented during the Nouakchott workshop (in Mauritania) in August 2007 insisted on the need to ensure that this vision be consistent with and based on: (a) the OMVS foundational texts; (b) the Water Charter; and (c) the Nouakchott Declaration on the OMVS Strategic Orientation.

The spirit and main principles contained in the foundational texts of the OMVS were also taken into consideration. In particular, this concerns:

- The Convention on the Creation of the OMVS (1972) that was supplemented in 1997 by laws that created the SOGEM (Société de Gestion de l’Energie du barrage de Manantali) and the SOGED (Société de Gestion et d’Exploitation du barrage de Diama), and by the inclusion of Guinea in the OMVS in March 2006;
- The Convention on the Legal Status of the Senegal River (1972) declaring the Senegal River an “international river” and which, among other things, adopts the principle of prior approval by the other member states for any project initiated by one of the states and which may noticeably change the river’s characteristics;
- The Convention on the Legal Status or Common Structures (1978) making physical structures with a common interest the common property of OMVS member countries; and
- The Convention on Funding Modalities for Common Structures (1982) that defines a system to distribute costs and expenses among the member states for finance investments.

The “Senegal River Water Charter” was also taken into account in the formulation of the Vision. The Charter was adopted in May 2002 by the Conference of Heads of State of the OMVS before being ratified by the parliaments of member states. The principles of equity, solidarity and preservation of good rapport and peaceful relations between countries and

peoples sharing the waters of the Senegal River are the foundations of the Charter (OMVS, Water Charter, Ould Merzoug et al, 2003; Le Goff et al, 2005). The Charter defines the optimal strategy for allocation of water resources from the Senegal River. Hence, it fixes modalities for allocating water from the river between user sectors and modalities for the inspection and approval of new projects for water users or ones that can affect its quality. It also determines the rules related to environmental conservation and protection.

Based on the Charter, the May 2003 Declaration of the Heads of State on the strategic orientation of the OMVS—known as “The Nouakchott Declaration”—is intended to mark the beginning of a new period in transboundary cooperation regarding the Senegal River Basin, particularly through the OMVS. While drawing from the values of international agreements, notably the World Summit on Sustainable Development in 2002, the Nouakchott Declaration specifically emphasizes the need for consultation and participation among all actors to establish long-term development for the Senegal River Basin that will be ecologically sustainable (OMVS, Nouakchott Declaration, 2003; Le Goff et al, 2005).

Based on these texts, but also in reference to the general principles and values emerging in the transboundary river basin management, the stakeholders meeting in Nouakchott believed that the formulation of the Vision should focus on the following key words: sustainable development, shared economic and social development, integration, hope, solidarity, consultation, stability, harmonious life, good health and equity.

Based on these various key words, formulations of the vision were proposed. Consensus was finally reached in favor of the following declaration of the **Vision for the Senegal River Basin for 2030**:

Basin resources are managed in an integrated, cooperative and sustainable way to:

- **Guarantee food security, social well-being and high and sustained economic growth**
- **Ensure restoration and conservation of ecosystems and biological diversity in the basin; and**
- **Consolidate the community, ensure its future and establish a deep-seated spirit of solidarity, sharing, equity and peaceful coexistence between the basin’s peoples and countries.**

This declaration, while adopting the principles of integration and participation (as reflected in the integrated water resources management approach adopted in Dublin in 1992) and those of sustainable development in general (reaffirmed during the World Summit on Sustainable Development in 2002), still recognizes this primary obligation: to eradicate poverty and ensure the well-being of communities and economic development in the basin. Thus, the vision recognizes the legitimacy of the OMVS’s and member states’ development efforts and the need to mobilize water resources from the river to achieve these objectives. Whether or not the basin has an environmental strategy, these development efforts and the investments required to carry them out will certainly continue since this is the specific role of the OMVS. The Vision’s second key point is the heart of the SAP because it concerns the necessity to preserve the basin’s natural environment through restoration and conservation of ecosystems

that have particular value in terms of biodiversity. This key point of the Vision ensures that development efforts are not carried out to the detriment of the natural environment, the good health of which guarantees the sustainability of economic and social gains. The last key point of the Vision is political. It banks on sustained political will in favor of solidarity, equity and sharing the costs and benefits of basin development and conservation of its natural environment.

4.2. The Long-Term Environmental Quality Objectives (LTEQOs)

A Long-Term Environmental Quality Objective (LTEQO) was defined for each of the most urgent environmental problems defined in the TDA—a total of five problems. The LTEQO is the level of resolution for the environmental problem considered acceptable by the stakeholders. For example, solving the problem of invasive species proliferation could aim for achieving total eradication, or simply stopping their progression, or reducing the area of land occupied by these species by one-half. The target level depends on the envisaged environmental quality but also takes into consideration what is technically, economically and financially feasible and what is acceptable from a social and political standpoint.

Representatives for basin stakeholders meeting in Nouakchott in August 2007, after reaching consensus on the vision, defined the LTEQOs below. Monitoring indicators have been defined for each LTEQO.

4.2.1. LTEQO 1– Land degradation/desertification

The following LTEQO was agreed upon to confront land degradation in the basin:

LTEQO 1: The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization.

The United Nations Conference on Environment and Development (1992) defines desertification as “the degradation of land and vegetation, soil erosion and the loss of topsoil and fertile land in arid, semi-arid and dry sub-humid areas, caused primarily by human activities and climatic variations.” Therefore, desertification can be summarized by various environmental problems, particularly: (a) land degradation from wind and water erosion and salinization; and (b) loss of vegetation cover (from wood cutting, bush fires and overgrazing) and others. Degradation of drainage basins, and particularly the river’s headwaters contribute to the manifestations of desertification.

During recent years, the process of desertification—further aggravated by the manifestations enumerated above—has significantly advanced in the Senegal River Basin and the rest of the Sahelian sub-region. Despite efforts at a national level (notably with National Action Programmes to Combat Desertification) and at the Sahelian regional level (with the Sub-Regional Action Plan to Combat Desertification), very few tangible results have been achieved. Efforts in the 1970–1980s increasingly seem to have given way to resignation. By identifying desertification as one of the high priority environmental problems to solve in the Senegal River Basin, the basin stakeholders have committed themselves to taking on a veritable challenge.

Monitoring indicators

Sustainable recovery or maintaining the level of land degradation can be demonstrated through the level of primary productivity per surface unit, while riverbank degradation can be measured through the stability of the riverbed or lack thereof. The indicators below have been defined to measure outcomes of efforts undertaken in combating the process of desertification in the river basin:

- ♦ *Land subjected to siltation that has been treated:* Sandy land surfaces that have been treated by techniques such as sand removal (flood-recession or irrigated crop fields or palm groves freed from sand encroachment) and tree planting (for dune fixation).
- ♦ *Primary productivity (biomass/ha) in the targeted geographical areas:* Classified forests; gonakier forest sites; headwaters in the upper basin. Given the practical difficulty in measuring biomass on the ground, it could be more convenient to monitor the parameter of vegetation/tree cover (in percentage of coverage). One limitation here is that increases in cover and biomass of invasive species signals environmental degradation rather than improvement. Therefore, this aspect will be taken into account by clearly delineating areas colonized by invasive plants.
- ♦ *Productivity of factors in the agricultural sector:* This indicator concerns: (a) the weight of crop yields per unit of invested capital (agricultural inputs and manpower); (b) the weight of crop yields per unit of volume of water used (for irrigated farming); and (c) the weight harvested per unit of land used (yield per hectare). Although not always sufficient, the indicator for which the data is most commonly collected concerns the crop yields. Therefore, it can be used as an impact indicator, but by controlling for factors such as inputs, annual rainfall and/or the quantity of water used for irrigation.
- ♦ *Reduction in loss of agricultural land from salinization:* This indicator can be measured by documenting the quantity of saline land that has been recovered and made suitable for irrigation farming and then subtracting the quantity of land recently lost to salinity. The less land that is lost to salinity, the greater chance that farmland degradation will stop and even reverse.
- ♦ *Level of livestock load for the basin's pastoral routes relative to their carrying capacity:* Since overgrazing is exceeding the animal carrying capacity on livestock routes, the proposed indicator will consist first of estimating the carrying capacity for the basin's large-sized routes and then to collect the necessary data from targeted surveys or the statistical database of livestock farming services. One barrier with this indicator is that a reduction in the number of livestock in the basin (through various factors including natural disasters) could be interpreted as a positive change in the indicator (reduction in the actual livestock load) while instead this indicates a negative change for the basin as a whole. Therefore, this indicator should be complemented by monitoring the biomass and floral quality of pastures and their appetite (on sites selected through sampling).
- ♦ *Change in riverbank stabilization:* This indicator measures the breadth of the riverbank's receding or advancing. Various approaches can be combined: (a) measurement using satellite images or aerial photographs; and (b) measurements on the ground on reference transects chosen through sampling. However, the course of the river, zigzagging through meanders, experiences natural adjustments without any human intervention in the form of dams or otherwise. Thus, total stability of the river's course is not a realistic objective. Nevertheless, riverbed can be subjected to instability caused or aggravated by human factors. This is probably the case for riverbank instability along the Senegal River, which appears to be accelerating on some reaches, particularly downstream from Manantali. Hence, it is important that the monitoring of this indicator also cover the period before the dam. Old aerial photographs can be useful sources of information for reconstituting the

riverbed's dynamics and for potentially understanding if human effects that can be corrected may account for the recent high level of this instability.

4.2.2. LTEQO 2 –Water supply and quality

To confront decreased water supply and the degradation of water quality in the basin, the retained LTEQO is:

LTEQO 2: *Optimally controlled water resources are managed through integrated and sustainable systems to ensure good water quality and adequate availability to users.*

The fundamental motivation for transboundary cooperation within the Senegal River Basin is water management, and thus for the creation of the OMVS whose goal is the *development* of water resources. The OMVS has remained loyal to this mission: It has sought to implement a suitable institutional environment and to mobilize the expertise and partnerships required to carry out large-scale investments for water management. Today, the OMVS pursues its efforts to manage priority environmental problems in the basin with or without a Strategic Action Program. Therefore, the SAP's goal is not to replace the OMVS development program and investments in water management. Rather, it aims to complement these efforts so that water resources and natural resources involved in these development efforts in the basin are preserved, conserved and used with wisdom and current efforts therefore produce sustainable outcomes. The SAP is not the appropriate vehicle to carry out investment projects for water management infrastructure. However, it will place greater focus on ensuring that the viability of existing and future infrastructure is not compromised by water supply problems, particularly water scarcity, and severe deficits or excess, possible phenomena resulting from climate variability and change.¹¹ In addition, the SAP aims to guarantee that existing water management infrastructure contributes to preserving water quality and ensures the resource's allocation to the many user sectors (as stipulated in the Water Charter). Water allocation to ecosystems so they may maintain and even strengthen their ecological and socio-economic functions is the weak link in the basin's water-resources management system. This situation does not result from any lack of political will—the Water Charter is a firm commitment to consider the environment when allocating water resources—but is caused instead by scientific, technological and institutional barriers. The SAP aspires to help lift these barriers. The deterioration of water quality is another critical environmental problem that must be addressed by the SAP. Water quality is a strong indicator of the overall health status of the basin environment as it is for the human, animal and plant populations that live there.

Monitoring indicators

The experience of the Limnology Unit of the Manantali reservoir will be maximized in choosing the indicators and information collection methods for monitoring. The Manantali Limnology Unit currently monitors the following water quality indicators:

- ♦ *Water temperature:* Water temperature is an important factor since aquatic organisms have their optimal conditions for survival and reproduction in specific temperature ranges.

¹¹ See the Special Initiative on Climate Change below.

- ♦ *Dissolved oxygen*: In an aquatic setting with low dissolved-oxygen levels, organisms tend to suffocate; when dissolved oxygen is high, vegetation production increases, causing water eutrophication.
- ♦ *Conductivity*: High water conductivity (high salinity) is a constraint for agriculture.
- ♦ *pH*: The pH is a good indicator for water toxicity (when the pH is too low or too high).
- ♦ *Water turbidity* (the quantity of dry matter in suspension): This parameter not only provides information on the health status of the ecosystem (light penetration in water necessary for aquatic vegetation and animals), but also on reservoir lifespan (rate of sedimentation and therefore, filling up the reservoir), the riverbed stability (sedimentary deposits on the riverbed can affect its stability) and soil fertility of land flooded by river water (the flood's silt load, for example).

In addition to these indicators are the following:

- ♦ *Nutrient load (nitrogen, phosphorous)*: A high load created by factors favorable to the proliferation of particular plant species.
- ♦ *Pesticides*: In the context of the Senegal River Basin where irrigated agriculture occupies large areas and is likely to further develop in the future, it is important to monitor the impacts of pesticide disposal from irrigated areas and agro-industry on water quality.
- ♦ *Heavy metals*: Heavy metals (mercury, lead) are naturally present in the water, but their high water concentration (due to industrial and mining pollution) could harm animal and human health.

The list of indicators that will be monitored will be as concise as possible. The parameters to follow will be defined according to river reaches and the specific kinds of threats affecting water quality.

4.2.3. LTEQO 3 – Waterborne diseases

The LTEQO agreed upon by the basin stakeholders in confronting the challenge of the high prevalence of waterborne diseases is the following:

LTEQO 3: The prevalence of waterborne diseases is reduced to a level that no longer poses a public health problem.

A “public health problem” is a health-related difficulty (specifically the health status of a portion of the population or its determining factors) that, because of its pervasiveness, requires an urgent solution—which can only be collective. The criteria that make a health problem into a public health problem are: (a) a high prevalence of cases of persons with the disease; and (b) serious impacts on the lives of affected patients, on the healthcare system and availability of resources in the health sector and on society in terms of treatment costs and loss of income for national economies (disability within a large part of the workforce, etc.). There is no commonly accepted threshold defining when society is dealing with a public health problem or at what point a health issue ceases to be a public health problem. Here, the level deemed acceptable by stakeholders is a determining criteria for assessing what is or is not a public health problem.

In any case, one important aspect in defining a public health problem is that the definition implies that solutions exist and that the means to confront the problem are available even if the cost of effectively mobilizing these means can be very high.

Based on these criteria, intestinal and urinary bilharzia, malaria, diarrhea, etc. are public health problems in the Senegal River Basin due to their high prevalence as well as their costs for households and the national economies of the basin countries. Moreover, remedies exist to combat these plagues, but an effective response is not only costly but requires a concerted, coordinated and ongoing effort from the entire basin.

Monitoring indicators

Three combined indicators have been proposed to measure changes in health problems caused by waterborne diseases in the Senegal River Basin:

- ♦ *Prevalence rate.* This is the level of prevalence for these diseases (intestinal and urinary bilharzia, malaria, diarrhea and other diseases that could emerge). It is expressed by a percentage of total population or a percentage of cases of diseases inventoried in the health system (medical consultations).
- ♦ *Decline in mortality rate.* This refers to the number of deaths within a population during a given time period compared to the average number of this population during the same time period. This indicator has the advantage of being covered in the periodic demographic surveys and specifically during general population censuses.
- ♦ *Burden on public resources and households.* This is the cost of treating the disease compared, for example, to health expenditures for the riparian states and/or budgets for households in the valley.

4.2.4. LTEQO 4 –Invasive aquatic species

Given the plague of invasive species and more specifically proliferating plants, the following LTEQO has been retained:

LTEQO 4: *No aquatic, animal or plant species proliferates to the point of threatening ecological equilibrium and economic activities in the Senegal River Basin.*

The species that are currently considered invasive and harmful are sometimes native species that traditionally have great social and economic uses. This is the case for *Typha* (reeds), which has existed in the Senegal River Basin since the Ice Age and is therefore part of the area's natural biodiversity. In addition, it is traditionally used in constructing fences, huts and mats. Today, many still perceive it as an abundant source of energy (it is used to make charcoal briquettes).

For these reasons, it would be ill advised from an ecological perspective and, in some cases, from a socio-economic perspective to try to eradicate this now-invasive species. This concern was taken into account when formulating the LTEQO on aquatic species that proliferate in the river basin to the point of destroying the basin's ecological balance. Moreover, these species disrupt some vital economic activities such as irrigation and fishing, while being at the root of other critical environmental problems such as the prevalence of waterborne diseases.

Monitoring indicators

Spatial coverage of invasive aquatic plants: (a) Gross land area covered by invasive plants; and (b) rate of increase or decrease of land area covered by invasive plants over time.

Income earned from the economic use of invasive plants: (a) Income generated by industrial or semi-industrial units that exploit invasive plants; and (b) income generated from artisan exploitation of invasive plants by households or community associations.

4.2.5. LTEQO 5 – Biodiversity in the basin

Given the degradation of natural habitats and the risks for biological diversity in the basin, the retained LTEQO is the following:

LTEQO 5: *Areas with high biodiversity value are identified, restored and sustainably preserved.*

This LTEQO sets out to identify and take specific measures to preserve individual ecosystems in the basin that play a vital role in protecting the basin's biodiversity. The wetlands are part of this type of ecosystem. The wetlands are known for their exceptional biodiversity. They become shelters and refuges for biodiversity when land degrades, desertification encroaches and when human activities (expansion of settlements, cultivated land, and mining areas) cause the destruction of habitats for animal and plant species. The wetlands can be natural or artificial (as in the reservoirs). The forests, including the gallery forests of gonakiers in the valley or primary forest remains in the upper basin, can also be important refuges for biodiversity. Forests and wetlands can benefit from special protection measures (classified areas, Ramsar sites, etc.). They may be in relatively good health or in an advanced state of degradation. The diversity and population of fish species is an indicator of biodiversity and fluvial ecosystem health. Restoration of ecological functions in wetlands (for example, annual flooding of the alluvial plain) plays an important role in ichthyology.

Monitoring indicators

Maximum land area flooded over 15 consecutive days per year. The extent of maximum flooded surface area seems to correlate closely with biodiversity parameters such as the fish population and birds (the case of birds in wetlands hosting migratory birds).

Species diversity. The method currently used by the Manantali Limnology Unit in the Manantali reservoir and its environs will be used on a large scale in the basin.

Catch volume by fishermen (using the method used by the Manantali Limnology Unit).

5. Measures for priorities to achieve the LTEQOs

This section presents each of the LTEQOs, the significant actions contributing to achieving the LTEQO that are in progress or planned and specific measures to implement within the SAP framework to carry out this LTEQO. The choice of these priority measures is the result of a participatory process at the regional (basin), national and local (LCC) level. A succinct presentation of the adopted methodology is also included.

5.1. Methodology for choosing priority measures

During the regional start-up workshop, after agreeing upon the Long-Term Vision and the LTEQOs, the stakeholders proposed a series of measures to achieve each LTEQO. A total of 105 measures were proposed for all of the LTEQOs.

Stakeholders at the national workshops that followed the regional workshop in Nouakchott (Mauritania) had the task of selecting a maximum of 10 measures per LTEQO, based on the central criteria for the measure's relevance for each country. The relevance was determined by balancing the severity of the environmental problem against the efficacy and social and economic acceptability of the measure's options.

Then, for each of the basin's 28 LCCs, stakeholders had to choose a maximum of five measures per LTEQO, based on the same reasoning used at the national level. In other words, each LCC had to examine the 10 measures proposed at the national level and discuss their relevance as a solution to the environmental problem. At the LCC level, stakeholders had to take into account the relevant activities that are in progress or planned that contributed to solving the considered LTEQOs in order to avoid potential duplication of efforts.

Based on suggestions and priorities expressed by the stakeholders at the national and then local level (the 28 LCCs), a total of 22 measures were retained for necessary implementation to achieve the LTEQOs and therefore to realize the SAP Long-Term Vision. These 22 measures were chosen by combining two approaches:

- First, this was done based on how frequently measures were chosen by the LCCs. Often, frequent selection of a measure by the LCCs reflected its transboundary character, especially when the concerned LCCs were located in more than one country. Annex 3 shows the distribution for all of the considered measures and how frequently they were chosen by the 28 LCCs (4 LCCs in Guinea, 10 in Mali, 7 in Mauritania and 7 in Senegal).
- Next, some measures were reformulated and in some cases merged.

5.2. Priority measures

After defining the LTEQOs, stakeholders discussed and agreed upon priority measures to implement to achieve the LTEQOs.

5.2.1. Measures to implement for LTEQO 1

LTEQO 1: *The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization.*

Significant actions in progress or planned

In Component 2 of the PGIRE, the sub-component “Water resources protection” supports the planning and management of land and water on a community and sub-basin scale. One of the activities refers to launching programs to restore and maintain the riverbanks (target sites have been identified). Another activity will be to manage the shoals (particularly in Mali and Guinea) to promote income-generating activities there. This sub-component will also support the development of agro-forestry by establishing a map and reforestation program as well as related training sessions.

In view of the planned budgets for these activities—approximately 4.5 million USD for agro-forestry and the same for both riverbank protection and shoals management—significant results can be obtained, but given the scope of these environmental problems, much remains to be done. Therefore, the planned measures in the SAP will complement those planned in the PGIRE.

The SAP measures have also been inspired by small interventions to combat desertification funded by the micro-grant component of the GEF-BFS Project. These will be capitalized on at the beginning of the SAP to learn lessons and explore possibilities for large-scale replication of the most successful and promising interventions. The following illustrates examples of activities funded within the framework of micro-interventions: the creation and management of community forests and orchards; environmental education for riverbank protection through bush fire management; involvement of local collectivities in natural resources management; direct activities for riverbank restoration and sand dune fixation; promotion of agro-forestry; extension of biogas (particularly with involvement from women’s associations).

The second component of the Dutch co-financing for the GEF-BSF project deals with the development and implementation of an action plan to combat riverbank erosion. The degraded riverbanks and some reaches along the river (particularly the Kayes area) have been targeted in this component. Identification and final selection of intervention sites as well as analysis of the feasibility and implementation of actions to combat riverbank erosion is planned. These interventions are aimed more at experimentation with and demonstration of approaches and methods for solving the problem of riverbank degradation than at solving the whole problem. From this perspective, Component 2 of the co-financing can be considered as

a pilot phase for large-scale interventions to combat riverbank degradation planned in the SAP.¹²

The Program of Integrated Natural Resources Management in the Fouta Djallon Massif, which receives GEF funding, aims to alleviate the causes and impacts of land degradation on the ecosystems of the Fouta Djallon Massif. Key intervention points include, among others, the implementation of a regional consultative framework for the management of the Fouta Djallon Massif, improved management of natural resources and improved living conditions for communities. The planned duration for program implementation has been set for a period of 10 years, which approximately corresponds to the first half of the period covered by the SAP. The planned interventions in the upper basin within the framework of this SAP will be designed and implemented in close cooperation with the GEF Fouta Djallon Program, piloted by the UNEP in collaboration with the FAO and the African Union's International Coordination Office for the Fouta Djallon Massif.

Measures to achieve LTEQO 1

Measure 1. Develop alternative energy sources (I-M01)

- **I-M01-01.** IEC activities on alternative energy sources (awareness raising and training in constructing improved cookstoves; extension of accessible adapted technologies)
- **I-M01-02.** Promotion of the use of improved cookstoves
- **I-M01-03.** Promotion of the use of solar energy
- **I-M01-04.** Promotion in the use of gas stoves
- **I-M01-05.** Promotion of the use of biofuels/Development of bricks made of rice straw or *Typha*
- **I-M01-06.** Promotion of the use of wind energy
- **I-M01-07.** Professional training in building improved cookstoves; production of charcoal from *Typha* and rice straw; installation and maintenance of solar panels and wind energy units

Measure 2. Awareness raising, education and information on land degradation and desertification (I-M02)

- **I-M02-01.** IEC on degradation targeting: (a) local collectivities; and (b) community-based organizations (village, women's and producers' associations)/Radio/TV awareness-raising campaigns
- **I-M02-02.** Development of materials to teach and promote environmental education in schools and literacy centers, focused on land degradation and corrective measures
- **I-M02-03.** Identification and promotion of practices to combat desertification and land degradation

Measure 3. Development and application of an action program for the restoration and protection of riverbanks and headwaters (I-M03)

- **I-M03-01.** Determining exhaustive baselines for riverbank and headwaters degradation and its causes

¹² Capitalization on achievements and lessons learned for activities funded within the framework of the GEF-BFS micro-grants and within the framework of Component 2 of the co-financing will therefore be a priority activity during the operationalization phase of the SAP (see section on OMVS capacity building).

- **I-M03-02.** Identification of vulnerable areas and creating a plan defining zoning and land-use of riverbanks and headwaters
- **I-M03-03.** Selection of target sites to restore (to complement the PGIRE and GEF co-financing)
- **I-M03-04.** Interventions in combating erosion and gully; riverbank fixation
- **I-M03-05.** Monitoring system using methods combining satellite images and soil surveys
- **I-M03-06.** Development and implementation of a management plan (restoration and sustainable land management) for the most degraded headwaters – Building stone bunds, stone lines, live hedges, etc.

Measure 4. Prevention and management of bush fires (**I-M04**)

- **I-M04-01.** Building a firebreak
- **I-M04-02.** IEC on bush fires
- **I-M04-03.** Early-warning and prevention system (vigilance committee)
- **I-M04-04.** Interstate exchanges of experiences

Measure 5. Promotion of sustainable agro-pastoral practices (**I-M05**)

- **I-M05-01.** Promotion of fodder crops (for demonstration)
- **I-M05-02.** Promotion of agro-sylvo-pastoral integration in selected sites (one per country)

Measure 6. Implementation of an enabling legal environment for sustainable use of water and land resources (**I-M06**)

- **I-M06-01.** Initiate basin-wide participatory in-depth reflection on the suitability of existing national land-tenure laws to guarantee sustainable land use
- **I-M06-02.** Experimentation on local land-tenure agreements to promote investment in activities for conservation, protection and sustainable improvement of land productivity

Measure 7. Identification and restoration of land that has undergone the most exposure to erosion, siltation and desertification (**I-M07**)

- **I-M07-01.** Analysis and mapping of soil according to its degree of exposure and susceptibility to erosion and identification of restoration sites
- **I-M07-02.** Lead desiltation activities in target sites (irrigated and flood recession farmland, oases, transportation routes)
- **I-M07-03.** Initiation of sand dune fixation to combat desert encroachment

5.2.2. Measures to implement for LTEQO 2

LTEQO 2: Optimally controlled water resources are managed through integrated and sustainable systems to ensure good water quality and adequate availability to users.

Significant actions in progress or planned

Within the framework of Component 1 of the Dutch co-financing for the GEF-BFS Project—the component on IWRM activities—planned interventions will contribute to improving water supply, notably canal and drain maintenance.

Component 3 of the PGIRE—Development of a regional multisectoral integrated plan—works toward creating the conditions that will allow for increased investment in large construction projects for water management (dams). This project and the investments already in progress for second-generation construction (the Félou, Gouina dams, etc.) will improve basin water management and, therefore, water supply for sectors and users. For this reason, the SAP (whose goal above all is the environment) will emphasize the quality of water resources and the promotion of small innovative interventions that combine the eradication of poverty and the need to conserve resources and the environment on a local community level.

Measures to achieve LTEQO 2

Measure 1: Awareness raising/education/information on water quality (II-M01)

- **II-M01-01.** IEC on the Water Charter and other relevant legal texts
- **II-M01-02.** IEC on the use of pesticides and fertilizers
- **II-M01-03.** IEC on water treatment techniques

Measure 2: Ensure better control of improvements in water quality (II-M02)

- **II-M02-01.** Establish baselines for basin water quality (surface and groundwater, upstream and downstream)
- **II-M02-02.** Define water quality standards
- **II-M02-03.** Institute a system for specifications/preserving water quality for large-scale use (agro-industry, mining and the National Companies SAES, SONADER, etc.)
 - Promote laws to put the Water Charter's polluter-payer principle into effect
- **II-M02-04.** Set up a monitoring system for water quality
 - Establish a limnology unit for the Diama reservoir
- **II-M02-05.** Promote collaborative agreements with decentralized collectivities in urban and rural settings for the implementation of laws related to water quality

Measure 3: Promote innovative approaches to water management that alleviate poverty while protecting the environment (II-M03)

- **II-M03-01.** Inventory and mapping of potential sites for hill reservoirs and other water bodies
- **II-M03-02.** Management of ponds and water points for livestock (to limit the concentration of livestock on riverbanks)
- **II-M03-03.** Promotion of collection and conservation techniques for rainwater (retention ponds, etc.)

- **II-M03-04.** Managing targeted troughs/shoals to demonstrate an ecosystem approach to wetlands management
- **II-M03-05.** Identification of and stocking fish in ponds for fish farming
- **II-M03-06.** Studies on the mechanism for groundwater recharge and its relationship to surface water

5.2.3. Measures to implement for LTEQO 3

LTEQO 3: *The prevalence of waterborne diseases is reduced to a level that no longer poses a public health problem*

Significant actions in progress or planned

Component 3 of the Dutch co-financing for the GEF-BFS Project contributes to improving the availability of drinking water: an amount of 1 million euros, or one-tenth of the co-financing budget, is planned for access to drinking water and combating waterborne diseases in general. This initiative will certainly contribute to improving water availability for human consumption (in the four targeted villages for this activity) but will be far from meeting the needs for investment in this domain.

Even more funding will be invested by the PGIRE (Component 2/Sub-Component: Combating waterborne diseases) to improve the health of basin communities. This sub-component will support efforts aimed at reducing morbidity related to malaria and schistosomiasis within local communities. The main activities of this health sub-component are: (i) large-scale distribution of insecticide-impregnated mosquito nets with sustainable results and to disseminate other appropriate measures to combat vectors (for example, insecticide spraying in homes and spreading larvicides); (ii) combating the health impacts of water-resources development activities such as clearing irrigation and drainage canals; (iii) mass treatment with praziquantel and albendazole for schistosomiasis; and (iv) disease surveillance and operational research of joint activities to combat malaria and schistosomiasis. To ensure that the sub-activity reinforces malaria control (the health sub-component of PGIRE Component 2), the fixed objective is that at least 60% of the river basin population maintain sustainable use of impregnated mosquito nets by the project end (WB, PAD PGIRE).

Planned measures to achieve LTEQO 3

Measure 1: Health education and awareness raising on the causes of waterborne diseases

(III-M01)

- **III-M01-01.** Strengthen human, material and technical capacities of structures involved in raising community awareness
- **III-M01-02.** Lead education, awareness-raising and information campaigns
 - Awareness-raising programs on water potabilization for domestic use; development of an information and communication plan (including local radio)
- **III-M01-03.** Create didactic supports for health education in schools
- **III-M01-04.** Promote transboundary collaboration between basin health professionals

Measure 2: Epidemiological monitoring **(III-M02)**

- **III-M02-01.** Equip health centers and posts with the necessary testing supplies
- **III-M02-02.** Lead training sessions on conducting surveys and epidemiological analyses
- **III-M02-03.** Conduct periodic epidemiological surveys

Measure 3: Combat disease vectors **(III-M03)**

- **III-M03-01.** Treatment of stagnant wastewater and rainwater
- **III-M03-02.** Chemical control, disinfection (pre-rainy-season dusting, etc.)
 - Lead activities for human investments by CBOs (destruction of breeding sites)
- **III-M03-03.** Biological control in larvae sites

Measure 4: Improve access to drinking water **(III-M04)**

- **III-M04-01.** Inventory groundwater resources and their quality
- **III-M04-02.** Collect, analyze and disseminate information on surface and groundwater quality
- **III-M04-03.** Identify and promote suitable techniques/technologies for water treatment

Measure 5: Reduce water pollution caused by household garbage and domestic waste **(III-M05)**

- **III-M05-01.** Collection and treatment of household garbage – Conduct pilot experiments (one in each country) as a demonstration
- **III-M05-02.** Overhaul and extension of adapted disposal systems and wastewater treatment (lead pilot experiments—one in each country as a demonstration)
- **III-M05-03.** Pilot experiments in the diffusion of the ECOSAN ecological sanitation method (in collaboration with CREPA)

5.2.4. Measures to implement for LTEQO 4

LTEQO 4: *No aquatic, animal or plant species proliferate to the point of threatening ecological equilibrium and economic activities in the Senegal River Basin*

Significant actions in progress or planned

Controlling *Typha* is the goal of Component 1 of the Dutch co-financing for the GEF-BFS Project. The planned actions are focused on restoration, improvement and regular maintenance of the river's water system (distributaries, structuring waterways, canals and drains). Improved adapted tools will be experimented with for waterweed cutting. Half of the co-financing budget, or 5 million euros, will be invested in combating *Typha*. The planned interventions within the framework of this component will contribute to improving water supply, notably canal and drain maintenance. This initiative's approach combines information and awareness-raising activities and physical interventions targeting specific waterways (four in the lower valley and delta). The planned activities in the Dutch co-financing can clear the terrain, test new approaches and raise awareness about the phenomenon among communities and decision makers. However, given the extent of the invasive plant threat and how rapidly these plants are spreading, it will be far from sufficient to achieve the quality objective for

invasive species defined in the SAP. Even for *Typha*, it cannot be said with certainty that by the end of the co-financing implementation that “*Typha* no longer proliferates to the point of threatening ecological balance and economic activities in the Senegal River Basin.” Therefore, the SAP will draw from the experience and achievements of the co-financing schema to contribute to efforts to control *Typha* and invasive species in general. The implementation period for the planned co-financing activities should be finalized in mid-2010. This period should more or less coincide with the actual start-up of the operations and implementation phase for initial SAP activities. Hence, the SAP and, in particular, the planned measures for LTEQO 4 could benefit from the experience and lessons learned from the Dutch co-financing to combat *Typha*.

Planned measures to achieve LTEQO 4

Measure 1: Integrated program to combat *Typha australis* (IV-M01)

- **IV-M01-01.** Update baselines for spatial distribution and evolution of invasive plants
- **IV-M01-02.** Mechanical (channel clearing, weed cutting, artisan/traditional control-manual cutting) and/or biological control
- **IV-M01-03.** Organize workshops to pool experiences
- **IV-M01-04.** Information, training and awareness raising on invasive species

Measure 2: Implement a monitoring and early-warning system (IV-M02)

- **IV-M02-01.** Create monitoring and early-warning committees – Set up a surveillance and species identification team
- **IV-M02-02.** Create a communication circuit
- **IV-M02-03.** Organize forums at regular intervals – Provide training in invasive plant detection
- **IV-M02-04.** Identify and raise awareness for all stakeholders

Measure 3: Economic valorization of invasive plants (IV-M03)

- **IV-M03-01.** IEC on the economic potential of invasive plants
- **IV-M03-02.** Development of artisan and modern techniques
- **IV-M03-03.** Support setting up networks to market products from invasive plants

5.2.5. Measures to implement for LTEQO 5

LTEQO 5: *Areas with high biodiversity value are identified, restored and sustainably preserved*

Significant actions in progress or planned

Within the framework of Component 1 of the PGIRE (Regional Institutional Development to Promote Water Resources—12.7 million dollars), efforts to operationalize and ensure application of the Senegal River Water Charter provisions on environmental and social issues in the development of water resources in the basin context have been envisaged. However, this concerns just one activity among others that have been poorly explained and that still have no specified budget. Nevertheless, this component could contribute to operationalize

essential measures for natural habitat and biodiversity conservation in the basin: for example, water allocation to respond to the needs of ecosystems (environmental flows) and flood plain (flood management). Once plans for implementation of Component 1 of the PGIRE are clearer, planned measures in the SAP in the domains cited above will be specified and reformulated as needed to avoid the possible risk of duplicated efforts.

Planned measures to achieve LTEQO 5

Measure 1: Strengthen capacities/environmental education (V-M01)

- **V-M01-01.** Strengthening human, material and technical capacities of concerned structures
- **V-M01-02.** Information, awareness raising and education for communities and political and administrative officials
- **V-M01-03.** Organize study trips for local collectivities
- **V-M01-04.** Broadcast radio and television shows about the basin's biological diversity
- **V-M01-05.** Introduce environmental education in the schools
- **V-M01-06.** Literacy training focused on environmental issues for communities

Measure 2: Establish biodiversity baselines (V-M02)

- **V-M02-01.** Conduct baseline study and freshwater biodiversity assessment
- **V-M02-01.** Identify biodiversity hotspots

Measure 3: Reduce fishing pressure (V-M03)

- **V-M03-01.** Regulation of fishing techniques
- **V-M03-02.** Institution of season closures
- **V-M03-03.** Awareness raising for fishermen
- **V-M03-04.** Fish farming; incentives for introducing fish farming into rice fields; funding projects in aquaculture

Measure 4: Establish conservation and land-management policy for wetlands (V-M04)

- **V-M04-01.** Inventory of wetlands
- **V-M04-02.** Development and implementation of management plans for the most threatened wetlands
- **V-M04-03.** Classification of additional wetlands as Ramsar sites (particularly the upper basin)
- **V-M04-04.** Networking for basin wetlands (i.e., "Senegal Wet")
- **V-M04-05.** Applied research on environmental flows
- **V-M04-06.** Adopt stricter provisions guaranteeing that floodgates are opened as frequently as possible

5.3. Special Initiative on Climate Change

Objective: The Senegal River Basin has a high level of resilience to the impacts of climate variability and change while contributing to efforts to mitigate greenhouse gas emissions.

Discussions during the workshop to validate the preliminary SAP report and subsequent consultations have shown the critical importance of taking climate change into account in the long-term strategy to manage the Senegal River Basin environment.

In effect, it appears that the climate factor is omnipresent among the root causes of nearly every major environmental problem identified in the TDA, around which the SAP's strategic directions (the LTEQOs) were formulated. These are: land degradation and desertification, lowered water supply and water quality and even harmful aquatic species proliferation, the high prevalence of waterborne diseases and loss of biodiversity habitats.

Changes in water supply clearly demonstrate climate's important role especially concerning climate variability and change. In general, Africa has confronted increasingly serious problems in water supply. The Intergovernmental Panel on Climate Change (IPCC) estimates that over the last 50 years, water supply per African has decreased by 75%, following the combination of two factors: (a) reduced rainfall and flows from waterways; and (b) population increase (IPCC, 2001). These trends were even more clear-cut in West Africa, one of the world's three regions having recorded the most unfavorable changes in precipitation during the period 1900–2000—the other regions are the Horn of Africa and southwestern South America (IPCC, 2007). In the Senegal River Basin itself, the OMVS estimates that average river flows were reduced by half between the first and second halves of the 20th century and again by half between 1950–75 and 1975–2000 (OMVS, 2003). However, the Diama and Manantali dams have significantly contributed to alleviating problems in surface water supply, at least for the short term, in the Senegal River Basin.

Given these climate issues, the SAP's long-term objective is that the Senegal River Basin substantially reduces its level of vulnerability to the impacts of climate variability and change while contributing to efforts to mitigate greenhouse gas emissions.

Two approaches will be used to prepare the basin to better adapt to the potential impacts of climate change. First, a forecasting study on the probable progression of climate change in the basin will be conducted by downscaling to the basin level to assess scenarios of climate change using atmospheric circulation models. Based on plausible scenarios for climate changes in the basin, appropriate adaptation measures can be taken that address the size of construction projects and protection of existing ones as well as safety in communities, choices about investments in agriculture and other economic sectors, etc. This top-down approach will be complemented by a bottom-up approach based on the vulnerability analysis for current climate variability and possible climate change scenarios and on adaptation measures for climate risks that have already been implemented (autonomously by communities or with cooperation from states or development programs). Large-scale replication of the most promising adaptation measures will significantly reduce vulnerability to climate variability and change in the basin over the long-term during SAP implementation and beyond.

Along with adaptation measures, the SAP will also address the mitigation of climate change by promoting a significant contribution from the Senegal River Basin to the global effort to reduce greenhouse gas emissions. Alternative initiatives, as opposed to those causing greenhouse gas emissions (hydro-electricity, reforestation, promoting alternative energy sources that can reduce deforestation), currently in progress or planned in the basin in the context of the SAP or other OMVS programs are also opportunities to finance implementation of proposed measures in this strategy.

Ongoing/planned relevant actions

All the countries in the basin are Parties to the United Nations Framework Convention for Climate Change, and within this framework periodically prepare a National Communication to report on efforts undertaken to achieve the UNFCCC objectives. As Least Developed Countries (LDCs), the four basin countries also receive support from the UNFCCC to prepare and implement their National Adaptation Programmes of Action (NAPAs) for climate change. Each country has a NAPA that will be considered in the SAP Special Initiative on Climate Change. The World Bank funded study entitled “Responding to Climate Change in West Africa” is one of the significant actions in progress. Its goal is to develop a strategy/policy framework for adaptation to climate change in the Senegal and Niger River Basins. This initiative is currently being lead by the IUCN in collaboration with AGRHYMET, the GWP/WA, the NBA and the OMVS. Results from this study will first be assessed for their use as a basis for carrying out planned activities in the Special Initiative on Climate Change.

Measures and activities for the Special Initiative on Climate Change:

- **Component 1 - S-01.** Improve the quality of climate information (predicting future climate and its impacts on water resources)
 - **S-01-01.** Strengthen capacities of the basin countries in modeling and climate forecasting
 - **S-01-02.** Strengthen capacities in vulnerability analysis and adaptation measures
 - **S-01-03.** Conduct a predictive study on climate change forecasting and impact in the Senegal River Basin
 - **S-01-04.** Conduct studies on risks linked to rising sea level—possible impacts on the potential navigation program (sea-river transport), on the safety of structures built near the sea (Diama dam) and on the basin’s coastal cities (particularly the city of Saint Louis)
 - **S-01-05.** Conduct studies on risks linked to the rise in extreme flooding
 - Mapping high-risk areas
 - Development and implementation of an adaptation plan for risks linked to destructive flooding
- **Component 2 - S-02.** Promote adaptation measures to reduce the vulnerability of production systems for basin communities (while taking into account measures selected by the basin states in their National Communications and NAPAs)
 - **S-02-01.** Promotion of a variety of adapted seeds
 - **S-02-02.** Expansion of agriculture with water control (improved irrigation and recession)

- **S-02-03.** Diversification of agricultural production systems and promotion of non-agricultural activities
- **S-02-04.** Identify and diffuse adapted local practices and techniques in land and water management
- **Component 3 - S-03.** Ensure climate-proofing of hydraulic and hydro-agricultural infrastructure. Adapt technical design standards for structures (dams, levees, irrigation systems and port infrastructure) to climate change conditions
- **Component 4 - S-04.** Develop capacities of basin actors to obtain carbon funds

6. Measures to improve the legal and institutional framework

6.1. Measures and reforms related to improving the legal framework

The SAP will contribute to implementing a legal and institutional framework by acting at two levels: (a) by taking measures to effectively apply the Water Charter of the Senegal River Basin and particularly its most relevant provisions to SAP implementation; and (b) by leading political dialogue with the basin states to guide them in collaborating to harmonize, update and implement their institutional and legislative reforms in specific domains relevant to the SAP.

The OMVS Water Charter, adopted in May 2002 by the OMVS member countries fixes the principles and modalities for water distribution from the Senegal River between the various sectors that use it (agriculture, livestock farming, inland fishing, fish farming, forestry, fauna and flora, hydro-electricity, supplying water for urban and rural communities, health, industry, navigation and environment) while considering domestic uses. It also determines the rules for preserving and protecting the environment, particularly concerning fauna, flora and the ecosystems of the flood plains and wetlands. Hence, the contracting states have committed to control any action that would noticeably alter characteristics of the river regime, the water's health status, biological characteristics of its fauna and flora, its water layout and more generally, its environment.

The existence of the Water Charter—a pioneering initiative in the management of transboundary water basins in Africa—is a unique opportunity for the Senegal River Basin to build an enabling legal environment to promote sustainable development. For the domains that it covers, the Water Charter takes precedence over national legislation. This places the OMVS in an advantageous position that is still only a dream for most of the basin organisms in Africa. However, the assets provided to the OMVS by the Charter are more virtual than real insofar as the Charter has yet to be fully applied. Thus, one of the SAP's greatest challenges is to help put the Charter into effect so that the most relevant provisions for the SAP are effectively implemented.

Another challenge for the SAP will be to lift the potential constraint caused by laws on environmental management that differ greatly and, in general, are rarely applied. In effect, each of the basin countries has a panoply of legal texts on the management of water, land and/or the environment in general. In addition, plans have been or are in the process of being developed for combating desertification, water resources management, adaptation to climate change, etc. These environmental policy laws and documents, developed at various dates, reflect the concerns and values of the times and, in many cases, have become obsolete regarding some of their provisions. Between one country and the other, these texts are so different, and even contradictory, that their juxtaposition at the regional level (particularly in the Senegal River Basin) is more a constraint than an asset to promote sustainable development. Within a single country, these texts often contradict one another and in many cases are not implemented due to lack of regulations for enforcement.

The following measures have been envisaged in the SAP so the legal and institutional environment in the member countries of the OMVS and in the basin are favorable to overall SAP implementation. A distinction will be made between those related to OMVS member

states' policies and legal systems and those related to the Water Charter. The legislative and institutional measures and reforms needed to create an enabling environment for SAP implementation are the following:

6.1.1. Measures related to the laws and policies of OMVS member states

- **R-01.** Reactivation of action plans to combat desertification
- **R-02.** Implementation of sub-regional Action Plan to combat desertification
- **R-03.** Development and/or implementation of IWRM Action Plans
 - **R-03-01.** Funding mobilization for and implementation of IWRM National Plans in Mali and Senegal
 - **R-03-02.** Development of IWRM National Plans and funding mobilization needed for funding in Guinea and Mauritania
- **R-04.** Support for member countries in maintaining greater respect of their obligations as signatories of the Ramsar Convention on Wetlands
- **R-05.** Support for member countries in maintaining greater respect of their obligations as Contracting Parties of the Convention on Biological Diversity
- **R-06.** Development and/or implementation of National Adaptation Programmes of Action for climate variability and change
- **R-07.** Revision of water regulations to take into account emerging principles and values (IWRM, polluter-payer principle, recognizing water's economic value, guaranteeing environmental flows, equitable distribution, public participation)
 - **R-07-01.** Revision and reform
 - **R-07-01.** Development and implementation of regulations
- **R-08.** Revision and implementation of environment and forest regulations (to create incentives for environmental protection, tree planting, etc.)
- **R-09.** Revision and implementation of land-tenure regulations to create incentives for sustainable investments for land valorization (land-tenure security)
- **R-10.** Revision, harmonization and strengthening of safety systems in mining regulations for the basin countries
- **R-11.** Revision, harmonization and strengthening of conservation systems for wildlife biodiversity in hunting regulations
- **R-12.** Update and harmonize regulations on herding and livestock farming
- **R-13.** Harmonize the principles and practices of environmental impact studies in the basin countries and align them with international standards
 - **R-13-01.** Establish a baseline for regulating impact studies in the basin countries

- **R-13-02.** Organize information seminars on international standards and practices
 - **R-13-03.** Lead dialogue on policy with the Ministries of Environment of the concerned countries
 - **R-13-04.** Implementation of reforms for procedures for environmental impact studies
 - **R-13-05.** Training for professionals in the Ministries of Environment and the OMVS in preparing ToRs and invitations to tender for environmental impact studies
 - **R-13-06.** Training seminars for professionals (consultants and scientists) on conducting environmental impact studies
- **R-14.** Strengthen capacities of local collectivities in the basin to implement skills that have been transferred to them in the area of natural resources management and environment protection

6.1.2. Measures related to the Water Charter

- **R-15.** Pursue efforts to disseminate/extend the Charter
- **R-16.** Operationalization of the Charter and, in particular, the provisions on protecting and preserving the environment (Article 4 of the Charter)
- **R-16-01.** Operationalization of the Charter provisions on inter-state coordination in response to extreme climate events;
 - **R-16-02.** Operationalization of the Charter provisions on inter-state coordination in preventing and combating invasive aquatic species;
 - **R-16-03.** Operationalization of provisions on preserving water quality and combating pollution, including implementation of the polluter-payer principle.

6.2. Measures related to strengthening actors' capacities

Operationalization and steering of the SAP as well as its implementation requires setting up management and coordination structures and consultation and participation platforms at a regional, national and local level. The following measures will be implemented within the framework of the SAP to satisfy these requirements.

- **C-01.** Support the operationalization and coordination unit for the SAP process

The measures and activities defined in the SAP are not only aggregated, but their practical feasibility (specific actions and costs, timeframes and deadlines for implementation) still needs further in-depth study. It is expected that these measures will become programs and projects whether individually or grouped together in a packet of measures.

Ongoing efforts for funding mobilization and consultations with development partners, the states and stakeholders are foreseen. Hence, plans have been made to set up a unit within the OMVS whose mission will be to put the SAP into effect, to translate it into executable projects and programs and to assist high officials in the OMVS with funding mobilization.

➤ **C-02.** Capitalization of relevant experiences

Within the context of putting the SAP into effect, one of the unit's immediate tasks will be to conduct studies to capitalize on some of the relevant OMVS initiatives, notably activities in micro-financing carried out within the framework of the GEF-BFS Project and also components (1 and 2) of the Dutch co-financing for the same project. The achievements and lessons from these initiatives will help significantly with the strategies to implement some of the SAP measures, such as those related to protecting riverbanks and combating invasive plants (particularly *Typha*).

➤ **C-03.** Strengthen the context of participation by civil society

The process initiated by the GEF-BFS Project to identify, analyze and mobilize civil society and generally all stakeholders related to water in the Senegal River Basin was quite impressive. Within the framework of SAP implementation, these efforts will be reinforced because an environment for broad participation from stakeholders is essential for guaranteeing success in implementing the SAP, a negotiated document that needs periodic updates.

➤ **C-04.** Support for OMVS national and local coordination and consultation platforms (NCCs and LCCs)

The NCCs and the LCCs that have been set up within the framework of the GEF-BFS have demonstrated their usefulness as coordination structures for OMVS interventions at the national level but also as bridges for communication between the OMVS and national actors. The NCCs and LCCs also serve as consultative platforms, representing the diversity of basin actors. Carrying out the process to formulate the TDA and this SAP benefitted greatly from the existence of these structures. Therefore, the SAP will seek to support these structures both at the national and local level. Lessons drawn from the final assessment of the GEF-BFS Project will be used to carry out improvements that could be necessary in these structures' mandates and how they are set up.

➤ **C-05.** Consolidation of the process to involve the scientific community

The SAP is based on the TDA, which sought to rely on the best scientific knowledge available for the basin. Despite numerous studies conducted on the Senegal basin—which has been described as one of the most studied basins in sub-Saharan Africa—it has been noted that in many domains serious knowledge gaps still exist, whether because these domains have not been studied, because the existing studies are outdated or because their quality is unsatisfactory. It is therefore important that scientific production in the basin increases and takes into account questions posed by decision makers and, particularly, the problems covered by the TDA and the SAP. By maintaining and even strengthening the scientific community's involvement in the SAP process, it is anticipated that universities and researchers will meet the needs for knowledge to support decision making in basin management and for information to periodically update the TDA-SAP.

➤ **C-06.** Support to set up the Basin Committee

To better promote actor participation and accountability in managing the Senegal River Basin, the OMVS plans to set up a basin committee bringing together representatives from the

different categories of actors in the basin. The existence of such a participation platform encourages consideration of ideas expressed in the Long-Term Vision to manage the Senegal River Basin environment. Therefore, the SAP will support setting up the Senegal River Basin Committee.

➤ **C-07. Training for stakeholders in effective SAP implementation**

OMVS does not hold sole responsibility for SAP funding mobilization and implementation. These responsibilities are shared with the member states (through the relevant national structures and especially the national development companies active in the basin), decentralized collectivities, community-based organizations, etc. For these actors to be able to effectively contribute to funding mobilization required for the SAP and to the implementation of recommended measures, they need support in terms of capacity building in domains such as: local planning, funding mobilization, project management and monitoring-evaluation, and in specific technical domains such as combating invasive plants, combating bush fires, deforestation, etc.

7. Financing and monitoring of SAP implementation

7.1. SAP financing

Financing needed for the SAP over the first five-year phase (the priority phase) is close to 92,730,000 euros. The budget for the second phase (6–10 years) will be completed and refined one year before the end of the priority phase and is temporarily estimated at 78,750,000 euros, bringing the provisional amount for 10 years to just over 170,000,000 euros. Since achieving the Vision is set for 2030, or in 20 years, it must be expected that the provisional budget below will at least double so that the basin environmental vision can become a reality.

As demonstrated, the financing needs are quite high compared to the limited means of the countries in the Senegal River Basin and the OMVS.

Table 2. Budget for the priority phase of the SAP (0–5 years) and a summarized and partial estimation for subsequent phases (in euros)

LTEQO	Short-, medium- and long-term goal				TOTAL per LTEQO
	Short term		Medium term	Long term	
	Urgent (Immediate)	0–5 years	6–10 years	11–20 years	
Measures related to LTEQO 1 (Land degradation)	1 390 000	15 810 000	20 750 000	22 900 000	60 850 000
Measures related to LTEQO 2 (Water supply and quality)	880 000	6 900 000	12 550 000	150 000	20 480 000
Measures related to LTEQO 3 (Waterborne diseases)	400 000	22 100 000	8 450 000	2 200 000	33 150 000
Measures related to LTEQO 4 (Invasive species)	400 000	32 875 000	23 000 000	25 000 000	81 275 000
Measures related to LTEQO 5 (Biodiversity)	350 000	8 580 000	14 000 000	1 000 000	23 930 000
Special Initiative on Climate Change	400 000	2 100 000	0	0	2 500 000
Support for legal and institutional reforms	450 000	1 415 000	0	0	1 865 000
Strengthening OMVS and stakeholder capacities	820 000	2 950 000	0	0	3 770 000
TOTAL	5 090 000	92 730 000	78 750 000	51 250 000	227 820 000

** Estimates for the 6–10-year and 11–20-year periods of the SAP will be completed and updated at year-4 of the SAP, i.e. one year before the end of the first 5-year phase, and at year-9, one year before implementation of the 11–20-year phase.

Funding sources:

Since adoption of the SAP by the Council of Ministers of the OMVS held in Bamako the 6–7 July 2008, the responsibility for implementation first falls on the OMVS but also on each of the member countries. Each of these entities will have to actively participate in the funding mobilization required for SAP implementation.

For possible sources to finance the SAP, the following options should be explored:

- ♦ State public resources: The states allocate a large portion of their budgets to environmental protection, without counting investments in water resources development.
- ♦ OMVS internal resources: These resources come from contributions from the member states, water licensing fees and particularly the sale of hydro-electricity products.
- ♦ The budgets of local collectivities as well as resources from community-based organizations and the private sector, assuming the SAP has been disseminated, explained and appropriated by the stakeholders at all levels. This also assumes that the legal and institutional barriers to private and community investment in conservation and sustainable development activities have been lifted.
- ♦ Development partners including the GEF, who has been the main source of funding in the TDA-SAP phase. A round table on SAP funding will be organized for donors as soon as the document is approved by the Council of Ministers.
- ♦ The national and international NGOs, especially those active on the ground in environmental protection.

Resorting to innovative funding mechanisms is also being considered for a portion of SAP funding. The following options are foreseeable:

- ♦ Carbon funds, since many of the planned SAP interventions are alternatives to solutions that generate fairly high levels of greenhouse gas emissions.
- ♦ An environmental fiduciary fund that could be fed from part of the income drawn for productive use of basin resources (electricity production, water withdrawal for domestic use or irrigation farming) or through taxes generated from applying the polluter-payer principle.

It is anticipated that approximately 30% of the investment required to carry out the planned measures in the SAP could be supported through the internal resources of the aforementioned actors. Therefore, approximately **70,000,000** euros of external funding must be sought for the first five years of the project and approximately 56,000,000 euros for the following five years (this amount may be revised as higher once more precise planning of this phase is completed).

However, these figures are approximate at this stage. Within the framework of SAP operationalization planned for the first two years of its implementation, funding will be analyzed in greater detail to better define the costs for proposed measures and the potential sources to finance each measure. Preliminary analysis of the feasibility of the measures (summarized in Annex 3) will be conducted in the SAP operationalization phase. Moreover, before measures are implemented, the required economic and financial feasibility analyses and the appropriate social and environmental impact studies will be conducted under the same conditions as similar OMVS programs and projects.

Funding needs for urgent measures

Immediate implementation of urgent measures will be necessary following SAP adoption. In particular, these urgent measures will involve preparing the terrain for implementation of the five-year priority program and the subsequent five-year programs. They include the following activities:

- Implementation and functioning of the SAP operationalization unit: this structure will be in charge of transforming the SAP measures into executable programs and projects.
- Studies: a series of studies should be conducted immediately to facilitate the operationalization of some recommended measures in the SAP. These studies will concentrate on: (a) analysis of and mapping basin land formations and their vulnerability to erosion (to better target interventions to combat land degradation and desertification); (b) data collection for programs such as headwaters and riverbank protection for which certain basin sectors have a large information deficit; and (c) data collection on the baseline situation so that SAP indicators can be monitored (for example, in the areas of epidemiology, invasive plants, biodiversity, wetlands, etc.).
- Capitalizing on experiences so the SAP can benefit from lessons learned on critical issues. These exercises in capitalizing and experience sharing will address combating aquatic vegetation (*Typha* in particular), various experiences funded through micro-grants under the GEF-BFS Project, which in some cases are likely to be replicated within the framework of the SAP, etc.
- Leading IEC activities on the Water Charter in general and specifically on scientific aspects that are particularly relevant to the SAP, for example certain provisions related to preventing pollution.

Funding needs for urgent measures are estimated at 5.09 million euros. “Project Development Funds” (PDFs from the GEF) could be solicited in addition to collaboration from traditional OMVS partners.

7.2. Monitoring SAP implementation

The SAP is an evolving and dynamic “living” document. Therefore, it must be updated periodically to take into account the environmental dynamics (in some regards, unpredictable) within the basin and international and basin-wide political and economic circumstances. Developments in scientific knowledge as well as environmental values and standards can dictate the need for adjustments in the SAP. Hence, the SAP is an adaptive management tool for the Senegal River Basin environment.

For all cases, a one-to-two-year operationalization phase has been planned. This phase will take effect from the start of SAP implementation.

In year-4 of the strategy’s implementation (one year before the end of the 5-year priority period), a participatory exercise will be undertaken for updating.

The same will be true for the second phase of strategy implementation for the period from year-6 to year-10.

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Annex 1. Logical framework and financial costs for SAP measures and priority activities

LTEOO 1: The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization	Monitoring indicators: <ul style="list-style-type: none"> ♦ Land subjected to siltation that has been treated ♦ Primary productivity (biomass/ha) in the targeted geographical areas ♦ Productivity of factors in the agricultural sector ♦ Reduction in loss of agricultural land from salinization ♦ Level of livestock load for the basin's pastoral routes relative to their carrying capacity ♦ Change in riverbank stabilization 				
Measures	Activities	LCC potential targets			
		Guinea	Mali	Mauritania	Senegal
Measure 1: Develop alternative energy sources (I-M01)	➤ I-M01-01. IEC activities on alternative energy sources	All LCCs	Yélimané Kéniéba Diéma Banamba Bafoulabé Koulikoro	All	All
	➤ I-M01-02. Promotion of the use of improved cookstoves	All	All	All	All
	➤ I-M01-03. Promotion of the use of solar energy	All	All	All	All
	➤ I-M01-04. Promotion of the use of gas stoves	All	All	All	All
	➤ I-M01-05. Promotion of the use of biofuels/Development of bricks made of rice straw or <i>Typha</i>	All	All	All	All
	➤ I-M01-06. Promotion of the use of wind energy	All	All	All	All
	➤ I-M01-07. Professional training in building improved cookstoves; production of charcoal from <i>Typha</i> and rice straw; installation and maintenance of solar panels and wind energy units.	All	All	All	All
Measure 2: Awareness raising, education and information on land degradation and desertification (I-M02)	➤ I-M02-01. IEC on degradation targeting: (a) local collectivities; and (b) community-based organizations (village, women's and producers' associations)/Radio/TV awareness-raising campaigns	All	All	All	All
	➤ I-M02-02. Development of materials to teach and promote environmental education in schools and literacy centers, focused on land degradation and corrective measures	All	All	All	All
	➤ I-M02-03. Identification and promotion of practices to combat desertification and land degradation	All	All	All	All
Measure 3: Development and application of an action program for the restoration and protection of riverbanks and headwaters (I-M03)	➤ I-M03-01. Determining exhaustive baselines for riverbank and headwaters degradation and its causes	B-Source B-Downstream Bakoye Falémé	Kayes Yélimané Kati Bafoulabé	AD	Saintlouis Matam Kanel Bakel Podor Louga
	➤ I-M03-02. Identification of vulnerable areas and creating a plan defining zoning and land-use of riverbanks and headwaters	B-Source B-Downstream Bakoye	Kayes Yélimané Kati	AD	Saint Louis Matam Kanel

LTEQO 1: The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization	Monitoring indicators: <ul style="list-style-type: none"> ♦ Land subjected to siltation that has been treated ♦ Primary productivity (biomass/ha) in the targeted geographical areas ♦ Productivity of factors in the agricultural sector ♦ Reduction in loss of agricultural land from salinization ♦ Level of livestock load for the basin's pastoral routes relative to their carrying capacity ♦ Change in riverbank stabilization 				
Measures	Activities	LCC potential targets			
		Guinea	Mali	Mauritania	Senegal
		Falémé	Bafoulabé		Bakel Podor Louga
	➤ I-M03-03. Selection of target sites to restore (to complement the PGIRE and GEF co-financing)	B-Source Bakoye Falémé	Kayes Yélimané Kati Bafoulabé	AD	Saint Louis Matam Kanel Bakel Podor Louga
	➤ I-M03-04. Interventions in combating erosion and gullyng; riverbank fixation	B-Source Bakoye Falémé	Kayes Kolokani Bafoulabé	AD	Saintlouis Matam Kanel Bakel Podor Louga
	➤ I-M03-05. Monitoring system using methods combining satellite images and soil surveys	All LCCs	Kéniéba Diéma Kita Yélimané	AD	Saintlouis Matam Kanel Bakel Podor Louga
	➤ I-M03-06. Development and implementation of a management plan (restoration and sustainable land management) for the most degraded headwaters – Building stone bunds, stone lines, live hedges, etc.	B-Source Bakoye Falémé			
Measures 4: Prevention and management of bush fires (I-M04)	➤ I-M04-01. Building a firebreak	B-Downstream Falémé Bakoye	Kéniéba Bafoulabé	All	All
	➤ I-M04-02. IEC on bush fires	B-Downstream Falémé Bakoye		All	Saintlouis Matam Bakel Dagana Podor Louga
	➤ I-M04-03. Early-warning and prevention system (vigilance committee)	B-Downstream Falémé		Kaedi Maghama	
	➤ I-M04-04. Interstate exchanges of experiences				

LTEQO 1: The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization	Monitoring indicators: <ul style="list-style-type: none"> ♦ Land subjected to siltation that has been treated ♦ Primary productivity (biomass/ha) in the targeted geographical areas ♦ Productivity of factors in the agricultural sector ♦ Reduction in loss of agricultural land from salinization ♦ Level of livestock load for the basin's pastoral routes relative to their carrying capacity ♦ Change in riverbank stabilization 				
Measures	Activities	LCC potential targets			
		Guinea	Mali	Mauritania	Senegal
Measures 5: Promotion of agro-pastoral practices (I-M05)	➤ I-M05-01. Promotion of fodder crops (for demonstration)	All		Aleg Rosso Kaédi Boghé	
	➤ I-M05-02. Promotion of agro-sylvo-pastoral integration in selected sites (one per country)	All			
Measure 6: Implementation of an enabling legal environment for sustainable use of water and land resources (I-M06)	➤ I-M06-01. Initiate basin-wide participatory in-depth reflection on the suitability of existing national land-tenure laws to guarantee sustainable land use	All	Kéniéba Kayes Yélimané Kita		Bakel Dagana Podor Louga
	➤ I-M06-02. Experimentation on local land-tenure agreements to promote investment in activities for conservation, protection and sustainable improvement of land productivity	All	Kita Bafoulabé Yélimané Banamba Kita		Bakel Dagana Podor Louga
Measure 7: Identification and restoration of land that has undergone the most exposure to erosion, siltation and desertification (I-M07)	➤ I-M07-01. Analysis and mapping of soil according to its degree of exposure and susceptibility to erosion and identification of restoration sites	All	All	All	All
	➤ I-M07-02. Lead desiltation activities in target sites (irrigated and flood recession farmland, oases, transportation routes)		Kayes	All	All
	➤ I-M07-03. Initiation of sand dune fixation to combat desert encroachment			K. Macene Rosso Boghe Aleg Kaedi	S-Louis Louga Dagana Podor Matam

LTEQO 2: Optimally controlled water resources are managed through integrated and sustainable systems to ensure good water quality and adequate availability to users.	Monitoring indicators: <ul style="list-style-type: none"> ♦ Water temperature; Dissolved oxygen ♦ Conductivity; pH ♦ Water turbidity; Nutrient load ♦ Pesticides; Heavy metals 				
Measures	Activities	LCC target			
		Guinea	Mali	Mauritania	Senegal
Measure 1: Awareness raising/education/information on water quality (II-M01)	➤ II-M01-01. IEC on the Water Charter and other relevant legal texts	All	All	All	All
	➤ II-M01-02. IEC on the use of pesticides and fertilizers	All	All	All	All
	➤ II-M01-03. IEC on water treatment techniques	All	All	All	All
Measure 2: Ensure better control of improvements in water quality (II-M02)	➤ II-M02-01. Establish baselines for basin water quality (surface and groundwater, upstream and downstream)	All	All	All	All
	➤ II-M02-02. Define water quality standards	All	All	All	All
	➤ II-M02-03. Institute a system for specifications/preserving water quality for large-scale use (agro-industry, mining companies) <ul style="list-style-type: none"> ○ Promote laws to put the Water Charter's polluter-payer principle into effect 	All	All	All	All
	➤ II-M02-04. Set up a monitoring system for water quality <ul style="list-style-type: none"> ○ Establish a limnology unit for the Diama reservoir 	All	All	All	All
	➤ II-M02-05. Promote collaborative agreements with decentralized collectivities in urban and rural settings for the implementation of laws related to water quality	All	All	All	All
Measure 3: Promote innovative approaches to water management that alleviate poverty while protecting the environment (II-M03)	➤ II-M03-01. Inventory and mapping of potential sites for hill reservoirs and other water bodies	All	All	All	All
	➤ II-M03-02. Management of ponds and water points for livestock (to limit the concentration of livestock on riverbanks)	All	All	All	All
	➤ II-M03-03. Promotion of collection and conservation techniques for rainwater (retention ponds, etc.)	All	All	All	All
	➤ II-M03-04. Managing targeted troughs/shoals to demonstrate an ecosystem approach to wetlands management	All	All	All	All
	➤ II-M03-05. Identification of and stocking fish in ponds for fish farming	All	All	All	All
	➤ II-M03-06. Studies on the mechanism for groundwater recharge and its relationship to surface water	All	All	All	All

LTEQO 3: The prevalence of waterborne diseases is reduced to a level that no longer poses a public health problem	Monitoring indicators: <ul style="list-style-type: none"> ◆ Prevalence rate: malaria, bilharzia, etc. ◆ Mortality rate ◆ Burden on public resources and households 				
Measures	Activities	LCC target			
		Guinea	Mali	Mauritania	Senegal
Measure 1: Health education and awareness raising on the causes of waterborne diseases (III-M01)	➤ III-M01-01. Strengthen human, material and technical capacities of structures involved in raising community awareness	All	All	All	All
	➤ III-M01-02. Lead education, awareness-raising and information campaigns	All	All	All	All
	➤ III-M01-03. Create didactic supports for health education in schools	All	All	All	All
	➤ III-M01-04. Promote transboundary collaboration between basin health professionals	All	All	All	All
Measure 2: Epidemiological monitoring (III-M02)	➤ III-M02-01. Equip health centers and posts with the necessary testing supplies	All	All	All	All
	➤ III-M02-02. Lead training sessions on conducting surveys and epidemiological analyses	All	All	All	All
	➤ III-M02-03. Conduct periodic epidemiological surveys	All	All	All	All
Measure 3: Combat disease vectors (III-M03)	➤ III-M03-01. Treatment of stagnant wastewater and rainwater	All	All	All	All
	➤ III-M03-02. Chemical control, disinfection (pre-rainy-season dusting, etc.)	All	All	All	All
	➤ III-M03-03. Biological control in larvae sites	All	All	All	All
Measure 4: Improve access to drinking water (III-M04)	➤ III-M04-01. Inventory groundwater resources and their quality	All	All	All	All
	➤ III-M04-02. Collect, analyze and disseminate information on surface and groundwater quality	All	All	All	All
	➤ III-M04-03. Identify and promote suitable techniques/technologies for water treatment	All	All	All	All
Measure 5: Reduce water pollution caused by household garbage and domestic waste (III-M05)	➤ III-M05-01. Collection and treatment of household garbage – Conduct pilot experiments (one in each country) as a demonstration	1 location	1 location	1 location	1 location
	➤ III-M05-02. Overhaul and extension of adapted disposal systems and wastewater treatment (lead pilot experiments—one in each country as a demonstration)	1 location	1 location	1 location	1 location
	➤ III-M05-03. Pilot experiments in the diffusion of the ECOSAN ecological sanitation method (in collaboration with CREPA)	2 locations	5 locations	3 locations	3 locations

LTEQO 4: No aquatic, animal or plant species proliferate to the point of threatening ecological equilibrium and economic activities in the Senegal River Basin	<u>Monitoring indicators:</u> <ul style="list-style-type: none"> ♦ Spatial coverage of invasive aquatic plants ♦ Income earned from the economic use of invasive plants 				
Measures	Activities	LCC target			
Measure 1: Integrated program to combat <i>Typha australis</i> (IV-M01)	➤ IV-M01-01. Update baselines for spatial distribution and evolution of invasive plants	Guinea	Mali Kayes	Mauritania All	Saint Louis Dagana Podor Louga
	➤ IV-M01-02. Mechanical (channel clearing, weed cutting, artisan/traditional control-manual cutting) and/or biological control			All	Saint Louis Dagana Podor Louga
	➤ IV-M01-03. Organize workshops to pool experiences			All	Saint Louis Dagana Podor Louga
	➤ IV-M01-04. Information, training and awareness raising on invasive species		Kayes	All	Saint Louis Dagana Podor Louga
Measure 2: Implement a monitoring and early-warning system (IV-M02)	➤ IV-M02-01. Create monitoring and early-warning committees – Set up a surveillance and species identification team		Kayes	All	Saint Louis Dagana Podor Louga
	➤ IV-M02-02. Create a communication circuit			All	Saint Louis Dagana Podor Louga
	➤ IV-M02-03. Organize forums at regular intervals – Provide training in invasive plant detection		Kayes	All	Saint Louis Dagana Podor Louga
	➤ IV-M02-04. Identify and raise awareness for all stakeholders		All	All	Saint Louis Dagana Podor Louga
Measure 3: Economic valorization of invasive plants (IV-M03)	➤ IV-M03-01. IEC on the economic potential of invasive plants			Aleg Keur-Macene Rosso Kaedi Selibaly	Saint Louis Dagana Podor Louga

<i>LTEQO 4: No aquatic, animal or plant species proliferate to the point of threatening ecological equilibrium and economic activities in the Senegal River Basin</i>	Monitoring indicators: <ul style="list-style-type: none"> ♦ <i>Spatial coverage of invasive aquatic plants</i> ♦ <i>Income earned from the economic use of invasive plants</i> 				
Measures	Activities	LCC target			
		Guinea	Mali	Mauritania	Senegal
				Maghama Boghe	
	➤ IV-M03-02. Development of artisan and modern techniques			Aleg Keur-Macene Rosso Kaedi Selibaly Maghama Boghe	Saint Louis Dagana Podor Louga
	➤ IV-M03-03. Support setting up networks to market products from invasive plants			Aleg Keur-Macene Rosso Kaedi Selibaly Maghama Boghe	Saint Louis Dagana Podor Louga

LTEOO 5: Areas with high biodiversity value are identified, restored and sustainably preserved	Monitoring indicators: <ul style="list-style-type: none"> ♦ Maximum land area flooded over 15 consecutive days per year ♦ Species diversity ♦ Catch volume by fishermen 				
Measures	Activities	LCC target			
		Guinea	Mali	Mauritania	Senegal
Measure 1: Strengthen capacities/environmental education (V-M01)	➤ V-M01-01. Strengthening human, material and technical capacities of concerned structures	All	All	All	All
	➤ V-M01-02. Information, awareness raising and education for communities and political and administrative officials	All	All	All	All
	➤ V-M01-03. Organize study trips for local collectivities	All	All	All	All
	➤ V-M01-04. Broadcast radio and television shows about the basin's biological diversity	All	All	All	All
	➤ V-M01-05. Introduce environmental education in the schools	All	All	All	All
	➤ V-M01-06. Literacy training focused on environmental issues for communities	All	All	All	All
Measure 2: Establish biodiversity baselines (V-M02)	➤ V-M02-01. Conduct baseline study and freshwater biodiversity assessment	All	All	All	All
	➤ V-M02-02. Identify biodiversity hotspots	All	All	All	All
Measure 3: Reduce fishing pressure (V-M03)	➤ V-M03-01. Regulation of fishing techniques	All	All	All	All
	➤ V-M03-02. Institution of season closures	All	All	All	All
	➤ V-M03-03. Awareness raising for fishermen	All	All	All	All
	➤ V-M03-04. Fish farming; incentives for introducing fish farming into rice fields; funding projects in aquaculture	All	All	All	All
Measure 4: Establish conservation and land-management policy for wetlands (V-M04)	➤ V-M04-01. Inventory of wetlands	All	All	All	All
	➤ V-M04-02. Development and implementation of management plans for the most threatened wetlands	All	All	All	All
	➤ V-M04-03. Classification of additional wetlands as Ramsar sites (particularly the upper basin)	All	All	All	All
	➤ V-M04-04. Networking for basin wetlands (i.e., "Senegal Wet")	All	All	All	All
	➤ V-M04-05. Research and application on environmental flows	All	All	All	All
	➤ V-M04-06. Adopt stricter provisions guaranteeing that floodgates are released as frequently as possible	All	All	All	All

Special Initiative on Climate Change: The Senegal River Basin has a high level of resilience to the impacts of climate variability and change while contributing to efforts to mitigate greenhouse gas emissions					
Components	Actions	Target countries			
		Guinea	Mali	Mauritania	Senegal
S-01. Improve the quality of climate information (predicting future climate and its impacts on water resources)	S-01-01. Strengthen capacities of the basin countries in modeling and climate forecasting	X	X	X	X
	S-01-02. Strengthen capacities in vulnerability analysis and adaptation measures	X	X	X	X
	S-01-03. Conduct a predictive study on climate change forecasting and impact in the Senegal River Basin	X	X	X	X
	S-01-04. Conduct studies on risks linked to rising sea level			K. Macene Rosso	St Louis Dagana
	S-01-05. Conduct studies on risks linked to the rise in extreme flooding	X	X	X	X
S-02. Promote adaptation measures to reduce the vulnerability of production systems for basin communities (while taking into account measures selected by the basin states in their National Communications and NAPAs)	S-02-01. Promotion of a variety of adapted seeds	X	X	X	X
	S-02-02. Expansion of agriculture with water control (improved irrigation and recession)	X	X	X	X
	S-02-03. Diversification of agricultural production systems and promotion of non-agricultural activities	X	X	X	X
	S-02-04. Identify and diffuse adapted local practices and techniques in land and water management	X	X	X	X
S-03. Ensure climate-proofing of hydraulic and hydro-agricultural infrastructure	Adapt technical design standards for structures/investments	X	X	X	X
S-04. Develop capacities of basin actors to obtain carbon funds	- Targeted training - Assistance in preparing grant proposals	X	X	X	X

Legal and institutional reforms/measures: Support to establish an enabling legal and institutional environment for SAP implementation					
Reforms	Actions	Target countries			
		Guinea	Mali	Mauritania	Senegal
R-01. Reactivation of action plans to combat desertification	- Political dialogue with the states	X	X	X	X
R-02. Implementation of sub-regional Action Plan to combat desertification	- Political dialogue with the states - Facilitation of consultation meetings	X	X	X	X
R-03. Development and/or implementation of IWRM Action Plans	R-03-01. Funding mobilization for and implementation of IWRM National Plans in Mali and Senegal - Political dialogue with the states - Advocacy for financial partners	X	X	X	X
	R-03-02. Development of IWRM National Plans and funding mobilization needed for funding in Guinea and Mauritania: - Political dialogue with the states - Facilitation of meetings to share experiences - Advocacy for financial partners	X	X	X	X
R-04. Support for member countries in maintaining greater respect of their obligations as signatories of the Ramsar Convention on Wetlands	- Political dialogue with the states - Facilitation of consultation meetings	X	X	X	X
R-05. Support for member countries in maintaining greater respect of their obligations as signatories of the Convention on Biological Diversity	- Political dialogue with the states - Facilitation of consultation meetings	X	X	X	X
R-06. Development and/or implementation of National Adaptation Programmes of Action for climate variability and change	- Political dialogue with the states - Advocacy for UNFCCC	X	X	X	X
R-07. Revision of water regulations to take into account emerging principles and values (IWRM, polluter-payer principle, recognizing water's economic value, guaranteeing environmental flows, equitable distribution, public participation)	R-07-01. Revision and reform: - Political dialogue with the states - Facilitation of consultation meetings	X	X	X	X
	R-07-01. Political dialogue with the states - Facilitation of consultation meetings	X	X	X	X
R-08. Revision and implementation of environment and forest regulations (to create incentives for environmental protection, tree planting, etc.)	- Political dialogue with the states - Facilitation of consultation meetings	X	X	X	X
R-09. Revision and implementation of land-tenure regulations to create incentives for sustainable investments for land valorization (land-tenure security)	- Political dialogue with the states - Facilitation of consultation meetings	X	X	X	X

Legal and institutional reforms/measures: Support to establish an enabling legal and institutional environment for SAP implementation					
Reforms	Actions	Target countries			
		Guinea	Mali	Mauritania	Senegal
R-10. Revision, harmonization and strengthening of safety systems in mining regulations for the basin countries	<ul style="list-style-type: none"> - Political dialogue with the states - Facilitation of consultation meetings 	X	X	X	X
R-11. Revision, harmonization and strengthening of conservation systems for wildlife biodiversity in hunting regulations	<ul style="list-style-type: none"> - Political dialogue with the states - Facilitation of consultation meetings 	X	X	X	X
R-12. Update and harmonize regulations on herding and livestock farming	<ul style="list-style-type: none"> - Political dialogue with the states - Facilitation of consultation meetings 	X	X	X	X
R-13. Harmonize the principles and practices of environmental impact studies in the basin countries and align them with international standards	R-13-01. Establish a baseline for regulating impact studies in the basin countries: <ul style="list-style-type: none"> - Technical/consultative support - Political dialogue with the states - Facilitation of consultation meetings - 	X	X	X	X
	R-13-02. Organize information seminars on international standards and practices	X	X	X	X
	R-13-03. Lead dialogue on policy with the Ministries of Environment of the concerned countries	X	X	X	X
	R-13-04. Implementation of reforms for procedures for environmental impact studies <ul style="list-style-type: none"> - Political dialogue with the states - Facilitation of consultation meetings 	X	X	X	X
	R-13-05. Training for professionals in the Ministries of Environment and the OMVS in preparing ToRs and invitations to tender for environmental impact studies	X	X	X	X
	R-13-06. Training seminars for professionals (consultants and scientists) on conducting environmental impact studies	X	X	X	X
R-14. Strengthen capacities of local collectivities in the basin to implement skills that have been transferred to them in the area of natural resources management and environment protection	<ul style="list-style-type: none"> - Training for elected officials and community agents - Training for state decentralized services 	X	X	X	X
R-15. Pursue efforts to disseminate/extend the Charter	<ul style="list-style-type: none"> - Develop communication materials - Diffuse information on the Charter - Organization of information and awareness-raising sessions/campaigns 	X	X	X	X
R-16. Operationalization of the Charter and, in particular, the provisions on protecting and preserving the environment (Article 4 of the	R-16-01. Operationalization of the Charter provisions on inter-state coordination in response to extreme climate events	X	X	X	X

Legal and institutional reforms/measures: Support to establish an enabling legal and institutional environment for SAP implementation					
Reforms	Actions	Target countries			
		Guinea	Mali	Mauritania	Senegal
Charter)	R-16-02. Operationalization of the Charter provisions on inter-state coordination in preventing and combating invasive aquatic species	X	X	X	X
	R-16-03. Operationalization of provisions on preserving water quality and combating pollution, including implementation of the polluter-payer principle	X	X	X	X

Measures: Strengthening capacities of the OMVS and basin stakeholders					
Measures	Actions	Target countries			
		Guinea	Mali	Mauritania	Senegal
C-01. Support the operationalization and coordination unit for the SAP process	<ul style="list-style-type: none"> - Staff - Equipment - Support for consultants - Miscellaneous 				
C-02. Capitalization of relevant experiences	<ul style="list-style-type: none"> - Capitalization on Dutch Co-financing of the GEF-BFS Project - Capitalization on micro-grants 	X	X	X	X
C-03. Strengthen the context of participation by civil society	Training for NGO, GIE, etc. agents	X	X	X	X
C-04. Support for national coordination and consultation platforms (NCCs and LCCs)	<ul style="list-style-type: none"> - Staff - Equipment - Miscellaneous 	X	X	X	X
C-05. Consolidation of the process to involve the scientific community	<ul style="list-style-type: none"> - Experimentation sites - Action research 	X	X	X	X
C-06. Support to set up the Basin Committee	<ul style="list-style-type: none"> - Support for Basin Committee operations 	X	X	X	X
C-07. Training for stakeholders in effective SAP implementation	<ul style="list-style-type: none"> - Training in project planning and design management - Training in funding mobilization - Training in project management/implementation 	X	X	X	X
Total for Measures to strengthen OMVS and stakeholder capacities					

Annex 2. Detailed Budget

Annex 2. 1. LTEQO 1 Budget

LTEQO 1: The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization.							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long term		
		Urgent (Immediate)	0–5 years	6–10 years	11–20 years		
Measure 1: Develop alternative energy sources (I-M01)	➤ I-M01-01. IEC activities on alternative energy sources		200 000	200 000		400 000	
	➤ I-M01-02. Promotion of the use of improved cookstoves		200 000	200 000		400 000	
	➤ I-M01-03. Promotion of the use of solar energy		2 000 000	4 000 000	2 000 000	8 000 000	
	➤ I-M01-04. Promotion of the use gas stoves		200 000	200 000		400 000	
	➤ I-M01-05. Promotion of the use of biofuels/Development of bricks made of rice straw or <i>Typha</i>		1 000 000	1 000 000		2 000 000	
	➤ I-M01-06. Promotion of the use of wind energy		200 000	200 000		400 000	
	➤ I-M01-07. Professional training in building improved cookstoves; production of charcoal from <i>Typha</i> and rice straw; installation and maintenance of solar panels and wind energy units		400 000	200 000		600 000	
	Total: Measure I-M01	0	4 200 000	6 000 000	2 000 000		12 200 000

LTEOO 1: *The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization.*

Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long term		
		Urgent (Immediate)	0–5 years	6–10 years	11–20 years		
Measure 2: Awareness raising, education and information on land degradation and desertification (I-M02)	➤ I-M02-01. IEC on degradation targeting: (a) local collectivities; and (b) community-based organizations (village, women's and producers' associations)/Radio/TV awareness-raising campaigns		400 000			400 000	
	➤ I-M02-02. Development of materials to teach and promote environmental education in schools and literacy centers, focused on land degradation and corrective measures		200 000			200 000	
	➤ I-M02-03. Identification and promotion of practices to combat desertification and land degradation		400 000			400 000	
	Total: Measure I-M02		1 000 000	0	0		1 000 000
Measure 3: Development and application of an action program for the restoration and protection of riverbanks and headwaters (I-M03)	➤ I-M03-01. Determining exhaustive baselines for riverbank and headwaters degradation and its causes	100 000				100 000	
	➤ I-M03-02. Identification of vulnerable areas and creating a plan defining zoning and land-use of riverbanks and headwaters	50 000				50 000	
	➤ I-M03-03. Selection of target sites to restore (to complement the PGIRE and GEF co-financing)	40 000				40 000	
	➤ I-M03-04. Interventions in combating erosion and gullyng; riverbank fixation	500 000	3 500 000	4 000 000	6 000 000	14 000 000	
	➤ I-M03-05. Monitoring system using methods combining satellite images and soil surveys		250 000	250 000	500 000	1 000 000	

LTEQO 1: *The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization.*

Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long term		
		Urgent (Immediate)	0–5 years	6–10 years	11–20 years		
	➤ I-M03-06. Development and implementation of a management plan (restoration and sustainable land management) for the most degraded headwaters – Building stone bunds, stone lines, live hedges, etc.	400 000	260 000	3 000 000	2 500 000	6 160 000	
	Total: Measure I-M03	1 090 000	4 010 000	7 250 000	9 000 000		21 350 000
Measure 4: Prevention and management of bush fires (I-M04)	➤ I-M04-01. Building a firebreak		1000000	2000000	3000000	6 000 000	
	➤ I-M04-02. IEC on bush fires		100000	300000	400000	800 000	
	➤ I-M04-03. Early-warning and prevention system (vigilance committee)		200000	200000		400 000	
	➤ I-M04-04. Interstate exchanges of experiences		100000			100 000	
	Total: Measure I-M04	0	1 400 000	2 500 000	3 400 000		7 300 000
Measure 5: Promotion of agro-pastoral practices (I-M05)	➤ I-M05-01. Promotion of fodder crops (for demonstration)		300000			300 000	
	➤ I-M05-02. Promotion of agro-sylvo-pastoral integration in selected sites (one per country)		600000			600 000	
	Total: Measure I-M05	0	900 000	0	0		900 000
Measure 6: Implementation of an enabling legal environment for sustainable use of water and land resources (I-M06)	➤ I-M06-01. Initiate basin-wide participatory in-depth reflection on the suitability of existing national land-tenure laws to guarantee sustainable land use		150000			150 000	

LTEQO 1: The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization.							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long term		
		Urgent (Immediate)	0–5 years	6–10 years	11–20 years		
	➤ I-M06-02. Experimentation on local land-tenure agreements to promote investment in activities for conservation, protection and sustainable improvement of land productivity		150000			150 000	
	Total: Measure I-M06	0	300 000	0	0		300 000
Measure 7: Identification and restoration of land that has undergone the most exposure to erosion, siltation and desertification (I-M07)	➤ I-M07-01. Analysis and mapping of soil according to its degree of exposure and susceptibility to erosion and identification of restoration sites	300000				300 000	
	➤ I-M07-02. Lead desiltation activities in target sites (irrigated and flood recession farmland, oases, transportation routes)		2000000	3000000	4500000	9 500 000	
	➤ I-M07-03. Initiation of sand dune fixation to combat desert encroachment		2000000	2000000	4000000	8 000 000	
	Total: Measure I-M07	300 000	4 000 000	5 000 000	8 500 000		17 800 000
Total for LTEQO 1		1 390 000	15 810 000	20 750 000	22 900 000		60 850 000

Annex 2. 2. LTEQO 2 Budget

LTEQO 2: Optimally controlled water resources are managed through integrated and sustainable systems to ensure good water quality and adequate availability to users.							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Observations
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
Measure 1: Awareness raising/education/information on water quality (II-M01)	➤ II-M01-01. IEC on the Water Charter and other relevant legal texts	160 000				160 000	
	➤ II-M01-02. IEC on the use of pesticides and fertilizers	400 000				400 000	
	➤ II-M01-03. IEC on water treatment techniques		200 000	200 000		400 000	
	Total: Measure II-M01	560 000	200 000	200 000			960 000
Measure 2: Ensure better control of improvements in water quality (II-M02)	➤ II-M02-01. Establish baselines for basin water quality (surface and groundwater, upstream and downstream)	100 000				100 000	
	➤ II-M02-02. Define water quality standards	100 000				100 000	
	➤ II-M02-03. Institute a system for specifications/preserving water quality for large-scale use (agro-industry, mining companies)		100 000			100 000	
	➤ II-M02-04. Set up a monitoring system for water quality		500 000	2 000 000		2 500 000	
	➤ II-M02-05. Promote collaborative agreements with decentralized collectivities in urban and rural settings for the implementation of laws related to water quality		100 000	200 000		300 000	
	Total: Measure II-M02	200 000	700 000	2 200 000	0		3 100 000
Measure 3: Promote innovative approaches to water management that alleviate poverty while protecting the environment (II-M03)	➤ II-M03-01. Inventory and mapping of potential sites for hill reservoirs and other water bodies	70 000				70 000	

LTEQO 2: Optimally controlled water resources are managed through integrated and sustainable systems to ensure good water quality and adequate availability to users.							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Observations
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
	➤ II-M03-02. Management of ponds and water points for livestock (to limit the concentration of livestock on riverbanks)		2 500 000	2 500 000		5 000 000	
	➤ II-M03-03. Promotion of collection and conservation techniques for rainwater (retention ponds, etc.)			150 000	150 000	300 000	
	➤ II-M03-04. Managing targeted troughs/shoals to demonstrate an ecosystem approach to wetlands management		3 000 000	7 000 000		10 000 000	
	➤ I I-M03-05. Identification of and stocking fish in ponds for fish farming		500 000	500 000		1 000 000	
	➤ II-M03-06. Studies on the mechanism for groundwater recharge and its relationship to surface water	50 000				50 000	
	Total: Measure II-M03	120 000	6 000 000	10 150 000	150 000		16 420 000
Total for LTEQO 2		880 000	6 900 000	12 550 000	150 000		20 480 000

Annex 2. 3. LTEQO 3 Budget

LTEQO 3: The prevalence of waterborne diseases is reduced to a level that no longer poses a public health problem							
Measures	Activities	Short, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
Measure 1: Health education and awareness raising on the causes of waterborne diseases (III-M01)	➤ III-M01-01. Strengthen human, material and technical capacities of structures involved in raising community awareness		500 000			500 000	
	➤ III-M01-02. Lead education, awareness-raising and information campaigns		200 000	300 000		500 000	
	➤ III-M01-03. Create didactic supports for health education in schools		50 000			50 000	
	➤ III-M01-04. Promote transboundary collaboration between basin health professionals		100 000	200 000		300 000	
	Total: Measure III-M01	0	850 000	500 000	0		1 350 000
Measure 2: Epidemiological monitoring (III-M02)	➤ III-M02-01. Equip health centers and posts with the necessary testing supplies		1 000 000	2 000 000		3 000 000	
	➤ III-M02-02. Lead training sessions on conducting surveys and epidemiological analyses		100 000	150 000		250 000	
	➤ III-M02-03. Conduct periodic epidemiological surveys	200 000	300 000	500 000	1 000 000	2 000 000	
	Total: Measure III-M02	200 000	1 400 000	2 650 000	1 000 000		5 250 000
Measure 3: Combat disease vectors (III-M03)	➤ III-M03-01. Treatment of stagnant wastewater and rainwater	200 000	800 000	500 000	500 000	2 000 000	URG: études préliminaires
	➤ III-M03-02. Chemical control, disinfection (pre-rainy-season dusting, etc.)		800 000	500 000	200 000	1 500 000	

LTEQO 3: The prevalence of waterborne diseases is reduced to a level that no longer poses a public health problem							
Measures	Activities	Short, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
	➤ III-M03-03. Biological control in larvae sites		200 000	300 000	500 000	1 000 000	
	Total: Measure III-M03	200 000	1 800 000	1 300 000	1 200 000		4 500 000
Measure 4: Improve access to drinking water (III-M04)	➤ III-M04-01. Inventory groundwater resources and their quality		250 000			250 000	
	➤ III-M04-02. Collect, analyze and disseminate information on surface and groundwater quality		300 000	500 000		800 000	
	➤ III-M04-03. Identify and promote suitable techniques/technologies for water treatment		500 000	1 000 000		1 500 000	
	Total: Measure III-M04	0	1 050 000	1 500 000	0		2 550 000
Measure 5: Reduce water pollution caused by household garbage and domestic waste (III-M05)	➤ III-M05-01 Collection and treatment of household garbage – Conduct pilot experiments (one in each country) as a demonstration		9 000 000	1 000 000		10 000 000	
	➤ III-M05-02. Overhaul and extension of adapted disposal systems and wastewater treatment (lead pilot experiments—one in each country as a demonstration)		6 000 000	1 000 000		7 000 000	
	➤ III-M05-03. Pilot experiments in the diffusion of the ECOSAN ecological sanitation method (in collaboration with CREPA)		2 000 000	500 000		2 500 000	
	Total: Measure III-M05	0	17 000 000	2 500 000	0		19 500 000
Total for LTEQO 3		400 000	22 100 000	8 450 000	2 200 000		33 150 000

Annex 2. 4. LTEQO 4 Budget

LTEQO 4: No aquatic, animal or plant species proliferate to the point of threatening ecological equilibrium and economic activities in the Senegal River Basin							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
Measure 1: Integrated program to combat <i>Typha australis</i> (IV-M01)	➤ IV-M01-01. Update baselines for spatial distribution and evolution of invasive plants	250 000				250 000	
	➤ IV-M01-02. Mechanical (channel clearing, weed cutting, artisan/traditional control-manual cutting) and/or biological control		30 000 000	20 000 000	25 000 000	75 000 000	
	➤ IV-M01-03. Organize workshops to pool experiences	150 000				150 000	
	➤ IV-M01-04. Information, training and awareness raising on invasive species		300 000			300 000	
	Total: Measure IV-M01	400 000	30 300 000	20 000 000	25 000 000		75 700 000
Measure 2: Implement a monitoring and early-warning system (IV-M02)	➤ IV-M02-01. Create monitoring and early-warning committees – Set up a surveillance and species identification team		50 000			50 000	
	➤ IV-M02-02. Create a communication circuit		100 000			100 000	
	➤ IV-M02-03. Organize forums at regular intervals – Provide training in invasive plant detection		75 000			75 000	
	➤ IV-M02-04. Identify and raise awareness for all stakeholders		150 000			150 000	
	Total: Measure IV-M02	0	375 000	0	0		375 000
Measure 3: Economic valorization of invasive plants (IV-M03)	➤ IV-M03-01. IEC on the economic potential of invasive plants		50 000			50 000	
	➤ IV-M03-02. Development of artisan and modern techniques		2 000 000	3 000 000		5 000 000	
	➤ IV-M03-03. Support setting up networks to market products from invasive plants		150 000			150 000	
	Total: Measure IV-M03	0	2 200 000	3 000 000	0		5 200 000
Total for LTEQO 4		400 000	32 875 000	23 000 000	25 000 000		81 275 000

Annex 2. 5. LTEQO 5 Budget

LTEQO 5: Areas with high biodiversity value are identified, restored and sustainably preserved							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
Measure 1: Strengthen capacities/environmental education (V-M01)	➤ V-M01-01. Strengthening human, material and technical capacities of concerned structures		500 000			500 000	
	➤ V-M01-02. Information, awareness raising and education for communities and political and administrative officials		150 000			150 000	
	➤ V-M01-03. Organize study trips for local collectivities		100 000			100 000	
	➤ V-M01-04. Broadcast radio and television shows about the basin's biological diversity		100 000			100 000	
	➤ V-M01-05. Introduce environmental education in the schools		100 000			100 000	
	Total: Measure V-M01	0	950 000	0	0		950 000
	➤ V-M01-06. Literacy training focused on environmental issues for communities		75 000			75 000	
Measure 2: Establish biodiversity baselines (V-M02)	➤ V-M02-01. Conduct baseline study and freshwater biodiversity assessment	150 000				150 000	
	➤ V-M02-02. Identify biodiversity hotspots	50 000				50 000	
	Total: Measure V-M02	200 000	75 000	0	0		275 000
Measure 3: Reduce fishing pressure (V-M03)	➤ V-M03-01. Regulation of fishing techniques		30 000			30 000	
	➤ V-M03-02. Institution of season closures		70 000			70 000	
	➤ V-M03-03. Awareness raising for fishermen		80 000			80 000	

LTEQO 5: Areas with high biodiversity value are identified, restored and sustainably preserved							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
	➤ V-M03-04. Fish farming; incentives for introducing fish farming into rice fields; funding projects in aquaculture		5 000 000	10 000 000		15 000 000	
	Total: Measure V-M03	0	5 180 000	10 000 000	0		15 180 000
Measure 4: Establish conservation and land-management policy for wetlands (V-M04)	➤ V-M04-01. Inventory of wetlands	150 000				150 000	
	➤ V-M04-02. Development and implementation of management plans for the most threatened wetlands		2 000 000	4 000 000	1 000 000	7 000 000	
	➤ V-M04-03. Classification of additional wetlands as Ramsar sites (particularly the upper basin)		25 000			25 000	
	➤ V-M04-04. Networking for basin wetlands (i.e., “Senegal Wet”)		50 000			50 000	
	➤ V-M04-05. Research and application on environmental flows		250 000			250 000	
	➤ V-M04-06. Adopt stricter provisions guaranteeing that floodgates are released as frequently as possible		50 000			50 000	
	Total: Measure V-M04	150 000	2 375 000	4 000 000	1 000 000		7 525 000
Total for LTEQO 5		350 000	8 580 000	14 000 000	1 000 000		23 930 000

Annex 2. 6. Budget: Special Initiative on Climate Change

Special Initiative on Climate Change: The Senegal River Basin has a high level of resilience to the impacts of climate variability and change while contributing to efforts to mitigate greenhouse gas emissions							
Measures	Activities	Short-, medium- and long-term goal				Total par activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
S-01. Improve the quality of climate information (predicting future climate and its impacts on water resources)	S-01-01. Strengthen capacities of the basin countries in modeling and climate forecasting		200000			200000	
	S-01-02. Strengthen capacities in vulnerability analysis and adaptation measures		200000			200000	
	S-01-03. Conduct a predictive study on climate change forecasting and impact in the Senegal River Basin	400000				400000	
	S-01-04. Conduct studies on risks linked to rising sea level		150000			150000	
	S-01-05. Conduct studies on risks linked to the rise in extreme flooding		200000			200000	
	Total: Component S-01	400000	750000	0	0		1 150 000
S-02. Promote adaptation measures to reduce the vulnerability of production systems for basin communities (while taking into account measures selected by the basin states in their National Communications and NAPAs)	S-02-01. Promotion of a variety of adapted seeds		200000			200000	
	S-02-02. Expansion of agriculture with water control (improved irrigation and recession)		200000			200000	
	S-02-03. Diversification of agricultural production systems and promotion of non-agricultural activities		200000			200000	
	S-02-04. Identify and diffuse adapted local practices and techniques in land and water management		300000			300000	
	Total: Component S-02	0	900000	0	0		900 000
S-03. Ensure climate-proofing of hydraulic and hydro-agricultural infrastructure	Adapt technical design standards for structures/investments		50000			50000	
	Total: Component S-03	0	50000	0	0		50 000

Special Initiative on Climate Change: The Senegal River Basin has a high level of resilience to the impacts of climate variability and change while contributing to efforts to mitigate greenhouse gas emissions							
Measures	Activities	Short-, medium- and long-term goal				Total par activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
S-04. Develop capacities of basin actors to obtain carbon funds	Targeted training/assistance in preparing grant proposals		400000			400 000	
	Total: Component S-04	0	400000	0	0		400000
Total for Special Initiative	-	400000	2100000	0	0		2 500 000

Annex 2. 7. Budget: Support for legal and institutional reforms/measures

Legal and institutional reforms/measures: Support to establish an enabling legal and institutional environment for SAP implementation							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
R-01. Reactivation of action plans to combat desertification	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		50 000			50 000	50 000
R-02. Implementation of sub-regional Action Plan to combat desertification	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		75 000			75 000	75 000
R-03. Development and/or implementation of IWRM Action Plans	R-03-01. Funding mobilization for and implementation of IWRM National Plans in Mali and Senegal		10 000			10 000	
	R-03-02. Development of IWRM National Plans and funding mobilization needed for funding in Guinea and Mauritania		50 000			50 000	
	Total: R.03+B267						60 000
R-04. Support for member countries in maintaining greater respect of their obligations as signatories of the Ramsar Convention on Wetlands	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		60 000			60 000	60 000
R-05. Support for member countries in maintaining greater respect of their obligations as signatories of the Convention on Biological Diversity	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		60 000			60 000	60 000
R-06. Development and/or implementation of National Adaptation Programmes of Action for climate variability and change	Political dialogue with the states; facilitation of meetings-exchanges; advocacy for UNFCCC		10 000			10 000	10 000

Legal and institutional reforms/measures: Support to establish an enabling legal and institutional environment for SAP implementation							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
R-07. Revision of water regulations to take into account emerging principles and values (IWRM, polluter-payer principle, recognizing water's economic value, guaranteeing environmental flows, equitable distribution, public participation)	R-07-01. Revision and reform; political dialogue; consultation facilitation		60 000			60 000	
	R-07-01. Development and implementation of regulations; political dialogue; consultation facilitation		60 000			60 000	
	Total: R-07						120 000
R-08. Revision and implementation of environment and forest regulations (to create incentives for environmental protection, tree planting, etc.)	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		60 000			60 000	60 000
R-09. Revision and implementation of land-tenure regulations to create incentives for sustainable investments for land valorization (land-tenure security)	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		60 000			60 000	60 000
R-10. Revision, harmonization and strengthening of safety systems in mining regulations for the basin countries	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		60 000			60 000	60 000
R-11. Revision, harmonization and strengthening of conservation systems for wildlife biodiversity in hunting regulations	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		60 000			60 000	60 000

Legal and institutional reforms/measures: Support to establish an enabling legal and institutional environment for SAP implementation							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
R-12. Update and harmonize regulations on herding and livestock farming	Political dialogue with the states; facilitation of meetings-exchanges; advocacy		60 000			60 000	60 000
R-13. Harmonize the principles and practices of environmental impact studies in the basin countries and align them with international standards	R-13-01. Establish a baseline for regulating impact studies in the basin countries		80 000			80 000	
	R-13-02. Organize information seminars on international standards and practices		50 000			50 000	
	R-13-03. Lead dialogue on policy with the Ministries of Environment of the concerned countries		10 000			10 000	
	R-13-04. Implementation of reforms for procedures for environmental impact studies		60 000			60 000	
	R-13-05. Training for professionals in the Ministries of Environment and the OMVS in preparing ToRs and invitations to tender for environmental impact studies		70 000			70 000	
	R-13-06. Training seminars for professionals (consultants and scientists) on conducting environmental impact studies		50 000			50 000	
	Total R. 13						320 000
R-14. Strengthen capacities of local collectivities in the basin to implement skills that have been transferred to them in the area of natural resources management and environment protection	Training for elected officials and community agents; Training for state decentralized services		10 000			10 000	10 000

Legal and institutional reforms/measures: Support to establish an enabling legal and institutional environment for SAP implementation							
Measures	Activities	Short-, medium- and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
R-15. Pursue efforts to disseminate/extend the Charter	Develop communication materials; diffuse information on the Charter; organization of information and awareness-raising sessions/campaigns	450 000				450 000	450 000
R-16. Operationalization of the Charter and, in particular, the provisions on protecting and preserving the environment (Article 4 of the Charter)	R-16-01. Operationalization of the Charter provisions on inter-state coordination in response to extreme climate events		100 000			100 000	
	R-16-02. Operationalization of the Charter provisions on inter-state coordination in preventing and combating invasive aquatic species		100 000			100 000	
	R-16-03. Operationalization of provisions on preserving water quality and combating pollution, including implementation of the polluter-payer principle		150 000			150 000	
	Total R. 16						350 000
Total for Support for reforms		450 000	1 415 000	0	0		1 865 000

Annex 2. 8. Budget: Strengthening capacities of the OMVS and stakeholders

Measures/Strengthening capacities of the OMVS and basin stakeholders							
Measures	Activities	Short, medium and long-term goal				Total per activity	Total per measure
		Short term		Medium term	Long Term		
		Urgent (Immediate)	0-5 years	6-10 years	11-20 years		
C-01. Support the operationalization and coordination unit for the SAP process	<ul style="list-style-type: none"> - Staff - Equipment - Consultant support - Miscellaneous 	750 000				750 000	
C-02. Capitalization of relevant experiences	<ul style="list-style-type: none"> - Capitalization of Dutch co-financing for GEF-BFS Project - Capitalization of micro-grants 	70 000				70 000	
C-03. Strengthen the context of participation by civil society	Training for NGO, GIE, etc. agents		750 000			750 000	
C-04. Support for national coordination and consultation platforms (NCCs and LCCs)	<ul style="list-style-type: none"> - Staff - Equipment - Miscellaneous 		1 000 000			1 000 000	
C-05. Consolidation of the process to involve the scientific community	<ul style="list-style-type: none"> - Experiment sites - Action research 		300 000			300 000	
C-06. Support to set up the Basin Committee	- Support for Basin Committee operations		400 000			400 000	
C-07. Training for stakeholders in effective SAP implementation	<ul style="list-style-type: none"> - Training in project planning and design management - Training in funding mobilization - Training in project management/ implementation 		500 000			500 000	
Total for Measures to strengthen OMVS and stakeholder capacities		820 000	2 950 000	0	0		3 770 000

Annex 3. Summary description of the portfolio of priority measures

LTEQO 1 - Measure 1: Develop alternative energy sources (I-M01)	
Context and Justification	<p>The basin communities (and those from riparian countries in general) depend highly on the use of wood to respond to their energy needs. With rising urbanization and runaway demographic growth, these needs have continued to grow in recent years. This results in intensive use of ligneous products to produce firewood and wood charcoal for local consumption, but especially to supply cities. In Guinea and Mali, the most forested countries in the basin, the demand for wood energy (firewood and wood charcoal) accounts for 80% of national energy consumption for these countries. In Mauritania and Senegal, wood energy covers 28% and 67%, respectively, of their national energy consumption.</p> <p>Therefore, it appears urgent that alternative energy sources are found to save the basin's remaining woody vegetation and forests. A wide variety of alternative energy sources are accessible in the basin and include, butane gas, solar energy and some forms of bio-energy, particularly those from invasive plant species such as <i>Typha</i>, bagasse (sugar cane) and rice straw. At the same time, opportunities exist to promote energy-saving techniques that have not been sufficiently used.</p>
Specific objective	Combat deforestation through reducing the Senegal River Basin countries' dependence on wood for energy.
Activities	<ul style="list-style-type: none"> • IEC activities on alternative energy sources • Promotion of the use of improved cookstoves • Promotion of the use of solar energy • Promotion of the use of gas stoves • Promotion of the use of biofuels/Development of bricks made of rice straw or <i>Typha</i> • Promotion of the use of wind energy • Professional training in building improved cookstoves; production of charcoal from <i>Typha</i> and rice straw; installation and maintenance of solar panels and wind energy units.
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kénieba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<p>States (Ministries and National Directorates in charge of environment and/or water resources)</p> <p>Public or private energy-production companies (gas, in particular)</p> <p>Research structures (on solar energy and other sources of alternative energy)</p> <p>Technical and financial partners</p> <p>Territorial collectivity</p> <p>NGOs</p> <p>Civil society</p>
Time period for implementation	10 years
Budget	10,200,000 euros

LTEQO 1 - Measure 2: Awareness raising, education and information on land degradation and desertification (I-M02)

Context and Justification	The current land degradation process is largely a result of poorly adapted practices and uses of resources. These practices are often longstanding and/or incur minimal immediate costs for households. This is the case of itinerant agriculture and/or bush fires used to address the problem of soil fertility. Resorting to practices that will protect land and preserve it for future generations has a cost. Communities only agree to pay this cost once they are fully aware of the impacts they cause and convinced that economically viable alternatives exist. Hence, education and awareness raising are key to combating poor management of natural resources, including practices that cause land degradation.
Specific objective	Raise the level of information among communities on the causes and consequences of land degradation and promote appropriate production systems and techniques.
Activities	<ul style="list-style-type: none"> • IEC on degradation targeting: (a) local collectivities; and (b) community-based organizations (village, women's and producers' associations)/Radio/TV awareness-raising campaigns • Development of materials to teach and promote environmental education in schools and literacy centers, focused on land degradation and corrective measures • Identification and promotion of practices to combat desertification and land degradation
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kéniéba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<p>State (Ministries and technical services in charge of agriculture, water and forests and the environment)</p> <p>Rural and community radio</p> <p>NGOs</p> <p>Local collectivities</p> <p>Civil society</p> <p>Technical and financial partners</p>
Time period for implementation	5 years
Budget	1,000,000 euros

LTEQO 1 - Measure 3: Development and application of an action program for the restoration and protection of riverbanks and headwaters (I-M03)

Context and Justification	<p>Degradation of riverbanks and headwaters affects the river's overall hydro-dynamics and to some extent, water quality.</p> <p>The sources of the Senegal River (the Bafing, the Bakoye and the Falémé) in the Fouta Djallon plateau sometimes endure an advanced state of degradation yet remain under-studied. Overuse of the shoals and riverbanks in the upper basin and the significant increase in livestock, the expansion of clay brick (banco) production, etc. are all factors that obstruct the sources and erode and accelerate the filling-up of many small waterways that usually converge toward the Bafing, the Bakoye and the Falémé. Exploitation and long-term management of the Senegal River depends on restoration and/or protection of the sources and streams in the upper basin. The Fouta Djallon Integrated Management Program (funded by the GEF and currently implemented by UNEP and FAO) has taken this need into consideration. The SAP measure presented here complements this important initiative. Concerning degradation downstream of the riverbanks, the most affected locations are in the reach between Bafoulabé (Bafing-Bakoye confluence) and the confluence between the Karakoro and the Senegal River, just downstream of Ambidedi. Riverbank instability in this river reach resulted in the destruction of housing and social and economic amenities. Through the PGIRE and the Dutch co-financing of the GEF, the OMVS is spending significant funds on finding a solution. Given the extent of the problem, this measure contributes to those efforts and will complement other initiatives that are in progress or planned aimed at stabilizing riverbanks and protecting populations, and their property, threatened by this process.</p>
Specific objective	Restore, protect and/or promote sustainable management of headwaters in the Guinean part of the basin and of riverbanks subjected to or threatened by erosion downstream from Manantali.
Activities	<ul style="list-style-type: none"> • Determining exhaustive baselines for riverbank and headwaters degradation and its causes • Identification of vulnerable areas and creating a plan defining zoning and land-use of riverbanks and headwaters • Selection of target sites to restore (to complement the PGIRE and GEF co-financing) • Interventions in combating erosion and gullyng; riverbank fixation • Monitoring system using methods combining satellite images and soil surveys • Development and implementation of a management plan (restoration and sustainable land management) for the most degraded headwaters – Building stone bunds, stone lines, live hedges, etc.
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kéniéba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p>And to some extent: <u>Mauritania</u> (Maghama, Kaedi); <u>Senegal</u> (Bakel, Matam).</p>
Concerned actors	<p>States (Ministries and technical services in charge of resources management, environment and forests)</p> <p>Local collectivities</p> <p>Technical and financial partners</p> <p>PGIRE Program, Dutch co-financing for GER-BFS; Fouta Djallon Massif Integrated Management Program (GEF)</p>
Time period for implementation	10 years
Budget	12,350,000 euros

LTEQO 1 - Measure 4: Prevention and management of bush fires (I-M04)

Context and Justification	<p>Bush fires affect the entire basin but they occur most frequently in the wooded regions of the upper basin and particularly in the Fouta Djallon Massif. The environmental consequences of bush fires include soil degradation, wind and water erosion (causing headwaters degradation) and loss of biodiversity habitat for fauna and flora.</p> <p>The approach used for this measure is to provide communities on the ground (who are often the first victims) and the states (who often solely pay the price for controlling fires) the means and the capacities necessary to ensure a local police force, in other words to, to prevent and sanction resorting to bush fires and to control them when they occur.</p>
Specific objective	Increase local and national capacities in bush fire prevention and management.
Activities	<ul style="list-style-type: none"> • IEC/campaigns on the consequences of bush fires • Construction of a fire break • Exchange inter-state experiences • Early-warning and prevention system (vigilance committee)
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kéniéba, Bafoulabé</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Kanel, Dagana, Podor, Louga</p>
Concerned actors	<p>State (Ministry responsible for the environment and natural resources)</p> <p>Decentralized technical services (Water and Forests, Agriculture, etc.)</p> <p>Local communities and village associations</p> <p>NGOs and civil society</p>
Time period for implementation	10 years
Budget	3,900,000 euros including 1,400,000 the first 5 years

LTEQO 1 - Measure 5: Promotion of agro-pastoral practices (I-M05)

Context and Justification	The river basin, especially in the Sahelian part, is an area of high concentration. With water scarcity in the dry season, herds tend to concentrate along the river and its tributaries. Overgrazing, intense soil compaction by livestock and tree pruning by herders to provide food supplements to their animals significantly contribute to soil erosion and land degradation. The need for space for livestock leads to frequent conflicts between herders and farmers. Pastoralism must be re-invented in the Senegal River Basin. The process will be slow; however, the SAP provides an opportunity to experiment (or more precisely, to re-experiment) using alternative approaches and practices.
Specific objective	Promote alternative livestock approaches and practices that decrease overgrazing in the Senegal River Basin.
Activities	<ul style="list-style-type: none"> • Promotion of fodder crops (for demonstration) • Promotion of agro-sylvo-pastoral integration in selected demonstration sites (one per country)
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>:</p> <p><u>Mauritania</u>: Aleg, Rosso, Kaédi, Boghe</p> <p><u>Senegal</u>:</p>
Concerned actors	<p>State</p> <p>Territorial collectivity</p> <p>Communities</p> <p>Chamber of Agriculture</p> <p>NGOs</p> <p>Technical and financial partners</p>
Time period for implementation	5 years
Budget	900,000 euros

LTEQO 1 - Measure 6: Implementation of an enabling legal environment for sustainable use of water and land resources (I-M06)

Context and Justification	The legal statutes on land, the level of security for holders of farmland and modalities for land-tenure transactions play a determining role in actors' behaviors vis-à-vis land. Lack of land-tenure security is commonly considered to be one of the main causes of poor land management and the low level of investment in land valorization (use of land conservation techniques). Through agro-land-tenure reforms, each basin country has recently tried to resolve this need to secure land tenure, while being careful to avoid creating serious inequalities regarding land tenure that could arise from generalized private ownership of land. Nevertheless, the agro-land-tenure reforms have had little effect on the ground with poor results in weakening customary procedures for land-tenure management. Consequently, the prevailing reality on the ground is the lack of a reference land-tenure plan and the resulting chaotic situation regarding access, control and land-tenure transactions. In this context, those using the land cannot find sufficient motivation to protect and improve the long-term productivity of the land domains they exploit. Local land-tenure agreements are promissory notes that set up the necessary conditions for land-tenure security while reconciling modern land-tenure law and customary law. Within the framework of the SAP, similar initiatives will be encouraged in various biophysical and socio-cultural contexts in the basin. In addition, lessons from the experience will be documented and shared with actors from the basin states with the hope that they will be considered to improve the legal context that governs land in the basin countries.
Specific objective	Encourage implementation of adapted formulas for land management that can generate lessons to improve the legislative framework for land management in the basin.
Activities	<ul style="list-style-type: none"> • Initiate basin-wide participatory in-depth reflection on the suitability of existing national land-tenure laws to guarantee sustainable land use • Experimentation on local land-tenure agreements to promote investment in activities for conservation, protection and sustainable improvement of land productivity • Document and share lessons learned
Intervention sites	(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.) <u>Guinea</u> : Bafing-Source, Bafing-Downstream, Falémé, Bakoye <u>Mali</u> : Kéniéba, Yélimané, Kayes, Kita, Banamba, Bafoulabé <u>Mauritania</u> : Aleg, Rosso, Kaédi, Boghe <u>Senegal</u> : Bakel, Kanel, Dagana, Podor, Louga
Concerned actors	States (Ministry in charge of the environment and natural resources; government structures in charge of implementing land-tenure reform) Technical services for water and forests and for the environment NGOs Technical and financial partners Civil society
Time period for implementation	5 years
Budget	300,000 euros

LTEQO 1 - Measure 7: Identification and restoration of land that has undergone the most exposure to erosion, siltation and desertification (I-M07)

Context and Justification	The Sahelian countries of the basin (Mali, Mauritania and Senegal) each have their own strategies, action plans and sometimes master plans (case of Mauritania) to combat desertification. The SAP will accompany these efforts by emphasizing measures to combat desertification that clearly pose a transboundary issue. Therefore, the SAP will promote efforts to combat sand invasion to preserve the basin's productive potential (for example, irrigated areas or flood lands affected or threatened by sand invasion); combating siltation that affects or threatens some places in the riverbed and the river's tributaries or distributaries; dune fixation when its spread can affect the basins productive potential; and protection of the basin's aquatic ecosystems affected or threaten by siltation.
Specific objective	Restore and preserve the basin's ecosystems and productive potential affected or threatened by desertification and particularly erosion, siltation and sand invasion.
Activities	<ul style="list-style-type: none"> • Analysis and mapping of soil according to its degree of exposure and susceptibility to erosion and identification of restoration sites • Lead desiltation activities in target sites (irrigated and flood recession farmland, oases, transportation routes) • Initiation of sand dune fixation to combat desert encroachment
Intervention sites	<u>Mauritania</u> : All LCCs <u>Senegal</u> : Saint Louis, Louga, Dagana, Podor, Matam, Bakel <u>Mali</u> : Kayes
Concerned actors	National development companies (SONADER, SAED) Ministries in charge of the environment and/or forests Decentralized collectivities Basin community organizations (producers', women's and young people's associations) NGOs
Time period for implementation	10 years
Budget	9,300,000 euros including 4,300,000 the first 5 years

LTEQO 2 -Measure 1: Awareness raising/education/information on water quality (II-M01)

Context and Justification	<p>Water quality degradation takes on diverse forms, occurring through various processes. Natural causes include those linked to changes in climate and water conditions in general (decreased water availability and change in river hydro-dynamics). However, in many cases, changes in water quality stem from human activities (agriculture, mining, household-waste disposal, etc.). However, the available information on the specific characteristics of water quality in the basin (for surface and groundwater) and specifically on the forms and processes of pollution in the river basin is insufficient.</p> <p>Given the high costs of a control approach with no assurance of sustainable results, the SAP will focus on environmental awareness raising and education. In fact, it appears that the underlying factor to human activities that pollute water quality is a lack of education in health, hygiene and the use of phytosanitary products. In many cases, lack of knowledge accounts for the behaviors that cause degradation of water resources. In these conditions, education, information and awareness raising can provide the means to promote behaviors that show greater respect for the environment and water quality.</p>
Specific objective	Improve actors' knowledge about pollutants and their risks by organizing education and awareness-raising campaigns for the public.
Activities	<ul style="list-style-type: none"> • Develop communication tools focused on the causes and prevention of pollution and on the Water Charter • Develop partnerships with local radio • Organize campaigns with mass media: radio shows (including rural/community radio), newspaper messages, etc. • Raise awareness among users on the risks of pollution • Raise awareness among users of pesticides and other polluting products (mines, artisans, industries) • Conduct IEC on the harm caused by pesticides • Conduct IEC on the use of pesticides and fertilizers • Train community relays to diffuse messages about pollution • Organize information sessions for industrialists and farmers on the impacts of pollution and prevention measures • Train elected officials and resource persons • Develop an information, education and communication plan
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kénieba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<p>States (Ministries and National Directorates in charge of environment and/or water resources)</p> <p>Regional development companies (PDIAM-Mali, SONADER-Mauritania, SAED-Senegal)</p> <p>Decentralized collectivities</p> <p>Community-based organizations</p> <p>Industrial and agro-industrial units (Sabadola gold mines-Mali, CSS-Senegal, etc.)</p> <p>National and international NGOs: GRDR-Mali, etc.</p> <p>Civil Society: CODESEN</p>
Time period for implementation	10 years
Budget	960,000 euros

LTEQO 2 – Measure 2: Water quality control (II-M02)

Context and Justification	The lack of laboratories and qualified staff and insufficient rigorous and coordinated monitoring/control of water quality in the river are among the main barriers to water quality management in the Senegal River Basin. Unregulated importation of chemical products (fertilizers, fungicides, herbicides, etc.) by basin countries is another problem since use of these products is a primary cause of water pollution. All of the National Contribution to the SAP reports have pointed out that the problem not only stems from lack of regulation but more specifically from disregard for laws, lack of quality standards and harmonized laws and regulations regarding water and non-enforcement of regulations on water pollution. Added to this is the lack of knowledge among many rural individuals about the damage caused by chemical products, no matter how necessary they are to agricultural development. Supervision of producers reveals insufficiencies in this area. In most of the human settlements in the Senegal River valley, the river supplies domestic water needs. The quality of this water is often suspected to be the cause of many health problems for both humans and livestock. The damage caused by these products to wildlife, vegetation and even communities is not fully understood. The situation in the cotton area demonstrates the adverse effects from the misuse of pesticides. Periodically, massive fish mortalities, assumed to be linked to accidental pollution from pesticides, are witnessed. Given these conditions, control and monitoring of water quality is a priority in water management strategies.
Specific objective	<i>Ensure better water quality control.</i>
Activities	<ul style="list-style-type: none"> • Implement an annual program to monitor water quality • Conduct targeted thematic studies • Ensure qualitative control of industrial waste • Strengthen capacities of structures for water-quality monitoring • Strengthen capacities of sanitation structures • Set up village surveillance committees • Develop tools for improved application of legislation on the marketing and use of fertilizers and pesticides • Establish baselines for basin water quality (surface and groundwater, upstream and downstream) • Define water quality standards • Institute a system for specifications/preserving water quality for large-scale use (agro-industry, mining and the National Companies SAES, SONADER, etc.) • Establish a limnology unit for the Diama reservoir • Promote collaborative agreements with decentralized collectivities in urban and rural settings for the implementation of laws related to water quality
Intervention sites	<u>Guinea</u> : Bafing-Source, Bafing-Downstream, Falémé, Bakoye <u>Mali</u> : Kayes, Kéniéba, Kolokani, Banamba, Kita, Bafoulabé and Koulikoro <u>Mauritania</u> : Aleg, Keur Macène, Rosso, Kaédi, Sélibabi, Maghama, Boghe <u>Senegal</u> : Saint Louis, Matam, Kanel, Podor
Concerned actors	States (Ministries and National Directorates in charge of environment and/or water resources) Decentralized collectivities Industrial and agro-industrial units (gold mines of Sadiola-Mali, CSS-Senegal, etc.) National and international NGOs: GRDR-Mali, community-based organizations, etc. Civil society: CODESEN
Time period for implementation	5 to 10 years
Budget	3,100,000 euros including 900,000 the first 5 years

LTEQO 2 - Measure 3: Promotion of innovative approaches to water management (II-M03)

Justification	<p>Although substantial volumes of groundwater are available for use, difficulties in accessing this water supply remain in areas that are rarely flooded. Insufficient water points for livestock is one explanation for the high concentration of herds along the river during most of the long dry season, causing overgrazing, soil and riverbank erosion, conflicts between farmers and herders, etc.</p> <p>Also, in order to optimize electricity production, regulation of the floodgates of the Manantali dam can maintain flow levels that will not submerge the flood plain. One of the consequences is a sharp decline in flood-recession farming that provides food crops and has played—and continues to play—a vital role in domestic economies of the middle valley. In these conditions, it is essential to implement a strategy that optimizes water resources management for the benefit of various users.</p>
Specific objective	Promote innovative approaches to water management that alleviate poverty while protecting the environment.
Activities	<ul style="list-style-type: none"> • Strengthen investments in pastoral water supply in the river basin to alleviate pressure from livestock along the riverbanks and tributaries • Inventory and mapping of potential sites for hill reservoirs and other water bodies • Management of ponds and water points for livestock (to limit the concentration of livestock on riverbanks) • Promotion of collection and conservation techniques for rainwater (retention ponds, etc.) • Managing targeted troughs/shoals to demonstrate an ecosystem approach to wetlands management • Identification of and stocking fish in ponds for fish farming • Studies on the mechanism for groundwater recharge and its relationship to surface water
Intervention sites	<p><u>Mali</u>: Kayes, Kéniéba, Kolokani, Banamba, Kita, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibabi, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Kanel, Podor</p>
Concerned actors	<p>States (Ministries and National Directorates in charge of environment and/or water resources)</p> <p>Regional development companies (PDIAM-Mali, SONADER-Mauritania, SAED-Senegal)</p> <p>Decentralized collectivities</p> <p>National and international NGOs: GRDR-Mali, community-based organizations, etc.</p> <p>Development partners</p> <p>Civil society: CODESEN</p>
Time period for implementation	<i>10 years</i>
Budget	<i>16,270,000 euros including 6,120,000 the first 5 years</i>

LTEQO 3 - Measure 1: Health education and awareness raising on the causes of waterborne diseases (III-M01)

Context and Justification	<p>Following modification of the river regime, the prevalence of some waterborne diseases rose dramatically. One factor in the current propagation of diseases is linked to cultural beliefs and considerations that could block efforts aimed at promoting behaviors that reduce risk. In effect, the prevailing mentality among populations living in the intervention area encourages activity and direct contact with water from the river or streams and holds such cultural importance that it will be very difficult to prevent.</p> <p>Increasing knowledge about the factors causing these diseases and good understanding of how humans contract them can promote behaviors that reduce risk and thus contribute to reducing the prevalence of these diseases. Awareness raising and training on the causes and consequences waterborne diseases, as well as the means to prevent them, will reduce the number of persons who are affected.</p>
Specific objective	Improve knowledge among communities about the causes and prevention tactics for waterborne diseases.
Activities	<ul style="list-style-type: none"> • Strengthen human, material and technical capacities of structures involved in raising community awareness • Organization of education, awareness-raising and information campaigns • Awareness-raising programs on water potabilization for domestic use • Development of an information and communication plan (including local radio) • Create didactic supports for health education in schools • Strengthen actors' capacities in information, education and communication • Health education and awareness raising on the causes of waterborne diseases • Strengthen information and communication actions for behavior change in the use of river water • IEC to learn about these diseases and behaviors to adopt to protect oneself from them • Awareness raising on the potabilization of water for domestic use
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea:</u> <i>Bafing-Source, Bafing-Downstream, Falémé, Bakoye</i></p> <p><u>Mali:</u> Kayes, Yélimané, Kéniéba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania:</u> Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal:</u> Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<ul style="list-style-type: none"> • States (Ministries and National Directorates in charge of health, education and/or water resources) • Decentralized collectivities • River basin communities • National and international NGOs (GRDR-Mali, community-based organizations, etc.) • Development partners • Civil society: CODESEN
Time period for implementation	5 years
Budget	1,350,000 euros

LTEQO 3 - Measure 2: Epidemiological monitoring (III-M02)

Context and Justification	A good strategy to combat waterborne diseases requires appropriate decision-making tools. Among these tools, one of the most important is a reliable database that provides information on trends and locations with high prevalence rates. Setting up a transboundary mechanism for epidemiological monitoring in the Senegal River Basin responds to this concern. It also makes it possible to measure the monitoring indicator for LTEQO 3, i.e. the prevalence rate for waterborne diseases such as malaria, bilharzia and diarrhea.
Specific objective	Provide a reliable transboundary mechanism to monitor the prevalence of waterborne diseases in the Senegal River Basin.
Activities	<ul style="list-style-type: none"> • Strengthen capacities of health structures with human resources qualified to diagnose the diseases • Equip health centers and posts with the necessary testing supplies • Lead training sessions on conducting surveys and epidemiological analyses • Conduct periodic epidemiological surveys • Develop transboundary collaboration between the basin's health professionals in epidemiological monitoring • Strengthen means for the monitoring-evaluation of actions
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kéniéba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<ul style="list-style-type: none"> • States (Ministries and National Directorates in charge of health) • Healthcare schools • Decentralized collectivities • National and international NGOs: GRDR-Mali, community-based organizations, etc. • Development partners: UNICEF-WCARO, WARN, WHO
Time period for implementation	10 years
Budget	4,250,000 euros including 1,600,000 the first 5 years

LTEQO 3 - Measure 3: Combat disease vectors (III-M03)

Context and Justification	<p>Since the dams have been in operation, the Senegal River Basin's most fertile land has been increasingly colonized by invasive plants that foster the development of mosquitoes and other disease vectors (bilharzia and malaria). This situation has resulted in an increased prevalence of these diseases, which has become a serious threat to the communities' socio-economic activities.</p> <p>Due to this, controlling disease vectors is a very important means of prevention in combating transmissible diseases such as malaria or bilharzia. Dealing directly with the vector (or the immediate host) can break the chain of disease transmission and therefore protect people from exposure.</p>
Specific objective	Reduce the proliferation of waterborne disease vectors (human and animal).
Activities	<ul style="list-style-type: none"> • Identification and mapping of infected areas • Treatment of stagnant wastewater and rainwater • Chemical control, disinfection (pre-rainy-season dusting, etc.) • Lead activities for human investments by CBOs (destruction of breeding sites) • Biological control in larvae sites • Set up an integrated control system • Intensified larva treatment in infected areas • Intensified control of invasive aquatic plants and river-water pollution
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kéniéba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<ul style="list-style-type: none"> • States (Ministries and National Directorates in charge of health, environment and/or water resources) • Regional development companies (PDIAM-Mali, SONADER-Mauritania, SAED-Senegal) • Decentralized collectivities • National and international NGOs: GRDR-Mali, community-based organizations, etc. • Development partners • Civil society: CODESEN
Time period for implementation	10 years
Budget	3,300,000 euros including 2,000,000 the first 5 years

LTEQO 3 - Measure 4: Improve access to drinking water (III-M04)

Context and Justification	<p>Consumption of contaminated and unsanitary water is a primary cause of gastroenteritis. Therefore, building and/or improving infrastructure for access to drinking water will control many waterborne diseases. The relevance of this measure lies in the fact that it places distance between communities and infected water from the river. This measure contributes to diarrheal-disease prevention and breaks the chain of transmission of bilharzia, a particularly troubling disease in the delta.</p> <p>Over recent years, the riparian states have made massive investments in infrastructure to improve access to drinking water and sanitation, within the framework of their efforts to achieve the Millennium Development Goals (MDGs). The SAP will support these efforts.</p>
Specific objective	Reduce human/disease vector contacts through a suitable DWS system.
Activities	<p>Planned activities for the entire basin are as follows:</p> <ul style="list-style-type: none"> • Inventory available resources and for DWS • Inventory water needs • Set up a water adduction system: network, standpipes, service pipes • Build and/or restore boreholes, large-diameter wells and pumping systems • Build a borehole in villages and hamlets • Repair/maintain defective pumps
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kéniéba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<ul style="list-style-type: none"> • States (Ministries and National Directorates in charge of health, environment and/or water resources) • Decentralized collectivities • National and international NGOs: GRDR-Mali, community-based organizations, etc. • Development partners • Civil society: CODESEN
Time period for implementation	10 years
Budget	2,550,000 euros including 1,050,000 the first five years

LTEQO 3 - Measure 5: Reduce water pollution caused by household garbage and domestic waste (III-M05)

Context and Justification	Irrigation agriculture is not the sole cause of degraded water quality in the river. For most communities living along the river (cities as well as villages), the river, despite being the main source for household water consumption, is used as a dump for household and municipal waste. Many reports from LCC discussions reveal insufficiencies in septic tanks and latrines, pushing communities to use natural sites along the river. In riparian villages and cities, natural outlets are often blocked by solid waste. The increased pollution in the river water has serious impacts on the health of riparian communities. Through sanitation infrastructure and pilot experiments to treat municipal waste, the SAP will work to protect river water from pollution caused by household and municipal waste.
Specific objective	Develop autonomous capacities for the collection and treatment of domestic wastewater and urban to reduce pollution of river water.
Activities	<ul style="list-style-type: none"> • Collection and treatment of household garbage in pilot sites (one in each country) • Overhaul and extension of adapted disposal systems and wastewater treatment (one pilot site in each country as a demonstration) • Development of pilot experiments in the diffusion of the ECOSAN ecological sanitation method (in collaboration with CREPA) • Ensure waste management • Build road networks • Build public and private latrines
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: 1 location</p> <p><u>Mali</u>: 1 location</p> <p><u>Mauritania</u>: 1 location</p> <p><u>Senegal</u>: 1 location</p>
Concerned actors	<ul style="list-style-type: none"> • States (Ministries and National Directorates in charge of health, social prevention, environment and/or water resources) • Decentralized collectivities: municipalities and rural communes to be chosen along the river • National and international NGOs: community-based organizations, etc. • Development partners: UNICEF, UN HABITAT • Civil society: CODESEN
Time period for implementation	10 years
Budget	19,500,000 euros including 17,000,000 the first 5 years

LTEQO 4 - Measure 1: Integrated program to combat *Typha australis* (IV-M01)

Context and Justification	Over recent years, <i>Typha australis</i> has suddenly spread to the point of becoming the most serious environmental, and possibly economic, challenge in the Senegal River Basin, and particularly in the river's middle and lower valley today. Fully aware of the critical nature of this phenomenon, the OMVS and the basin countries have deployed significant efforts to resolve this problem. However, despite their high costs, the means mobilized up to now have had no significant effect on <i>Typha australis</i> , which is spreading at a steady rate. Thus far, meager results have argued in favor of large-scale, ongoing and coordinated action. Interventions planned in the PGIRE and the co-financing must be supplemented by similar initiatives from the basin countries. The SAP also plans to contribute to these efforts by targeting specific areas of the basin and encouraging sharing of experiences with other river basins facing the same problem.
Specific objective	Contribute to controlling <i>Typha</i> proliferation through targeted interventions and sharing experiences with other river basins facing the same problem.
Activities	<ul style="list-style-type: none"> • Update baselines for spatial distribution and evolution of invasive plants • Mechanical (channel clearing, weed cutting, artisan/traditional control-manual cutting) and/or biological control • Organize workshops to pool experiences • Information, training and awareness raising on invasive species
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea:</u></p> <p><u>Mali:</u></p> <p><u>Mauritania:</u> Aleg, Keur Macène, Rosso, Kaédi, Sélibaby, Maghama, Boghe</p> <p><u>Senegal:</u> Saint Louis, Dagana, Podor, Louga</p>
Concerned actors	<p>State</p> <p>Decentralized services</p> <p>OMVS</p> <p>NGOs</p> <p>Communities</p> <p>Technical and financial partners</p>
Time period for implementation	10 years
Budget	50,700,000 euros including 30,700,000 the first 5 years

LTEQO 4 - Measure 2: Implement a monitoring and early-warning system (IV-M02)

Context and Justification	The accidental introduction of <i>Salvinia molesta</i> to the Senegal River delta in the late 1990s demonstrates the importance of a surveillance system to prevent the introduction of invasive non-native species and to slow the rapid spreading of native species as early as possible, as was the case for <i>Typha</i> . The incursion of water hyacinth, perhaps one of the most devastating invasive plants, from waterways in the sub-region such as the Niger River and Lake Chad justifies the need for redoubled vigilance in the Senegal Basin, which has been spared by this plague until now.
Specific objective	Increase capacity for the prevention of invasive plants and rapid response to contain the risks of proliferation of potentially harmful species.
Activities	<ul style="list-style-type: none"> • Create monitoring and early-warning committees – Set up a surveillance and species identification team • Create a communication circuit • Organize forums at regular intervals – Provide training in invasive plants • Identify and raise awareness for all stakeholders
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>:</p> <p><u>Mali</u>: Kayes, Yélimané, Kénieba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaby, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Dagana, Podor, Louga</p>
Concerned actors	<p>State</p> <p>Decentralized Services: Water and Forests, the Environment</p> <p>OMVS</p> <p>NGOs</p> <p>Communities</p> <p>Technical and financial partners</p>
Time period for implementation	5 years
Budget	375,000 euros

LTEQO 4 - Measure 3: Economic valorization of invasive plants (IV-M03)

Context and Justification	Several arguments endorse the promotion of economic valorization of invasive plants, without disregarding any effort to control and even eradicate some species. Firstly, current solutions for control have had little effect, meaning that much greater means must be mobilized if tangible results are expected in the face of phenomena such as <i>Typha</i> proliferation. Using these invasive species as a raw material for an economic activity contributes to efforts to control their proliferation. Next, some invasive species are probably here to stay and consequently constitute an abundant raw material that is almost guaranteed to potential investors for many years. A third reason is that their valorization can take on forms that offer an alternative to overuse of the basin's natural resources. For example, energy production (charcoal made from <i>Typha</i>) can alleviate the use of wood for energy, and therefore, deforestation.
Specific objective	<i>Promote the economic valorization of invasive plants as a means to control the proliferation of these plants, as a substitute to overuse of the basin's natural resources and a means to eradicate poverty.</i>
Activities	<ul style="list-style-type: none"> • IEC on the economic potential of invasive plants • Development of artisan and modern techniques • Support setting up networks to market products from invasive plants
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>:</p> <p><u>Mali</u>:</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaby, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Dagana, Podor, Louga</p>
Concerned actors	<p>State</p> <p>NGOs</p> <p>Communities</p> <p>Technical and financial partners</p>
Time period for implementation	10 years
Budget	5,200,000 euros including 2,200,000 the first 5 years

LTEQO 5 - Measure 1: Strengthen capacities/environmental education (V-M01)

Context and Justification	Biological diversity is a resource and an inheritance that is often misunderstood and/or neglected. The same is true for ecosystems—notably aquatic—from the perspective of their ecological functions; their cultural value and socio-economic benefits are generally underestimated. Through information, education and awareness raising for actors, aimed primarily at local communities and political decision makers, it is anticipated that the safety of biodiversity and protection of natural habitats (wetlands, in particular) will become a shared responsibility of the collectivity.
Specific objective	Through education and awareness raising, make protection of biodiversity and natural habitats a shared responsibility between the collectivity and policy decision makers.
Activities	Strengthening human, material and technical capacities of concerned structures Information, awareness raising and education for communities and political and administrative officials Organization of study trips for local collectivities Broadcasting radio and television shows about the basin's biological diversity Introduction of environmental education in the schools Literacy training focused on environmental issues for communities.
Intervention sites	(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.) <u>Guinea</u> : Bafing-Source, Bafing-Downstream, Falémé, Bakoye <u>Mali</u> : Kayes, Yélimané, Kéniéba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro <u>Mauritania</u> : Aleg, Keur Macène, Rosso, Kaédi, Sélibaby, Maghama, Boghe <u>Senegal</u> : Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga
Concerned actors	State NGOs Territorial collectivities Communities Technical and financial partners
Time period for implementation	5 years
Budget	950,000 euros

LTEQO 5 - Measure 2: Establish biodiversity baselines (V-M02)

Context and Justification	Studies conducted on the basin environment's baseline (OMVS- Observatoire de l'Environnement, 2003) and the recent Environmental Transboundary Diagnostic Analysis (TDA) of the Senegal River Basin have revealed a serious information gap regarding the basin's current biodiversity and the status of natural habitats. To bridge this gap, complete inventories should be conducted that are as rigorous as possible to know the current status of biodiversity in the basin (native and threatened species) and identify sensitive biodiversity areas that must undergo urgent restoration and protection. The freshwater biodiversity assessment conducted recently by the IUCN in East and West Africa could provide a methodology for a study focused on the Senegal River Basin.
Specific objective	Conduct a complete diagnostic of the biodiversity status in the Senegal River Basin to serve as a foundation for targeted actions to restore and protect natural habitats.
Activities	<ul style="list-style-type: none"> • Conduct baseline study and freshwater biodiversity assessment • Identify biodiversity hotspots
Intervention sites	(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.) Basin-wide
Concerned actors	State OMVS Environmental NGOs: IUCN, Wetlands International, WWF Technical and financial partners
Time period for implementation	5 years
Budget	275,000 euros

LTEQO 5 - Measure 3: Reduce fishing pressure (V-M03)

Context and Justification	During the 1970s, close to 10,000 basin inhabitants earned the bulk of their income from fishing in the river and its tributaries. Over recent years this activity has seen profound disruptions. Chronic water deficits have resulted in shortages and decreases in the flood level, which has a negative impact on fish reproduction and growth in the middle valley. Conversely, the reservoirs created by the Dama and Manantali dams are among the basin's main fishing areas (the Manantali reservoir is Mali's third largest fishing site). Overall, fishing activity has seen a significant decline in the basin. The strategy to revitalize the sector envisaged in the SAP consists of first putting a stop to overuse of this resource by regulating fishing techniques and observing seasonal closures to allow for its renewal. Then, the fishing potential that has been ignored until now should be developed. Pilot experiments in fish farming will be implemented throughout the basin in demonstration sites.
Specific objective	Re-energize the fishing sector in the basin through the promotion of responsible fishing practices and pilot experiments in fish farming.
Activities	<ul style="list-style-type: none"> • Regulation of fishing techniques • Institution of season closures • Awareness raising for fishermen • Fish farming; incentives for introducing fish farming into rice fields; funding projects in aquaculture
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye (including one demonstration site for fish farming)</p> <p><u>Mali</u>: Kayes, Yélimané, Kénieba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro (including one demonstration site for fish farming)</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaby, Maghama, Boghe (including one demonstration site for fish farming)</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga (including one demonstration site for fish farming)</p>
Concerned actors	<p>State (Directorate/Service in charge of inland fishing)</p> <p>Territorial collectivity</p> <p>Communities: fishing associations</p> <p>NGOs</p> <p>Private enterprises (fish farming)</p> <p>Technical and financial partners</p>
Time period for implementation	10 years
Budget	15,180,000 euros including 5,000,000 the first 5 years

LTEQO 5 - Measure 4: Establishment of a wetlands conservation and land-management policy (V-M04)

Context and Justification	The four countries in the Senegal River Basin are Member States of the Ramsar Convention on Wetlands of International Importance. Therefore, it is their responsibility to identify and protect wetlands of importance, particularly those lying within their borders. The only classified Ramsar sites in the Senegal River Basin are in the river delta (Mauritania and Senegal). In addition, an inventory should be conducted in the middle valley and the upper basin to explore and classify additional wetlands as Ramsar sites. Measures will be taken to ensure that these Ramsar sites undergo regular monitoring and benefit from conservation measures as needed. Similar to what has been done in the Niger River Basin, the Ramsar sites and other wetlands of importance will be included in a network (Senegal Wet) and will benefit from specific support programs. Particular attention will be paid to the flood plain in the river's middle valley, given its recognized ecological functions (on fish reproduction, gonakier groves, groundwater recharge and renewing soil fertility). References to the Water Charter provisions in favor of releasing the floodgates will be made to support initiatives to optimize valorization of the flood plain. The planned activities within the framework of this measure complement the recommended biodiversity inventory in measure V-M02.
Specific objective	Support the states and actors in the basin in the identification, protection and sustainable use of wetlands resources.
Activities	<ul style="list-style-type: none"> • Inventory of wetlands • Development and implementation of management plans for the most threatened wetlands • Classification of additional wetlands as Ramsar sites (particularly, the upper basin) • Networking for basin wetlands (ex., "Senegal Wet") • Research and application on environmental flows • Adopt stricter provisions guaranteeing that floodgates are opened as frequently as possible
Intervention sites	<p>(NB: sites as indicated in the national reports. To be refined during the operationalization phase for the measures.)</p> <p><u>Guinea</u>: Bafing-Source, Bafing-Downstream, Falémé, Bakoye</p> <p><u>Mali</u>: Kayes, Yélimané, Kénieba, Diéma, Kolokani, Banamba, Kita, Kati, Bafoulabé and Koulikoro</p> <p><u>Mauritania</u>: Aleg, Keur Macène, Rosso, Kaédi, Sélibaly, Maghama, Boghe</p> <p><u>Senegal</u>: Saint Louis, Matam, Bakel, Dagana, Kanel, Podor, Louga</p>
Concerned actors	<p>The State</p> <p>Territorial Collectivity</p> <p>NGOs</p> <p>Technical and financial partners</p>
Time period for implementation	10 years
Budget	6,525,000 euros including 2,525,000 the first 5 years

SPECIAL INITIATIVE ON CLIMATE CHANGE – Increasing the basin’s resilience to the impacts of climate change

Context and Justification	<p>The climate factor is omnipresent among the root causes of nearly all the major environmental problems identified in the TDA, which served as a basis to formulate the strategic directions (the LTEQOs) for this SAP. These are: land degradation and desertification, decreased water supply and water quality, proliferation of harmful aquatic species, increased prevalence of waterborne diseases and biodiversity habitat loss. One of the major barriers to preparing African river basins, and particularly the Senegal River Basin, to confront climate change is the lack of information on plausible changes in climate and its potential basin-wide impacts. The primary urgent concern for the OMVS is to have information that is as reliable as possible on climate evolution. Next, the OMVS will need support to develop and implement an efficient adaptation strategy mainly founded on strengthening the capacities of basin actors (in the domains of climate forecasting for river basins, vulnerability analysis and identification and implementation of suitable adaptation measures). Lastly, basin actors, the OMVS, private investors and local producers need support to fully benefit from the opportunities offered by the growing carbon market.</p>
Specific objective	<i>Substantially reduce the vulnerability of ecosystems, infrastructure and living conditions of basin communities due to climate change.</i>
Components/Activities	<p>Component 1. Improve the quality of climate information</p> <ul style="list-style-type: none"> • Strengthen capacities of the basin countries in modeling and climate forecasting • Strengthen capacities in vulnerability analysis and adaptation measures • Conduct a predictive study on climate change forecasting and impact in the Senegal River Basin • Conduct studies on risks linked to rising sea level—potential impacts on the potential navigation program (sea-river transport), on the safety of structures built near the sea (Diama dam) and on the basin’s coastal cities (particularly the city of Saint Louis) • Conduct studies on risks linked to the rise in extreme flooding <p>Component 2. Promotion of adaptation measures to reduce the vulnerability of production systems</p> <ul style="list-style-type: none"> • Promotion of a variety of adapted seeds • Expansion of agriculture with water control (improved irrigation and recession) • Diversification of production systems; promotion of non-agricultural activities • Identify and diffuse adapted local practices and techniques in land and water management <p>Component 3. Ensure climate-proofing of hydraulic and hydro-agricultural infrastructure</p> <ul style="list-style-type: none"> • Adapt technical design standards for structures/investments <p>Component 4. Develop capacities of basin actors to obtain carbon funds</p> <ul style="list-style-type: none"> • Targeted training • Support in preparing grant proposals
Intervention sites	All of the basin countries
Concerned actors	<p>OMVS with the Environmental Observatory as the coordination unit</p> <p>Regional development companies (SONADER, SAED, PDIAM, DGH)</p> <p>Agro-industrial units</p> <p>Producers associations and other community-based organizations</p> <p>Decentralized collectivities; NGOs</p>
Time period for implementation	5 years
Budget	2,500,000 euros

Annex 4. Prioritized measures at the LCC level

LTEQO 1: <i>The challenge posed by desertification in the Senegal River Basin is surmounted by sustainably reversing the process of deforestation, erosion, siltation and soil salinization</i>																													
COUNTRIES	MAURITANIA							MALI										GUINEA				SENEGAL							
MEASURES /LCCs	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	1	2	3	4	5	6	7	TOTAL
Development and implementation of an action plan to combat desertification	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1					1	1		1	1	1	1	21
Develop alternative energy sources	1	1	1	1	1	1	1		1	1	1		1			1	1							1			1	1	16
Develop and apply an action plan to restore and protect riverbanks and headwaters								1	1					1		1							1	1		1	1		8
Prevention and management of bush fires	1		1	1	1	1													1	1									7
Promotion of anti-erosion measures									1		1	1	1	1	1		1												7
Dune fixation, promotion of reforestation actions	1	1		1	1	1	1																						6
IEC for behavior change																		1	1	1	1				1	1			6
Development and application of sustainable agricultural practices										1		1	1	1	1														5
Strengthening investments in pastoral water supply								1	1		1			1		1													5
Restoration of protected areas and forest reserves																					1	1	1		1		1		5
Development and implementation of pastoral management plan																						1	1	1	1	1	1		5
Intensification/enforcement of laws/regulations for protected areas																		1	1	1	1					1			5
Develop fodder crops	1		1	1			1																						4
Institution and delimitation of transhumance corridor								1				1			1		1												4
Harmonization, diffusion and enforcement of laws regulating environmental and natural resources management																									1	1	1	1	4
Promotion and increasing reforestation in mountain, fragile or marginal areas																		1	1	1	1								4
Development of and compliance with soil classification map										1					1		1												3
Riverbed and ravines (gabion wall) fixation								1				1				1													3
Development of a national action plan to combat riverbank degradation																					1	1					1		3
Protection of headwaters and mountain ridges																	1		1										2
Construction of hill reservoirs in the small water basins													1																1
Transfer means to effectively assume responsibility for skills transfer (Environmental management of natural resources)																					1								1
Promotion of alternative energy sources and energy-saving techniques																					1								1
Restoration of gonakier forests																						1							1

N.B. The corresponding names and locations of the numbered LCCs above are indicated below.

LTEQO 2: Optimally controlled water resources are managed through integrated and sustainable systems to ensure good water quality and adequate availability to users																														
COUNTRIES	MAURATANIA							MALI										GUINEA				SENEGAL								
MEASURES/LCCs	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	1	2	3	4	5	6	7	TOTAL	
Set up control structures for surface and groundwater								1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19	
Ensure better control and improved quality of water	1	1	1	1	1	1	1													1			1	1		1	1		12	
Develop and implement regulations for the Water Charter, specifically for water quality											1		1		1	1		1			1	1	1	1				1	10	
Apply laws related to pesticide use; combat contamination and wastewater disposal and control the use of fertilizers and pesticides								1	1	1	1	1	1		1	1	1												9	
Consolidate monitoring and surveillance system for water resources								1	1	1	1	1	1				1				1								8	
Combat contamination and wastewater disposal; control pesticide use	1	1	1	1	1	1	1																						7	
Conduct an IEC campaign for local communities in managing water pollution problems								1		1		1	1	1		1	1												7	
Improved knowledge base on water availability	1	1	1	1		1	1																						6	
Strategy to improve water management methods	1	1	1	1		1	1																						6	
Develop a dynamic communication strategy to guarantee water quality and security																								1	1	1	1	1	1	6
Enforcement of regulations on pesticide use	1	1	1	1		1																							5	
Restore gallery forests and headwaters																		1	1	1	1					1			5	
Develop and apply a basin-wide water management plan															1	1						1	1						4	
Adopt and apply measures to discourage and prevent pollution																						1				1	1	1	4	
Implement effective programs to protect riverbanks and maintain waterways																								1	1		1	1	4	
Organize education and awareness-raising campaigns for the public and also training for communities and local collectivities on management of water pollution problems.																		1	1	1	1								4	
Ensure regulation and management of water quality									1	1		1																	3	
Strengthen the role of the OMVS in protecting water quality in the river from heightened risks of pollution																			1	1	1								3	
Conduct a study on the impacts of climate change									1			1																	2	
Improve information on Manantali downstream flood release and better manage minimum level and flow								1																					1	
Improve drainage and irrigation systems																	1												1	
Strengthen the OMVS institutional system (control, etc. of water resources)																										1			1	
Develop valorization programs for saltwater/freshwater/brackish water																										1			1	
Implement a master plan																		1												

LTEQO 3: The prevalence of waterborne diseases is reduced to a level that no longer poses a public health problem																														
COUNTRIES	MAURITANIA								MALI										GUINEA				SENEGAL							
MEASURES/LCCs	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	1	2	3	4	5	6	7	TOTAL	
Build infrastructure for drinking-water access and sanitation	1		1	1	1	1	1	1	1	1				1		1		1	1	1	1	1	1	1	1	1	1	1	22	
Combat disease vectors	1	1	1	1	1	1		1		1				1			1										1		11	
Systematic testing of malaria and bilharzia	1	1	1	1	1	1	1																						7	
Strengthen health services for improved patient care								1	1	1				1		1	1	1											7	
Administer preventive and curative treatments to communities									1							1		1		1		1		1	1				7	
Promotion of a program to combat the propagation of waterborne diseases, by implementing increased funding																					1	1	1	1	1	1	1	1	7	
Health education and awareness raising on the causes of waterborne diseases																		1		1	1	1	1		1	1			7	
Strengthen local collectivities	1	1	1	1		1	1																						6	
Develop nutrition programs for children and seniors									1										1			1	1	1			1		6	
Strengthen health services	1	1			1	1	1																						5	
Organize systematic distribution of impregnated mosquito nets																1	1	1	1		1								5	
Reinforce information and behavior-change communication actions in the use of river water								1						1	1						1								4	
Strengthen means for epidemiological monitoring								1	1								1		1										4	
Strengthen capacities of veterinarian services			1	1			1																						3	
Set up a common strategy to improve methods for managing water points										1				1			1												3	
Intensified control of invasive aquatic species and river-water pollution																					1					1		1	3	
Combat proliferation of waterborne disease vectors (human and animal)																							1		1		1		3	
Strategy to improve methods for water management																						1					1		2	
Promote planning policy for water management																											1		1	
Intensify larvae treatment in infected areas																			1										1	

LTEQO 4: No aquatic, animal or plant species proliferate to the point of threatening ecological equilibrium and economic activities in the Senegal River Basin																													
COUNTRY	MAURITANIA							MALI										GUINEA				SENEGAL							
MEASURES/LCC	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	1	2	3	4	5	6	7	TOTAL
Integrated control program	1	1	1	1	1		1	1														1				1	1	1	11
Monitoring and early-warning system								1														1	1	1	1	1	1	1	8
Economic valorization of plants		1	1	1	1	1		1																					6
Clearing and cutting weeds in waterways		1	1	1	1	1	1																						6
Construction of drainage system conforming to standards	1	1	1	1		1	1																						6
Baselines	1	1	1		1	1	1																						6
Environmental impact studies of projects	1																					1				1	1	1	5
Awareness-raising campaigns on the dangers of invasive plants	1					1	1	1														1							5
Control through water regime																						1				1	1	1	4
Living rationally with plants																										1	1	1	3
Prevention system								1																					1

LTEQO 5: Areas with high biodiversity value are identified, restored and sustainably preserved																													
COUNTRIES	MAURITANIA							MALI										GUINEA				SENEGAL							
MEASURES/LCCs	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	1	2	3	4	5	6	7	TOTAL
Strengthening capacities/Environmental education								1		1	1		1	1				1	1	1	1	1	1	1	1	1	1	1	16
Establish baselines for biodiversity											1	1	1	1	1							1	1	1	1		1	1	11
Reduce fishing pressure		1	1	1	1	1	1														1					1	1		9
Improved knowledge on endangered ecosystems and species	1		1	1	1	1	1												1	1									8
Establish a wetlands conservation and management policy	1	1	1	1	1	1	1																						7
Creation of areas to protect and restore											1		1	1									1	1	1			1	7
Development of agro-forestry	1	1	1	1		1	1																						6
Protect threatened species								1		1		1	1	1															5
Development and participatory application of fauna and flora regulations on a decentralized basis	1				1														1		1								4
Restoration and protection of natural reproduction areas								1		1		1		1															4
Combat bush fires																						1	1			1	1		4
Combat poverty																							1		1	1	1		4
Delimitation of protected area in the field			1	1		1																							3
Creation of IGAs (BC, PM)								1		1					1														3
Intensification of sustainable agricultural production to stop encroachment in protected areas																		1	1		1								3
OMVS involvement to ensure proper management of the Bafing/Falémé transboundary wildlife reserve																			1	1	1								3
Control and monitoring of pesticide use and promotion of the use of bio-products												1			1														2
Implement legislation that promotes equitable distribution of resources																										1	1		2
Biodiversity management and capacity building																		1		1									2
Development and participatory application of fauna and flora regulations on a decentralized basis																		1		1									2
Implement legislation that promotes equitable distribution of resources															1														1
Combat poaching											1																		1
Conservation and restoration of the Fouta Djallon Massif																						1							1
Integrated and harmonized management of river’s fishing resources																									1				1
Soil conservation measures																									1				1
Enforce regulations/laws on protected areas																		1											1

Figure 8. Names and locations of Local Coordination Committees of the Senegal River Basin: (LCCs)

LCC Names:

Guinea:

1. Bafing-Source
2. Bafing-Downstream
3. Falémé
4. Bakoye

Mali:

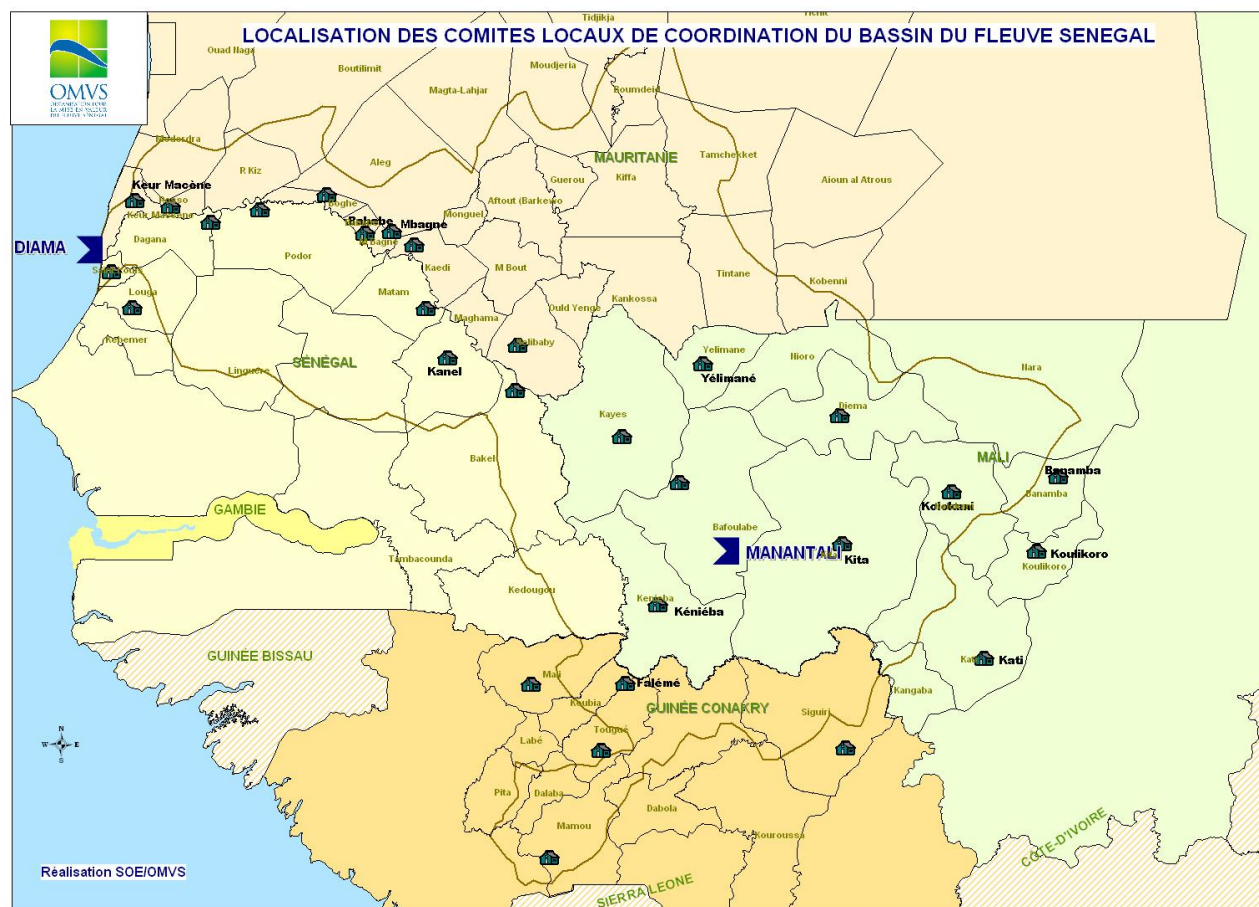
1. Kayes
2. Yélimané
3. Kénieba
4. Diéma
5. Kolokani
6. Banamba
7. Kati
8. Kita
9. Bafoulabé
10. Koulikoro

Mauritania:

1. Aleg
2. Keur Macène
3. Rosso
4. Kaédi
5. Sélibaly
6. Maghama
7. Boghé

Senegal:

1. Saint Louis
2. Matam
3. Kanel
4. Bakel
5. Dagana
6. Podor
7. Louga



Source: OMVS – Environmental Observatory

Annex 5. Profile of stakeholders involved in the SAP formulation process

5A. Actors in the regional process

Phases of the process	Date	Type and number of participants							Total participants
		<i>National Technical Directorates</i>	<i>Research Institutions</i>	<i>Civil Society /NGOs</i>	<i>NCCs</i>	<i>OMVS</i>	<i>SOGEM / SOGED</i>	<i>Consultants</i>	
Regional Start-up Workshop	25&26 /09/ 2007 Nouakchott	5	3	2	7	16	3	6	42
Regional Validation Workshop	10&11/04/ 2008 Dakar	11	5	6	9	18	2	8	49

5B. Actors in the national process - Guinea

Phases of the process	Date	Type and number of participants					Total participants
		<i>National Technical Directorates</i>	<i>Local Collectivities</i>	<i>Civil Society /NGOs</i>	<i>NCCs/ LCCs/ OMVS</i>	<i>Consultants</i>	
National Contribution Workshop	20/10/2007	4	3	9	19	2	37
Falémé LCC Workshop	20/10/2007	32	10	10	1	1	54
Bafing-Downstream LCC Workshop	23/10/2007	7	16	10	2	1	36
Bakoye LCC Workshop	25/10/2007	7	12	4	1	1	25
Atelier CLC Bafing-Source LCC Workshop	27/10/2007	11	35	9	1	1	57
SAP-NC Validation Workshop	18&19/02/2008	14		9	20	1	44

5C. Actors in the national process - Mali

Phases of the process	Date	Type and number of participants					Total participants
		<i>National Technical Directorates</i>	<i>Local Collectivities</i>	<i>Civil Society /NGOs</i>	<i>NCCs/ LCCs/ OMVS</i>	<i>Consultants</i>	
National Contribution Workshop	25&27/09/2007	nd	nd	nd	nd	4	64
Kayes LCC Workshop	28/09/2007	8	3		2	3	16
Yélimandé LCC Workshop	29/09/2007	8	8	11	1	2	30
Kéniéba LCC Workshop	01/10/2007	4	7	15	2	2	30
Diéma LCC Workshop	03/10/2007	5	2	12	1	2	22
Kolokani LCC Workshop	04/10/2007	5	6	9	1	2	23
Banamba LCC Workshop	08/10/2007	3	10	6	2	2	23
Kati LCC Workshop	09/10/2007	7	10	10	1	2	30
Kita LCC Workshop	17/10/2007	6	5	5	1	2	19
Bafoulabé LCC Workshop	19/10/2007	5	14	9	2	2	32
Koulikoro LCC Workshop	26/10/2007	5	5	9	1	2	22
SAP-NC Validation Workshop	22&23/02/2007	13		9	22	2	46

5D. Actors in the national process - Mauritania

Phases of the process	Date	Type and number of participants					Total participants
		<i>National Technical Directorates</i>	<i>Local Collectivities</i>	<i>Civil Society/ NGOs</i>	<i>NCCs/ LCCs/ OMVS</i>	<i>Consultants</i>	
National Contribution Workshop	5&6/10/2007	3	7	11	12	2	35
Boghé LCC Workshop	07/10/2007	4	2	9	2	2	19
Kaedi LCC Workshop	08/10/2007	4	1	6	3	1	15
Maghama LCC Workshop	09/10/2007	3	1	4	3	1	12
Sélibabi LCC Workshop	10/10/2007	6	2	22	1	1	32
Aleg LCC Workshop	31/10/2007	6	1	2	1	1	11
Rosso LCC Workshop	06/11/2007	nd	1	25	1	1	28
Keur Macène LCC Workshop	07/11/2007		2	4	2		8
SAP-NC Validation Workshop	27&28/01/2008	2	6		16	1	25

5E. Actors in the national process - Senegal

Phases of the process	Date	Type and number of participants					Total participants
		<i>National Technical Directorates</i>	<i>Local Collectivities</i>	<i>Civil Society /NGOs</i>	<i>NCCs/ LCCs/ OMVS</i>	<i>Consultants</i>	
National Contribution Workshop	23&24/10/2007	6	2	1	16	3	28
Saint Louis LCC Workshop	26/10/2007	60	10	30	2	1	103
Matam LCC Workshop	30/10/2007	12	1	15	1	1	30
Kanel LCC Workshop	31/10/2007	19	5	3	1	1	29
Bakel LCC Workshop	02/11/2007	8	6	10	1	1	26
Dagana LCC Workshop	04/11/2007	12	11	10	1	1	35
Podor LCC Workshop	06/11/2007	10	6	20	1	1	38
Louga LCC Workshop	08/11/2007	12	3	7	1	1	24
SAP-NC Validation Workshop	26&27/03/2007	19	4	1	8	1	33



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