

## PROJECT BRIEF

### 1. IDENTIFIERS:

**PROJECT NUMBER:**

**PROJECT NAME:**

**INTEGRATED MANAGEMENT OF LAND-BASED  
ACTIVITIES IN THE SÃO FRANCISCO BASIN**

**DURATION:**

2.5 years

**IMPLEMENTING AGENCY:**

UNEP

**EXECUTING AGENCY:**

OAS

Secretaria de Recursos Hidricos (SRH) do  
Ministerio do Meio Ambiente, dos Recursos  
Hidricos e da Amazonia Legal do Brasil  
(MMA)

**REQUESTING COUNTRY OR COUNTRIES:**

Brazil

**ELIGIBILITY:**

Under paragraph 9(b) of the Instrument.

**GEF FOCAL AREA:**

International waters with relevance to the  
cross-cutting area of Land Degradation

**GEF PROGRAMMING FRAMEWORK:**

OP 10 Contaminants based Operational  
Program, GPA element.

**2. SUMMARY:** This project develops a watershed management program for the Rio Sao Francisco Basin, which discharges into the South West Atlantic Large Marine Ecosystem and Brazil Current. The strategic, integrated and sustainable program for the management of this system and its coastal zone to be formulated during this project will address the physical, biological, chemical and institutional root causes of the progressive degradation which is affecting the basin and, particularly, the coastal ecosystems. The project will focus on the use of economic instruments and catalyze implementation activities with incremental costs to restore and sustain the coastal zone through improved river basin management included in the watershed management program. The project will complement basin-scale interventions by the Government of Brazil, financed in part from national sources and by The World Bank through the Program for Water Development (PROAGUA) and other donors. The project forms the Latin American demonstration project under the Global Program of Action for the Protection of the Marine Environment from Land-based Activities (GPA) GEF operational program element.

### 3. COSTS AND FINANCING (MILLION US):

<b>GEF:</b>	- Project:	US\$ 4.08 million
	- PDF B:	US\$ 0.341 million
	- Project Support Costs:	US\$ 0.28 million
	- Monitoring/Evaluation:	US\$ 0.07 million
	- Subtotal GEF	US\$ 4.771 million
<b>CO-FINANCING:</b>	- UNEP	US\$ 0.175 million
	- WB ( <i>PROAGUA loan</i> )	US\$ 8.625 million
	- OAS	US\$ 0.1 million
	- Government	US\$ 8.543 million
	- Subtotal	US\$17.443 million

**TOTAL PROJECT COST:** US\$ 22.214 million

### 4. ASSOCIATED FINANCING (MILLION US )

SRH/MMA	US\$3.5 (National PROAGUA)
SEPRE	US\$10.0 (coastal zone impact assess.)
JICA	US \$ 1.5 (State of Sergipe watershed management grant)

### 5. OPERATIONAL FOCAL POINT ENDORSEMENT:

Name: Daniel Ribeiro de Oliveira

Title: GEF Operational Focal Point

Organization: Secretario de Assuntos

Date: May 27, 1998

Internacionais, do Ministerio do  
Planejamento e Orcamento, Brazil

**6. IA CONTACT:**

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## LIST OF ACRONYMS

CEEIVASF	Comite Executivo de Estudos Integrados do Vale do Sao Francisco
CEMIG	Companhia Energetica de Minas Gerias
CHESF	Companhia Hidrelectrica do Sao Francisco
CODEVASF	Companhia de Desenvolvimento do Vale do Sao Francisco
CPRM	Companhia de Pesquisa de Recursos Minerais
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria
EMINWA	Environmentally-sound Management of Inland Water
GPA	Global Plan of Action for the Protection Marine Environment from Land-Based Activities
IFAD	International Fund for Agricultural Development
IGAM	Instituto Mineiro de Gestao das Aguas
IWRN	Inter-American Water Resources Network
JICA	Japanese International Cooperation Agency
LME	Large Marine Ecosystem
MMA	Ministry of Environment, Water Resources and Legal Amazon
OAS	General Secretariat of the Organization of American States
PLANEVASF	Master Plan for the Development of the Sao Francisco River Valley
PROAGUA	World Bank Program for Water Development
SFRB	Sao Francisco River Basin
SRH	Secretariat of Water Resources of the Ministry of Water Resources and Legal Amazon
WMP	Watershed Management Program

## PROJECT DESCRIPTION

### 1. Background and context

**1.1 GEF Programming Context.** This project meets the objectives of the GEF Operational Program #10 International Waters Land-based Activities Demonstration Project component (paragraph 10.13). The project will identify specific strategies, investment projects and activities that will meet GEF criteria, catalyze preparation of an integrated watershed management program (WMP), and serve as a demonstration project for the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) in Latin America.

**1.2 Implementing Agency Programming Context.** The proposed actions are consistent with the GEF principle of linking project elements with major cross-cutting issues such as land degradation, and with the UNEP Environmentally Sound Management of Inland Waters (EMINWA) integrated watershed management planning process and related, regional seas programme. The proposed actions are also consistent with UNEP's role under the GPA.

**1.3 GPA Programming Context.** (Annex 9) The goal of the GPA (adopted by 109 governments at the Washington Conference in November 1995) is to prevent degradation of the marine environment from land-based activities by assisting States in preventing and reducing major threats to the health, productivity and biodiversity of the marine environment resulting from human activities on land and in coastal areas. Thus, the GPA is designed to be a source of conceptual and practical guidance to assist States in taking action, individually or jointly within their respective policies, priorities and resources, that will lead to the prevention, reduction, control and/or elimination of degradation of the marine environment, as well as to its recovery from the impacts of land-based activities.

**1.4 National Programming Context.** Activities in the Brazilian Coastal zone are regulated by Federal Law No 7661/88, the National Environment Program, that, *inter alia*, establishes the National Coastal Management Plan, the principle objectives of which are the sustainable use of natural resources in the Coastal Zone, and preservation, conservation and rehabilitation of ecosystems in the Coastal Zone to promote sustainable development. A coastal zone inventory and macrodiagnostic, including the Rio Sao Francisco estuary, was completed in 1996 by the Government of Brazil with support from The World Bank. This study identified in a mapping format the major human uses of the coastal zone of Brazil, environmentally sensitive sites, and conservation units and reserves, which, in the Rio Sao Francisco coastal zone, are related primarily to agricultural use and conservation of endangered species, including sea turtles.

**1.5** The Master Plan for the Development of the São Francisco River Valley (PLANVASF) was completed in 1989, with the assistance of the OAS, and was designed to provide incentives to the public and private sectors for the development of the basin. This plan included proposals for the development of natural and water resources, increased food production through irrigated

agriculture, increased power generation supplying the National Network, increased water and sanitation services, improved river navigation, and enhanced environmental protection. This plan was adopted as a part of Federal Law 8851/94, as the Plan of Economic and Social Development of Northeastern Brazil.

**1.6** Subsequently, the Federal Government passed Law 9433/97, creating the National Policy on Water Resources and establishing public institutions such as the basin committees for the issuance of water rights and implementation of water use payment systems. With the approval of the National Policy Committee on Water Resources, as established by the National Constitution, the Federal Government is promulgating criteria and guidelines to be followed by states in implementing federal law 9433/97. Presently the States of Bahia, Pernambuco and Sergipe, within the Rio Sao Francisco Basin (SFRB), have passed legislation consistent with these objectives, principles and guidelines and are creating institutions to implement the new law at the State level, and the States of Minas Gerais and Alagoas are presently modifying or creating water legislation in order to comply with federal regulations.

**1.7** In this context, the Government of Brazil requested technical assistance in developing more integrated approaches to the management of land-based activities in the SFRB. The present project has been prepared using GEF PDF-B funds and is based upon extensive public consultation with stakeholders in the participating states, and initial agreement concerning institutional arrangements for implementation of the project. This proposed project is citizen-driven, and public and stakeholder participation remains an integral part of all components identified in this project. PDF-B funds were used to identify a framework for the development of: mechanisms to control the movement of priority contaminants from the land surface to nearshore marine waters; mechanisms for managing releases of water within this regulated river system; conservation of aquatic biological diversity; prevention of land degradation and rehabilitation of degraded lands in critical watersheds; and implementation of environmentally sound development proposals throughout the basin that will benefit the watershed and coastal zone.

**1.8** Building upon previous studies, the primary objective of this project will be to conduct planning and feasibility studies required to formulate a WMP that will promote environmentally sustainable development of the basin as a means of managing environmental degradation of the coastal zone. The WMP will include the identification and implementation of appropriate economic instruments, required to incorporate land-based environmental concerns affecting the coastal zone into the future development policies, plans and programs of the riparian states. Evaluation of the use of economic instruments as a policy mechanism to achieve environmentally sustainable modes of development is viewed as a key element of the WMP. The project will guide the Ministry of Environment, Water Resources and Legal Amazon (MMA) of the Federal Government of Brazil in their implementation of complementary World Bank loan financed programs (e.g., the Program for Water Development, PROAGUA) as well as those actions with incremental global benefit that might be implemented in subsequent activities.

**1.9 System Boundaries.** The SFRB, which extends over approximately 640,000 km<sup>2</sup>, comparable to the drainage basins of the Colorado or Columbia rivers of North America, discharges across the North East Brazil Shelf to the Southwest Atlantic Large Marine Ecosystem (LME) and Brazil Current (Annex 7). The river covers a large portion of the area known as the “Drought Polygon of Brazil” as it traverses climatic zones ranging from humid to arid as it flows through five states in Northeastern Brazil (the States of Alagoas, Bahia, Minas Gerais, Pernambuco, and Sergipe, plus the Federal District and State of Goiás at the headwaters of tributary streams). Land-based activities in these riparian states include mining, agricultural, urban and industrial activities, that deliver contaminants to the river system and thence to the coastal zone. Hence, the SFRB forms an appropriate case study under the GPA (Annex 9) and the GPA operational program of the GEF.

**1.10** The basin is divided into the upper, middle, lower middle, and lower sub-basins, plus the oceanic end point, each with distinct environmental and socio-economic characteristics. The estuarine wetlands located at the debouchment of the river into the South West Atlantic form a particularly important and environmentally sensitive habitat. The ecological structure and function of this habitat, as well as its physical integrity, is currently under threat due to unsustainable hydrological management and land use practices within the basin. Except for flood flows during the wet season, flow originates in the humid and semi-humid areas near the headwaters. Tributaries in the arid and semi-arid regions of the middle and lower middle sub-basins are largely intermittent, although flood flows in these streams may cause localized problems of flooding, erosion and sedimentation which affect the entire lower portion of the river system and the coastal zone. Some 13 million people are resident in this basin, principally concentrated in the upper sub-basin.

**1.11 Immediate and Intermediate Problems.** The priority environmental concerns in the SFRB are thought to include soil loss, and contamination by organic pollutants and heavy metals which will be systematically identified and quantified through the activities of this project. The SFRB is a very complex area, in which development has occurred in an historically haphazard and sectoral manner, with relatively little integrated planning, and within a relatively weak institutional framework. This has resulted in a less than optimal use of its water resources and degradation of the coastal zone, the root causes of which will be identified during the conduct of this project. Large stretches of river have been regulated, altering natural river flows that coincided with fish spawning periods. In addition, flow modifications have affected the deposition of sediments, nutrients and other contaminants in the system; altered erosion and deposition patterns; accelerated land degradation; and, modified the delivery of nutrients to the lower reaches of the basin and the coastal zone. As a consequence, significant modifications in the freshwater, estuarine and marine fauna and flora have occurred.

**1.12** Serious environmental problems identified in the Upper sub-basin include the direct discharge of untreated municipal effluents, and industrial and mining effluents containing heavy metals and cyanides. In addition, there is widespread use of agro-chemicals, and deforestation is occurring on a large scale due to the demand for charcoal and the clearing of land for agricultural

use and mining. River contamination, and the existence of large and medium size dams, further impact fish and aquatic fauna in this sub-basin. In the Middle sub-basin, environmental problems, while limited in comparison to the other sub-basins, include water quality problems (largely from upstream sources), land degradation, and accelerating erosion and desertification. Environmental problems in the Lower-middle sub-basin include water quality problems, contaminant deposition in reservoirs, impaired fish migration, high rates of soil erosion due to agricultural activities, contamination of surface and ground waters by runoff from irrigated lands, and modification of river basin and estuarine geomorphology due to the presence of flow regulation structures.

**1.13** All of these upstream problems contribute to, or are related to, environmental problems in the lower sub-basin and coastal zone which include: sedimentation; eutrophication in the reservoirs; and oligotrophication of coastal waters; alteration of river flow regimes; reductions in numbers and diversity of fish populations and populations of threatened and endangered species such as the sea turtle which nests along the coast; and increased incidence of endemic diseases.

## **2. Rationale and Objectives**

**2.1 Objectives.** Building upon the previous studies and the PDF-B phase, the objective of this GEF-GPA demonstration project is to assist the Government of Brazil to promote sustainable development of the SFRB and its coastal zone, based upon the implementation of an integrated approach to management of the watershed and coastal zone. The goal of this integrated and sustainable management program for the SFRB and its coastal zone is to catalyze, through planning and feasibility studies documented within a WMP, the incorporation of land-based environmental concerns into development policies, plans and programs for the SFRB for the protection of its coastal zone. If appropriate, implementation proposals, with incremental costs, will be prepared subsequently for submission to the GEF Council for consideration.

**2.2** This project proposal is being compiled at a time when the Government of Brazil and the riparian states of the Rio São Francisco Basin are commencing the implementation of Federal Law 9433/97. The establishment of mechanisms and means for the integrated management of the SFRB under this law can beneficially affect the South West Atlantic LME and Brazil Current into which the river discharges. The implementation of the public participation and grass-roots level water resources management structures, especially, provides an opportunity for the creation and implementation of effective structures, legal controls, and fiscal instruments to mitigate land and water management practices that degrade water quality, modify hydrological and hydraulic characteristics of the basin, and/or adversely affect the water resources of the Basin and its coastal zone.

**2.3 GEF Project Approach.** GEF incremental financing of strategic actions within this watershed at this time provides additional opportunities to incorporate global environmental concerns (i.e., the rehabilitation of the coastal zone and estuarine environments and critical ecosystems affecting the South West Atlantic LME and Brazil Current) within a coherent

framework of actions and policies as set forth in the WMP, the net result of which will be the sustainable use, including environmental use, of the land and water resources of the SFRB and its coastal zone extending into the South West Atlantic LME.

**2.4 Complementary Interventions.** Components proposed for implementation during the project period will be conducted in parallel with numerous on-going and proposed planning and development activities. Activities that directly relate to the conduct of the proposed project include, *inter alia*, the proposed US \$ 25 to US \$ 30 million river basin planning element of the Program for Water Development (PROAGUA) financed by The World Bank, and coordinated by the OAS, to promote rural water supply in semi-arid Northeast Brazil including parts of the SFRB (US \$ 8.6 million of this loan amount has been earmarked for use as co-financing in support of this project for pilot projects in environmental management and institutional strengthening as described in Annex 5), and national initiatives for the development of agriculture and hydro-power development by various parastatal corporations (CODEVASF, CHESF, etc.). A complementary project extending the concepts of PROAGUA throughout Brazil (the “National PROAGUA”) is also being implemented with an additional nationally financed investment, a portion of which will be allocated to water resources management in the SFRB.

**2.5** The Secretariat for Water Resources (SRH/MMA) is initiating implementation of a US \$ 3.5 million program of infrastructure improvement in the State of Minas Gerais. The Secretariat for Regional Policy (SEPRE) is initiating a US \$ 10 million basin-wide assessment of likely coastal zone impacts that could arise from the construction of the proposed inter-basin transfer scheme. The Japanese International Cooperation Agency (JICA) is initiating a US \$ 1.5 million watershed management program in the State of Sergipe, with emphasis on the state portion of the SFRB. Coordination of these programs within the SRH/MMA will be by common project teams appointed by the Secretary for Water Resources. These teams will be responsible for liaison with other project teams operating within the basin: strengthening of interagency communication to facilitate information exchange is an explicit element of the organizational structure development activity identified below.

### **3. Project Components/Activities and Expected Results**

**3.1** Proposed Project Components are designed to provide information for, and permit formulation of, a WMP for the SFRB and its coastal zone, and are concentrated in four principal components as set forth below. Specific terms of reference and identification of individual contractors will be developed for each component as one of the first actions initiated by the SRH, in consultation with UNEP and the OAS. The schedule of activity implementation is presented in Table 2 of Annex 8. More detailed information about the following components can be found in the work program presented in Annex 8. Elaboration of the work program will be the first action carried out by the project steering committee upon implementation of this project.

#### **COMPONENT I: River Basin and Coastal Zone Environmental Analysis**



Component I comprises the river basin and coastal zone diagnostic study. The objective of Component I is to provide the sound scientific and technical basis for the strategic remedial actions for the protection of the marine environment from land-based activities identified during the WMP process. Activities will include:

- Quantification of priority issues identified during the PDF phase, thereby updating and consolidating older data, and providing for the forecasting of potential future scenarios within the linked land, water and marine system.
- Identification and quantification of the extent to which land-based activities and river regulation in the Rio Sao Francisco influence hydrology, water quality (especially, sediment and nutrient transport), and fisheries and aquatic ecology throughout the system and, especially, at the coastal zone in the vicinity of its estuary.
- Identification and assessment of the most probable reasons for changes in river morphology and aquatic faunal community composition and distributions necessary to determine the root causes of these changes.
- Provide the quantitative basis for the determination of strategic actions to optimize the multiple purpose utilization of the water resources of the basin and the protection and restoration of the coastal zone ecosystems currently adversely affected by land-based activities.

The results of this component will include:

- an inventory of the aquatic fauna, flora and hydroclimate in the lower SFRB and historic changes in its composition; and,
- an evaluation of the environmental impacts of the river on the coastal zone including wetlands, beaches, and fish habitat;
- an analysis of the floods and the use of artificial floods as an hydrological management mechanism;
- an assessment of different scenarios for reservoir operation to minimize environmental impacts on the estuary and coastal zone.

It is anticipated that the execution of these activities will be undertaken by the relevant federal and states agencies such as CODEVASF, CHESF, CPRM and EMBRAPA, and CEMIG and IGAM; federal universities; municipal consortia and civil associations; and local NGOs. The coordination and supervision will be ensured by the Technical Coordinator at the SRH/MMA. This component is anticipated to be initiated during the first through the second quarters of the project period. GEF: US \$ 990,000; co-funding: US \$ 1,918,000; total: US \$ 2,908,000.

## **COMPONENT II: Public and Stakeholder Participation**

Component II provides for public involvement. The objective of Component II is to provide for the practical, hands on-type involvement of communities in the identification and field testing of remedial measures, as well as the establishment of a dialogue process between persons and agencies having economic interests in the basin. Actions formulated through this process will have the advantage of benefiting from community insights and experiences, and of being acceptable to the communities as economically and environmentally sustainable alternatives to

presently destructive practices. Although the major effort in this area is expected to be undertaken subsequently, the acquisition of specific information necessary for the determination of water rights and water rate allocations, and methodologies for controlling sediment movement within the basin (especially as it impacts the movement of sediments within the estuary), will be undertaken during this project. This information will also contribute to implementation of specific actions under the World Bank-financed PROAGUA program, and is a prerequisite for the implementation of water charges under Component IV. Activities will include:

- mapping at an appropriate scale to determine land ownership and condition, and a framework for establishing a water use allocation system;
- identification of, and establishment of coordination between, persons and agencies having commercial or institutional responsibilities within the basin, including the fisheries, navigation, mining and agro-industrial sectors and public sector at all levels of government;
- demonstration of sustainable agricultural and streambank management measures for implementation under community-based land management programs (supported through the World Bank-financed PROAGUA program that will demonstrate sound soil and water management techniques, appropriate utilization of agro-chemicals, and improved methods of crop management, irrigation design and maintenance of infrastructure such as roads and irrigation ditches); and,
- creation of community-based information and training programs to support community land management programs.

The results of this component will include:

- a sound basis to determine land ownership and condition together with the framework for establishing a water use allocation system and will contribute to the rational allocation of water and water charges,
- strengthened community-based and governmental initiatives that contribute to the determination of water use and its impact on the hydrology of the system, and facilitate implementation of water use charges, including the creation of public, private and public-private partnerships as appropriate,
- pilot-scale demonstration projects to identify methods of stabilizing degraded lands and riparian areas, and promulgation of appropriate remedial measures,
- training programs through which to communicate the measures to farmers and communities.

It is anticipated that the execution of these activities will be undertaken by the relevant federal and states agencies such as CODEVASF; and municipal consortia, and civil associations. The coordination and supervision will be ensured by the Technical Coordinator at the SRH/MMA. This component is anticipated to be initiated during the first through the second quarters of the project period. GEF: US \$ 520,000; co-funding: US \$ 1,150,000; total: US \$ 1,670,000.

### **COMPONENT III: Organisational Structure Development**

Activity III strengthens and improves institutional and staffing capabilities to implement new laws, regulations, and procedures. The objective of Component III is to equip and train institutions and individuals identified during the PDF Activities. Such institutional strengthening

and capacity building will contribute to the longer-term success of the watershed management measures identified in the WMP. This component targets specific institutions and skills needed within the basin at all levels of government, including the determination of appropriate inter-governmental structures to facilitate coordination between federal, state, municipal and local governments and agencies. Where appropriate, partnerships based upon the inclusion of nongovernmental organizations, industry councils and other institutions within the coordination mechanisms will be developed. In addition, this component supports the development of an effective and integrated Rio Sao Francisco Basin Committee structure, as provided for under federal law 9433/97. Activities, in concert with actions funded under PROAGUA, will contribute to the implementation of an effective, integrated basin committee, and ancillary agencies and organizations, at both the federal and state levels. Activities will include:

- an evaluation of the efficacy of several policy instruments for implementing the water law and related state legislation;
- pilot scale implementation in order to relate measured improvements in both rate of water use and degree of protection of downstream water quality; and,
- development of a framework for the implementation of the law in other sub-basins.

The results of this component will include:

- a framework for the creation of a financially-sustainable basin management agency that will contribute to the sustainable use and management of the water resources of the basin, including integration of environmental and coastal zone concerns into the overall management strategy for the system,
- the establishment of an integrated river basin committee consistent with the spirit of Federal Law 9433/07 in, *inter alia*, the Maranhao River sub-basin, and potential extension to the entire SFRB,
- a framework for the conduct of inter-agency discussions within a multiple purpose basin through the creation of a forum for the interaction of sub-basin committees and water agencies, and public and stakeholders participating in the decision-making process.

It is anticipated that the execution of these activities will be undertaken by the relevant federal and states agencies such as CODEVASF, CEEIVASF, IGAM; and municipal consortia and civil associations. The coordination and supervision will be ensured by the Technical Coordinator at the SRH/MMA. This component is anticipated to be initiated during the first through the second quarters of the project period. GEF: US \$ 450,000; co-funding: US \$ 845,000; total US \$ 1,295,000.

#### **COMPONENT IV: Watershed Management Program Formulation**

Component IV is the formulation of the WMP. The objective of Component IV is the synthesis of data and experiences, feasibility assessments and cost analyses developed in the three preceding components. Included in the principal activities within this component are four elements that address the legal, institutional, and human and natural resources bases essential for implementation of the remedial actions identified through the WMP process. Component IV explicitly provides for the cooperative development of a comprehensive WMP by both the

public and private sectors, based on a multi-sectoral, holistic approach to environmental management and economic development in this Basin and its coastal zone, as provided for in Chapters 18 and 21 of Agenda 21.

***A. Information Sharing and Dissemination*** - The goals of this element are (1) to promote (a) popular participation at the grass roots level throughout the basin, where some representative community-based institutions exist, and (b) to empower decentralized decision-making relating to the determination and implementation of management policies and practices at the community level, and (2) to facilitate sharing of technical information between states and agencies, as well as the extension and upgrading the data collection system to facilitate an holistic overview of hydrological and water quality conditions in the system. Achievement of these goals will contribute to flood forecasting, environmental and hydrological management, reservoir operations, and an informed community. Activities will include:

- the conduct of workshops, training programs for officials and community leaders, and informational campaigns within schools, civic groups and communities;
- the convening of two international seminars to facilitate discussion of the water resources issues of priority concern as a means of building appreciation for the unitary nature of the Rio Sao Francisco hydrological system and related coastal zone;
- the dissemination of the experiences gained in the determination and initial implementation of management actions through the professional literature, seminars, public informational meetings, and training programs to enhance the transfer of knowledge as encouraged under Chapter 15 of Agenda 21; and,
- the use of, and support for, the Inter-American Water Resources Network (IWRN) as a means of disseminating information regarding the conduct and findings of this activity.
- the development of a framework to extend and harmonize the existing hydrometeorological data collection network, unifying data gathering objectives and methodologies in order to enhance the dissemination of data and information throughout the basin.

The results of this element will include:

- meeting and workshop reports,
- a compendium of appropriate methods and means of integrating community-based decision-making into the structure and function of the integrated basin management committee proposed to be created under Component III,
- a regional water information system, including the publication of a magazine for basin-wide distribution to raise awareness, build participation and inform citizen across sectoral line,
- a framework for addressing the priority issues inherent in the management of the SFRB.

It is anticipated that the execution of these activities will be undertaken by the relevant federal and states agencies such as CODEVASF, IGAM. The coordination and supervision will be ensured by the Technical Coordinator at the SRH/MMA. This element is anticipated to be initiated throughout the project period. GEF: US \$ 430,000; co-funding: US \$ 671,000; total: US \$ 1,101,000.

***B. Quantification of Water Use, Use Conflicts and Hydrological Management*** - The objective of this element is to develop a quantitative framework for identifying and resolving quantitative water use and allocation conflicts within the basin in a transparent and equitable manner. This element creates the framework for the decision-support system to be designed under activities conducted under PROAGUA and the determination of an appropriate economic framework. Building upon the detailed hydrological and contaminant budgets to be completed under Component I, activities will include:

- the quantification of the volumes of water consumed by irrigated agriculture, the levels of contamination of surface and ground waters arising from agricultural water use, and the degree to which abstraction and contamination of waters impacts the ability of waters to be used by downstream users;
- an assessment of the need to develop the computational instruments needed to analyze water use conflicts through an integrated, quantitative, mathematical modeling of natural water flows, sectoral consumptive uses, projected inter-basin transfers into and out of the basin, and modifications of natural flows resulting from the operation of dams and reservoirs; and,
- the development of the parameters for models that will contribute to the sustainable, conjunctive management of the water resources of the SFRB.

The results of this element will include:

- knowledge of the stakeholders and their water requirements to be met from the water resources of the Rio Sao Francisco,
- the quantitative basis for the formulation of related fiscal and legal mechanisms, including allocation of water rights and development of water charges and use regulations, for the sustainable management of the river and its coastal zone,
- a framework for the development and use of a system of mathematical models of river hydraulics, hydrology and water use in the basin, to be included in the proposed PROAGUA decision support system, that will contribute to informed decision-making by stakeholders and agencies.

It is anticipated that the execution of these activities will be undertaken by the relevant federal and states agencies such as CODEVASF, and CHESF; federal universities; and municipal agencies and civil associations. The coordination and supervision will be ensured by the Technical Coordinator at the SRH/MMA, in close consultation with the PROAGUA project team. This element is anticipated to be initiated during the first through the fourth quarters of the project period. GEF: US \$ 640,000; co-funding: US \$ 3,059,000; total: US \$ 3,699,000.

***C. Financial Mechanisms*** - The objective of this element is to develop and implement a system of water rights and water charges, as provided for under federal law 9433/97, in representative sub-basins of the Rio Sao Francisco. This element builds upon activities funded under PROAGUA and the experiences obtained in the pilot-scale demonstration projects developed in Component III. Activities conducted under this component will:

- review of federal and state legal and financial mechanisms relating to the sectoral uses of water (e.g., agricultural subsidy schemes, urban land use planning regulations, etc. which affect

disturbances of the land surface that encourage erosion, water pollution, etc. to the detriment of water courses and water resources management);

- identify and propose amendments as appropriate to those mechanisms that affect sustainable use of water resources and the management of watersheds within the SFRB
- develop a detailed framework of the allocation and determination of water charges and introductions of watershed management measures, including proposals for legislation and strengthening of administrative mechanisms necessary to implement an equitable water pricing scheme and enhance the institutional capability to determine and implement a water use charges program; and,
- identify appropriate mechanisms to place water resources management within the basin on a sustainable footing, and encourage the optimization of water resources management policies, practices and programs, thereby creating a sound economic and legal basis for the sustainable development of the basin and its coastal zone.

The results of this element will be:

- a documented review of existing water resources management and protection legislation and recommended actions for the harmonization and optimization of such legislation in the basin,
- a program of proposed legislative initiatives to harmonize and optimize water resources management and protection legislation in the basin,
- a documented framework for the implementation of water use charges and restructuring of related fiscal, financial and legal mechanisms for water quantity and quality management in the five basin states consistent with an holistic concept of the SFRB,
- a compendium of appropriate mechanisms for the sustainable utilization and management of the Rio Sao Francisco.

It is anticipated that the execution of these activities will be undertaken by the relevant federal and states agencies such as CEEIVASF. The coordination and supervision will be ensured by the Technical Coordinator at the SRH/MMA, in close consultation with the PROAGUA project team. This activity component is anticipated to be initiated during the third quarters of the project period. GEF: US \$ 350,000; co-funding: US \$ 300,000; total: US \$ 650,000.

***D. Formulation of the Watershed Management Program*** - The formulation of a WMP is the goal of this project. The objectives of this element are the identification and harmonization of development initiatives in the SFRB and coastal zone, and the implementation of strategic actions to integrate and optimize the initiatives and proposals for sustainable development in the region. This element will enhance the capacity of basin organizations to manage the water resources of the basin, and contribute to the development of an operational procedure that will optimize economic use of the water resources in the basin, including environmental use. This element also will strengthen institutional capacities to implement national and sub-national (state, municipal, and local governmental) actions consistent with national undertakings relative to the GPA so as to manage water flows in a climate of changing water demands and in a manner consistent with maintenance of environmental conditions at the river estuary. Such actions will conserve

biological resources and minimize deleterious environmental impacts related to river flows. Thus, activities to be undertaken under this element will include:

- an environmental evaluation of the basin, emphasizing the analysis of priority problems and socio-economic issues relating to environmental practices and their relationship with the education, health, income and organization of population especially in the coastal zone, as well as the identification and coordination of organizational arrangements;
- support to Government efforts at introducing environmental considerations into the laws and regulations at the national and state levels; and,
- the incorporation of strategic measures for the mitigation and prevention of land degradation, protection of aquatic flora and fauna, and control and minimization of persistent contaminants into regional development programs, thereby incorporating methods and procedures for resolving priority environmental problems and obtaining global benefit into activities that directly affect the sustainability of the use of the water resources of the Rio Sao Francisco and development in the basin and its coastal zone.

Specific strategic actions for the integrated management of the SFRB and the rehabilitation of its coastal zone will also be identified.

The results of this element will be:

- knowledge of the impact of land-based activities on the coastal zone,
- strengthened governmental agencies and organizations, pursuant to federal law 9433/97,
- a documented strategy and programme of action for the integrated management of the SFRB and its coastal zone.

The execution of these activities will be ensured by the project team at the SRH/MMA with the active participation of UNEP, the OAS ,and the World Bank (mainly the PROAGUA project team), together with the relevant federal and state organizations and non-governmental organizations. This element is anticipated to be initiated during the first through the second quarters of the project period. GEF: US \$ 700,000; co-funding: US \$ 621,000; total: US \$ 1,321,000.

#### **4. Risk and Sustainability**

**4.1** To effect the sustainable management of the SFRB and its coastal zone, it is necessary to formulate a comprehensive program of coordinated actions by the Federal Government of Brazil and the riparian states. The federal water law and other legislation provides a sound basis for implementation of actions necessary to introduce sustainable management actions into this basin. The main risk facing the activity is that the legal mechanisms provided under the water law are not fully implemented by the basin states and that the basin committee remains relatively ineffectual in implementing cross-sectoral integration activities that will benefit the river system and coastal zone. However, recent moves toward adoption of complementary legislation by the basin states would suggest that this risk is small. Nevertheless, some emphasis on strengthening the basin committee is given in this project as a means of catalyzing and encouraging a more effective cross-sectoral role of the committee in managing water resources and related

development in the basin on a sustainable basis.

**4.2** The risk of unsustainable development in the SFRB is that continued development following current trends might result in serious undesirable environmental side effects, such as the catastrophic decline in the fisheries, damage to the underlying natural resource base, flooding or drying of critical habitats, and pollution of downstream ecosystems, including economic units of production. Such degradation of the natural resource base would severely limit reclamation and rehabilitation options available for implementation following formulation of the WMP. Notwithstanding, opportunities exist for the reclamation of some natural resources, such as soils, natural vegetation and forests, by strategically introducing effective and adequate environmental management practices and procedures. GEF funded activities, in conjunction with other state, national and international co-funded activities, could make a difference in the development of this basin and its coastal zone by helping to promote the adoption of actions which will contribute to the sustainable development of this important river and ocean system.

**4.3** Project Components and their implementation, including the participation process, are designed to achieve sustainability. Demonstration projects have been selected on the basis of their sustainability, both from the ecological as well as the economic points of view, and to achieve the maximum degree of beneficial impact on the coastal zone and adjacent marine and freshwater ecosystems, while other project components have been proposed for the purpose of quantifying the causes and effects of degradation of water and natural resources in the basin, and of identifying strategic means of reclaiming once productive areas and keeping them productive. Wherever possible the project will develop opportunities for the establishment of financial incentives, private sector investment and cost recovery in environmental management, as in the reclamation of eroded or mined lands, pastures and forests, rational management of natural forests, exploitation of newly forested areas or newly irrigated areas. The project also will provide actual, working examples of the new or refined land management actions necessary for the sustainable development of the watershed consistent with the procedures and processes embodied in the federal water law and related state legislation previously adopted or currently under consideration. The steering committee will be responsible for transmitting recommendations to the appropriate governmental bodies.

**4.4** The national and state governments have pledged their support to actions proposed to be implemented with the incremental financial assistance of the GEF by allocating state and national financial resources in excess of US \$ 20 million, including the JICA grant to the coastal state of Sergipe, and federal governmental initiatives in the upper and lower middle portions of the basin. Further, the SRH/MMA has already put into place management and administrative structures to ensure the complementarity of the various national and international efforts proposed for implementation within the SFRB, and, through federal water law 9433/97 and PROAGUA, respectively, has created the necessary legal and financial structures to promote successful and sustained application of environmentally-sound principles of multiple purpose river basin and coastal zone management to the SFRB.



## **5. Stakeholder Participation and Implementation Arrangements**

**5.1** Formulation of this proposal has involved extensive and broad-based participation by representatives of the municipal, state and national Governments, academic and research institutions, private sector representatives and non-governmental organizations. The participation process was facilitated by a series of consultative workshops, conducted in Belo Horizonte in the upper sub-basin during November 1997; Penedo in the lower sub-basin and estuary during December 1997; and, Petrolina in the middle and lower middle sub-basins during February 1998. Follow-up consultations were held with participants in the workshops and with other selected personnel from the SRH/MMA during February 1998 to prepare the project brief, which was subsequently endorsed by the GEF project preparation steering committee, which met in Brasilia and subsequently discussed and agreed at a meeting in Washington between representatives of the GEF Implementing Agencies and the OAS in March 1998.

**5.2** Approximately 270 persons representing more than 100 institutions, government agencies and NGOs, participated in the public meetings and provided inputs in drafting this proposal, many of which are expected to participate in the implementation of the project. This proposal is based on some 135 project concept documents prepared during the PDF-B process (Annex 4).

**5.3** All the proposed activities will be driven by a Project Steering Committee comprised of representatives of SRH/MMA; UNEP, as Implementing Agency; and OAS, as Executing Agency. The other GEF Implementing Agencies will be informed of, and may participate in, meetings of the Steering Committee in an *ex officio* capacity. The Steering Committee, at its first meeting to be convened at the earliest possible moment following project approval by the GEF, will be chaired by the Secretary for Water Resources of Brazil, who will act as Executive Director of the Project, in consultation with UNEP and the OAS. One Technical Coordinator, to be contracted by OAS as the Executing Agency in consultation with UNEP, will also be confirmed at this inaugural meeting of the Steering Committee.

**5.4** The Steering Committee will agree administrative and reporting procedures consistent with UNEP standards and OAS requirements including financial reporting. The Steering Committee will determine a proposed concept of execution for the program of work outlined herein. This program of work will be elaborated jointly by the Executing Agency and the SRH/MMA, in consultation with UNEP, prior to the second meeting of the Steering Committee and inauguration of project Components. Finally, the Steering Committee, at its inaugural meeting, shall conduct any other such business as may be required to initiate project Components, and set a date for the second meeting of the Steering Committee.

**5.5** Participation of the national, state and municipal agencies of Brazil with competence in the region, scientific and academic institutions, and concerned civil organizations (NGOs) will be by way of sub-committees of the Steering Committee. Subsequent meetings of the Steering Committee shall be scheduled by the Steering Committee but shall be at least every six months during the project period. The activities of the Steering Committee will be supported by the

SRH/MMA, with funds provided by GEF through the Implementing Agency. UNEP and OAS will support Project Execution. OAS, due to its historic involvement in the basin, its partnership with UNEP in similar projects within the region, and its role in implementing activities under related projects, will act as Executing Agency and manager of the funds provided to the project by UNEP on behalf of GEF, consistent with UNEP financial reporting requirements.

**5.6** Activities of national personnel, with the support of the international agencies, will be based upon preparatory work and Terms of Reference agreed with and approved by the SRH/MMA, in consultation with UNEP and OAS. To the extent possible, all Components will be executed by national agencies of Brazil and/or by consultants from Brazil under the direct supervision of the SRH/MMA and OAS. The SRH/MMA and Executing Agency will coordinate field activities, as directed by the Steering Committee, through coordinators appointed from their staff. The main Coordination activities will be directed from Brasilia, Brazil. All project activities will be conducted within the basin.

**6. Incremental Costs and Project Financing.** Recognizing that domestic benefits will accrue from this project, the Government of Brazil, the riparian state and municipal governmental units, and other participating parties defined herein, have committed substantial baseline funding to this project, both in the form of direct national appropriations for projects in Minas Gerais and those associated with the proposed inter-basin transfer scheme, and in the form of loans secured from The World Bank under the PROAGUA project. In addition, these governmental and nongovernmental entities have proposed counterpart contributions under the alternative project that represent a substantial percentage of the total funds required, thereby demonstrating their full support for, and interest in, this program. These investments are assumed to provide national benefits. Incremental GEF financing will promote consideration of issues of global environmental concern, within a strategic, sustainable development framework. The baseline and alternative costs are presented in Annex 1.

### Project Financing

The breakdown of project financing is presented in Table 1.

**Table 1. Component Financing (US \$).**

ACTIVITY	GEF	CO-FINANCING				TOTAL
		Government	World Bank	UNEP	OAS	
I. River Basin and Coastal Zone Environmental Analysis	990,000	1,918,000	--a			2,908,000
II. Public and Stakeholder Participation	520,000	1,150,000	--a			1,670,000
III. Organizational Structure	450,000	845,000	--a			1,295,000

Development						
IV-A. Information Sharing and Dissemination	430,000	671,000	--a			<b>1,101,000</b>
IV-B. Quantification of Water Use and Hydrological Management	640,000	3,059,000	--a			<b>3,699,000</b>
IV-C. Financial Mechanisms	350,000	300,000	--a			<b>650,000</b>
IV-D. Formulation of the Watershed Management Plan	700,000	396,000	--a	150,000	75,000	<b>1,321,000</b>
PROAGUA			8,600,000			<b>8,600,000</b>
<b>TOTAL (Project Costs)</b>	<b>4,080,000</b>	<b>8,339,000</b>	<b>8,600,000</b>	<b>150,000</b>	<b>75,000</b>	<b>21,244,000</b>
Project Support Costs	280,000					280,000
Monitoring and Evaluation	70,000					70,000
<b>PDF Preparation</b>	<b>341,000</b>	<b>204,000</b>	<b>25,000</b>	<b>25,000</b>	<b>25,000</b>	<b>620,000</b>
<b>GRAND TOTAL</b>	<b>4,771,000</b>	<b>8,543,000</b>	<b>8,625,000</b>	<b>175,000</b>	<b>100,000</b>	<b>22,214,000</b>

<sup>a</sup>The application of the US \$ 8,600,000 World Bank PROAGUA loan-financing is to be determined pending signature of the loan agreement.

## 7. Monitoring, Evaluation and Dissemination

**7.1** The administrative, technical and financial reporting framework will be provided by the Implementing Agency through the Executing Agency and Steering Committee using standard UNEP reporting protocols. Utilizing key process and status indicators will be an intrinsic part of the project. These indicators will be implemented through the establishment and integration of monitoring tools into project components, as agreed by the Steering Committee at their second meeting, as set forth above. A monitoring and evaluation plan, consistent with GEF criteria, will be prepared by the Executing Agency and SRH/MMA, and approved by the Steering Committee and UNEP. The objective of this monitoring is to contribute to improving, and, if needed, adapting management of work program activities as well as creating the basis for project evaluation. Implementing Agency supervision will be exercised through the Executing Agency and by participation in the regular meetings of the Steering Committee, the first and second meetings of the Steering Committee wherein the work plan and terms of reference for project staff and consultants will be discussed and agreed. A project implementation review would be undertaken jointly by the Government and UNEP two years after the end of the project.

**7.2 STAP Review.** (Annex 3) This project proposal was reviewed by Prof. Bjorn Kjerfve of the Marine and Geological Sciences Department of the University of South Carolina, an International Waters Expert included in the STAP Roster of Experts. Comments made by Prof. Kjerfve did not require any changes in this document. In general, the comments of the STAP reviewer were strongly supportive of the project approach, methodology and design.

**7.3** Incorporated into the WMP formulation are specific work program components (see Component IV) which explicitly aim to promote and disseminate the experiences obtained through the WMP formulation process and GPA demonstration project to the water resources professionals Latin America, and to communities within the SFRB through a program of public information and education. As previously noted, work program activities encourage and facilitate technology transfer and information dissemination through programs of public participation, stakeholder involvement, and professional and community-based education and information dissemination. State and municipal governmental, NGO and citizen involvement in project execution, especially, will also contribute to the dissemination of information on specific technologies and techniques that contribute to the sustainable environmental management and economic development of the watershed. Finally, the publication of the WMP for the SFRB will communicate to all concerned organizations, agencies and citizens the comprehensive strategic approach for the management of this critical drainage basin. Copies of this management program will be widely disseminated within the planning project area.

**Brazil: Integrated Management of Land-Based Activities in the São Francisco Basin**

**LIST OF ANNEXES**

*(Included in printed version)*

- Annex 1: Incremental Costs
- Annex 2: Logical Framework Analysis
- Annex 3: STAP Roster Technical Review

*(included in electronic version or to be provided by the IA upon request)*

- Annex 4: Public Involvement Plan Summary
- Annex 5: The World Bank PROAGUA Project
- Annex 6: Available Reference Documents
- Annex 7: Geography of the Rio Sao Francisco Basin and Planning Context.
- Annex 8: Proposed Work Program.
- Annex 9: The Global Program of Action for the Protection of the Marine Environment from Land-Based Activities
- Annex 10: Root Causes Analysis

## INCREMENTAL COSTS

**1. Broad Development Goals.** The goal of the watershed management program (WMP) for the Sao Francisco River Basin (SFRB) and nearshore waters of the South West Atlantic Large Marine Ecosystem (LME) is to promote environmentally sustainable development within the basin and its coastal zone. Achieving this goal requires taking into consideration programs of investments of the federal Government of Brasil and the five riparian states, as well as municipalities, local authorities, and nongovernmental organizations in the basin.

**2. Baseline Situation.** Significant investments have been made in the project area and surrounding environs. These consist of: (1) ongoing and long term development projects for the SFRB, and (2) environmentally related activities associated with development programs or executed independently by federal, state, and local authorities. Some of these projects are financed by national agencies such as CHESF, CEMIG, CODEVASF, etc. and possible other cofinancing. The World Bank loan for the large-scale PROAGUA project costs US \$ 198 million for Northeastern Brazil. These cover related investments in irrigation, hydropower, sanitation, transportation, and other infrastructure in the SFRB in the coming years. Another project is cofunded through an International Fund for Agricultural Development (IFAD) loan by government for environmentally sustainable development activities at the grass roots level in the semi-arid region. Government and counterpart funding is also provided within the sub-basin for the formation of a committee in the state of Minas Gerais by IGAM/SRH. There will also be studies on the impact of agriculture and agro-industries on water resources by EMBRAPA/CODEVASF and studies of surface and ground water quality by EMBRAPA. Although many of these latter initiatives are relatively uncoordinated to realize direct benefits for the project, they nevertheless represent in-country programs and activities within the region that may have impacts on the project site.

**3. Other baseline activities,** which have largely domestic or local impacts, include monitoring and remediation works being conducted by the federal government and states within the basin. Other investments of the federal government and states in routine environmental monitoring within the basin have not been estimated. Although data gathered under these programs will be available to, and used in, the preparation of the WMP to address Land-based Sources of Marine Pollution in the Sao Francisco Basin, with the exception of the harmonization of the hydrometeorological network, no additional efforts will be undertaken under this project. Conservatively, these costs have not been considered in the calculations presented in Table 1.

**4. GEF Alternative Scenario.** The alternative scenario consists of the implementation of those actions needed to both introduce sustainable development into development projects in the SFRB, and achieve the resulting global environmental benefits embodied in the mitigation of transboundary environmental problems affecting coastal marine waters and the South West Atlantic LME. The costs of these actions are those necessary to include sustainable development

considerations in the projects within the basin over and above the requirements of the regular environmental impact assessments and mitigation measures required to be completed under existing Brazilian federal and state environmental laws and regulations.

**5. Water resources management in the SFRB** will be directed and coordinated by the federal Ministry for Environment, Water Resources and the Legal Amazon, as set forth in federal law 9433/97. This agency, and any subsequently empowered river basin committee, will require strengthening, to be provided through GEF support.

**6. Reduced soil loss, improved flood forecasting, and more effective and sustainable use of available water resources** are national benefits to be expected as a result of the activities of this project, but these also have significant impacts in maintaining the watershed and its environs, and the globally significant resources within the basin. However, the full extent of localized benefits cannot be estimated at this time and it is assumed that the domestic funding provided is equivalent to the national costs and will adequately compensate for the domestic benefits achieved.

**7. Global Benefits.** The global benefit arising from the GEF intervention will be the formulation of a comprehensive watershed management program to reduce contamination and pollution of surrounding wetlands, coastal areas, and riverine systems. A strategic program of activities will to be included for the Sao Francisco Basin where improved management would reduce contamination from discharges into the South West Atlantic Large Marine Ecosystem and Brazil Current. A breakdown by component follows.

Component 1 River Basin and Coastal Zone Environmental Analysis. The activities set forth under this component are designed to assess and quantify specific issues of concern within the basin identified during the PDF activities; namely, the interception of contaminants from the headwater areas of the basin by the existing system of dams and reservoirs in the SFRB and the management of nutrient and sediment flows to the coastal zone. The proposed project considers means for reducing the flow of contaminants into the river and reservoirs and increasing the transport of nutrients and sediments to the coastal zone to offset the oligotrophication of the South West Atlantic that is currently occurring. The baseline costs cover existing infrastructure and investments in the basin, as well as the estimated \$1,918,000 counterpart contributions from the Brazilian government and local governmental and nongovernmental organizations. The alternative project costs are US \$ 2,908,000. GEF incremental funding is US \$ 990,000.

Component 2 Public and Stakeholder Participation. The baseline costs of this component represent completed and ongoing activities by the Brazilian government and states for engaging a variety of stakeholders in the design and implementation of on-the-ground watershed and basin management activities. The Government of Brazil and local governmental and non-governmental organizations will contribute US \$ 1,150,000 to cover strengthening of human resources capacity, reinforcement of institutions working in the basin, and additional operation costs. The alternative project cost is US \$ 1,670,000. GEF incremental funding is US \$ 520,000.

Component 3 Organization Structure and Development. Together with monitoring and regulation of commercial fishing and aquaculture activities along the course of the river, this component will result in strategies to increase the numbers of, and restore the biological diversity among, fishes and marine wildlife, especially in the SFRB estuary and coastal zone. Such increases are expected to contribute to the maintenance of global biological diversity within the South West Atlantic LME and Brazil current, and may also result in domestic benefits arising from (possible) increased commercial fishing opportunities within the riverine and lacustrine portions of the basin. Benefits will be evaluated during WMP formulation. There is no baseline cost of this alternative. The Government of Brazil and local governmental and non-governmental organizations will contribute US \$ 845,000 to cover strengthening of human resources capacity, and additional operation costs. The alternative project cost is US \$ 1,295,000. GEF incremental funding is US \$ 450,000.

Component 4 Watershed Management Program. The rational use of water and other natural resources in the basin and at the coast is limited by several existing and potential uses of water within the basin that are competing for increased shares of river flow. This competition can influence the extent of ecosystem degradation within the coastal zone. Given the intensity of demands upon this system, including its coastal marine waters, development of an integrative system of water resource management models could provide for a significant improvement in the decision-making ability of regulatory agencies in the basin that would result in both global and domestic benefits. Such an improvement would contribute to achievement of an optimal mix different water uses, based upon the corresponding costs and benefits of each use, including environmental uses, which could support negotiated allocations among the different stakeholders and related water pricing decisions. Knowledge of the critical factors of influencing river and coastal zone behavior, and experience with methods of negotiation and agreement among competitive users of water, to be acquired under activities 1 through 3 above, will be used for improving management of natural resources in the basin, and could be transferred to other international basins where complex mixes of competitive water uses exist. The baseline cost of this Component is US \$4,651,000, representing investments in operating the existing hydrometeorological network (under activity 4.1 in Annex 8) and other counterpart government contributions. The alternative project cost is US \$ 6,771,000. GEF incremental funding is US \$ 2,120,000.

**8.** Part of the baseline contributing to all project components includes activities funded through cofinancing from UNEP, OAS and government counterpart (preparation activities), of \$254,000 as well as funding from the World Bank PROAGUA loan (to be determined following signature of the loan agreement) of \$8,625,000.

**9.** It should be noted that specific expenditures for activities may be initiated at any time during the six-month period preceding the indicated date, as human and financial resources, and prerequisite information availability, warrant. Further, it is anticipated that each component within the four principle activities is likely to be executed over the period of at least a year.



### ANNEX 1 - Incremental Cost Matrix (US \$M)

Component	Category	Amount	Domestic Benefits	Global Benefits
River basin and coastal zone environmental analysis	Baseline	1.918	Interception of contaminants from the headwater areas of the basin by the existing system of dams and reservoirs in the SFRB; reduced nutrient and sediment flows basin wide	
	Alternative	2.908	Same as above.	Reduced flow of contaminants into the river and coastal zone and offset of oligotrophication of the South West Atlantic; increased protection of globally significant water systems
	Increment	.990		
Public and stakeholder participation	Baseline	1.150	Domestic advantages gained from pilot demonstrations with local stakeholders; rehabilitation of local natural vegetation in coastal wetlands and along river banks; promotion of appropriate agricultural practices and land regulations	
	Alternative	1.670	Same as above.	Improved coastal zone management in the basin and surrounding wetlands and water systems, resulting in reduced contamination and pollution from agriculture
	Increment	.520		
Organizational structure development	Baseline	.845	Improved monitoring and regulation of commercial fishing and aquaculture activities along the river	
	Alternative	1.295	Same as above.	Increased protection of biological diversity among fishes and marine life in SFRB, estuary, and coastal zone and greater maintenance of South West Atlantic LME and Brazil current
	Increment	.450		
Watershed management	Baseline	4.651	Better management of water	

program formulation <ul style="list-style-type: none"> <li>• Information Sharing and Dissemination</li> <li>• Quantification of Water Use, Use Conflicts, Hydrological Management</li> <li>• Financial Mechanisms</li> <li>• Formulation of Water Shed Management Program</li> </ul>			uses through controlled pricing, regulations, etc. and improved watershed management	
	Alternative	6.771	Same as above.	Positive impacts of watershed management applied to other international basins
	Increment	2.12		
TOTAL	Baseline	8.564		
	Additional Co-financing*	8.879		
	Alternative*	22.214		
	Increment	4.08		
Project support/administration		.280		
Monitoring and Evaluation		.070		
PDF Preparation		.341		
Total Increment		4.771		

\* Includes World Bank PROAGUA loan (\$8.625 M); UNEP and OAS Co-financing (\$.05M) and government counterpart (\$.204M) for project preparation.

**ANNEX 2 - LOGFRAME MATRIX**

<b>PROJECT PLANNING MATRIX</b>			
<b>SUMMARY</b>	<b>OBJECTIVELY VERIFIABLE INDICATORS</b>	<b>MEANS OF VERIFICATION</b>	<b>CRITICAL ASSUMPTIONS RISKS</b>
<b>OVERALL OBJECTIVES</b>			
Incorporation of land-based environmental concerns into development policies, plans and programs for the São Francisco River Basin for the protection of its coastal zone	Reduced pollution loads and mitigation and prevention of negative impacts on numbers and diversity of fish populations and populations of marine animals	Measurable improvements in the river basin and coastal zone environmental situation observed through regional monitoring programs	Governments* will agree to invest in the required baseline costs  Failure to do so would severely limit reclamation and rehabilitation options available for implementation following formulation of the watershed management program  strengthening of the Basin Committee should overcome this risk
<b>Outcomes</b>			
Improved river basin and coastal zone environmental analysis within the basin and its coastal zone	Endorsement of the Integrated Watershed Management Program by the Ministry of Environment, Water Resources and Legal Amazon, as well as by the Basin Committee and all the basin stakeholders	Meetings, reports and publications	Endorsement would facilitate appropriate exchange of information between agencies and improved sectoral approaches at the national level as embodied in the federal water law

Improved public and stakeholder participation through hands on-type involvement of communities in the remedial measures	Endorsement of the NGO and public participation plans by appropriate local and regional meetings	Meetings, reports and publications Implementation of demonstration projects by state and municipal governments, NGO and citizens	/Lack of appropriate fora for encouraging stakeholder participation is a risk. The strengthening of the Basin Committee should promote stakeholder participation
Development of the organizational structure and staffing capabilities needed to implement financial mechanisms for water rights and water charges, as provided for under federal law 9433/97, in representative sub-basins of the Rio Sao Francisco	Coordination of actions related to with river management and planning	Meetings, reports and publications	The legal mechanisms provided under the water law may not be fully implemented by the basin states; however strengthening of the Basin Committee, promulgation of appropriate laws and regulatory regimes for controlling environmental pollution, and availability of trained staff will bring a comprehensive and cohesive approach to watershed management in the SFRB
Quantification of Water Use, Use Conflicts and Hydrological Management through implementation of a decision-support system	Resolution of quantitative water use and allocation conflicts within the basin in a transparent and equitable manner	Meetings, reports and publications	Governments will agree and adopt the proposed DSS. This will be likely to be met given proposed inclusion of the DSS in PROÁGUA

<p>Formulation of the Watershed Management Program</p>	<p>Improved coordination of actions related with river management and planning</p> <p>Allocation and determination of water charges</p> <p>Identification of appropriate mechanisms to place water resources management within the basin on a sustainable footing</p>	<p>Meetings, reports and publications</p>	<p>As the formulation of the Watershed Management Program builds upon the synthesis of data and experiences, feasibility assessments and costs analyses developed in the preceding activities, it is imperative that these activities be finalized according to the workplan and in an acceptable manner. Based on the above assumptions, this is likely to happen</p>
<p><b>Components/Activities</b></p>			
<p><i><b>River Basin and Coastal Zone Environmental Analysis</b></i></p> <p>Evaluation of the environmental impacts of the river on the coastal zone including wetlands, beaches, and fish habitat as means of mitigation</p>	<p>Availability of various drafts and final version of the assessment reports and strategic program for sustainable economic development from the consultants</p> <p>Convening of steering committee meetings according to endorse these findings to agreed workplan; and inclusion of the findings in subsequent components / activities</p>	<p>Publication of assessments, consultants and meeting reports</p>	<p>It is assumed that the various drafts and final version of the assessment reports and strategic program for sustainable economic development will be ready on time according to the agreed workplan. However, contingency delays may happen and cannot really be evaluated</p>

<p><b><i>Public and Stakeholder Participation</i></b></p> <p>Identification and establishment of coordination between, persons and agencies having commercial or institutional responsibilities within the basin, including the fisheries, navigation, mining and agro-industrial sectors</p> <p>Demonstration of sustainable management measures for community-based implementation</p>	<p>Preparation of community-based management programs and training according to the agreed workplan</p> <p>Adoption of the management programs at the community level for the benefit of the coastal zone environment</p>	<p>Initiation of appropriate action at the state level and community level to implement the proposed programs and concept coastal zone protection</p>	<p>Governments and the basin community at large will agree to the management programs and training and with the concept of coastal zone management seems to be met since the basin communities are likely to be involved in the identification and demonstration of conservation measures in the watershed as well as in the dialogue process. Thus, actions formulated through this process will benefit from community insights and experiences and will be acceptable to the communities</p>
<p><b><i>Organizational Structure Development</i></b></p> <p>Pilot scale implementation of several policy instruments for implementing the water law and related state legislation in order to achieve measured improvements in both rate of water use and a degree of protection of downstream water quality; and development a framework for the implementation of the law in other basins</p>	<p>Preparation of draft proposals and state and community-based level discussions according initiation of agreed workplan</p> <p>Adoption of the environmentally-sound practices within agricultural, mining and urban economic sectors aimed at the protection and/or rehabilitation of critical areas by the basin community</p>	<p>Preparation of draft proposals and state and community-based level discussions according to the agreed workplan</p>	<p>Governments and the basin community at large will agree to the proposals for specific legislative actions and related capacity building programs. This seems likely to be achieved since the basin communities are to be involved in the dialogue process. Actions formulated through his process will benefit from community insights and experiences and will be</p>

			acceptable to the communities. Such reforms are also supported and encouraged by the federal law 9433/97
<p><b><i>Formulation of the WMP for the Basin</i></b></p> <p>Formulation of an WMP based on the synthesis of data and experience, feasibility assessments and costs analysis developed in the five preceding activities</p> <p>Dissemination of initial implementation of management actions to enhance international coordination and communication with other riparian countries</p>	<p>Preparation of drafts according to the agreed workplan</p> <p>Dissemination of information</p>	<p>Publication and adoption of the WMP</p>	<p>It is assumed that the governments and basin communities will actively cooperate in the development and further implementation of the WMP. This assumption is likely to be met as governments and basin communities will be directly involved in the preparation of the IWMP</p>

<b>Results</b>			
<p><b><i>River Basin and Coastal Zone Environmental Analysis</i></b></p> <p>Quantification of the historical evolution of the river and its estuary based upon an analysis of the changes in the rates and locations of sediment erosion and deposition within the river channel and estuary that affect navigation, river morphology, and shoreline wetlands</p> <p>Analysis and modeling of the behavior of the river flow and its effect on the transportation of sediments and nutrients under current and forecast future conditions</p> <p>Quantitative basis for the determination of strategic actions to optimize the multiple purpose utilization of the water resources of the basin and the protection and restoration of the coastal zone ecosystems currently adversely affected by land-based activities</p>	<p>Completion by of the various assessments and technical studies required for the WMP for sustainable development at the basin by the basin stakeholders; and endorsement by the steering committee</p>	<p>Meeting reports and various technical publications</p>	<p>The various assessments will be finalized in a manner acceptable to the Governments. This is likely to be achieved since environmental monitoring is currently on-going in the baseline development programs and investments in the hydrometeorological network</p>
<p><b><i>Public and Stakeholder Participation</i></b></p> <p>Rational allocation of water and water charges, the identification of water user</p>	<p>Endorsement of alternative means of economic production by the steering committee and adoption</p>	<p>Meeting reports, technical publications and training programs</p>	<p>Governments and the basin stakeholders will agree and adopt the proposed</p>



<p>groups, and the strengthening of community-based initiatives</p> <p>Identification of degraded lands and riparian areas in need of stabilization, and demonstration of appropriate remedial measures to protect the coastal zone</p>	<p>by the basin stakeholders</p> <p>Numbers of informed consumers</p> <p>Numbers of individuals trained</p>	<p>publications</p> <p>Activity progress</p> <p>Reports of the technical coordinator to the GEF and UNEP/OAS</p>	<p>alternative means of economic development and training and public environmental information will be accepted and disseminated to a wide audience. This is likely to be met since it is encouraged in federal law 9433/97</p>
<p><b><i>Organizational Structure Development</i></b></p> <p>Creation of a basis for a financially-sustainable basin management agency and contribution to the sustainable use and management of the water resources of the basin, including integration of environmental and coastal zone concerns into the overall management strategy for the system</p>	<p>Adoption of the legal assessment and improvement recommendations, and the conceptual basis for DSS and hydrological models, by the steering committee; and inclusion of the DSS in economic development program</p> <p>Increased information exchange among basin stakeholders</p>	<p>Meeting reports, publication of the legal assessment and of the conceptual and technical basis for DSS</p> <p>Activity progress reports of technical coordinator to the GEF and UNEP/OAS</p>	<p>Governments will agree to and adopt the recommended legislative and institutional changes and will support the public participation programming, staff training and strategic planning. This is likely to be met as coordinated management actions are embodied in the new federal law 9433/97 which seeks to enhance and strengthen the ability of the basin agency to undertake planning and management activities within the basin</p>

<p><b><i>Watershed Management Program Formulation</i></b></p> <p>Cooperative development of a comprehensive WMP by both the public and private sectors, based on a multi-sectoral, holistic approach to environmental management and economic development in the basin and its coastal zone, as provided for in Chapters 18 and 21 of Agenda 21</p> <p>Determination of appropriate methods and means of integrating community-based decision-making into the structure and function of the basin committee. The results of the action element will also enhance transparency and sharing of data throughout the basin, which will promote sustainable utilization and management of available water resources</p> <p>Development and use of a system of mathematical models of river hydraulics, hydrology and water use in the basin, to be included in a proposed decision support system, that will contribute to informed decision-making by stakeholders and agencies</p> <p>Formulation of related fiscal and legal mechanisms, including allocation of water rights and development of water charges and use regulations, for the sustainable management of the river and its coastal zone</p>	<p>Adoption of the Integrated watershed management Plan by the basin stakeholders and by the steering committee</p>	<p>Meeting reports and watershed management program</p>	<p>As the formulation of the Watershed Management program builds upon the synthesis of data and experiences, feasibility assessments and costs analyses developed in the preceding activities, it is imperative that these activities be finalized according to the workplan and in an acceptable manner. Based on the above assumptions, this is likely to happen</p>
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\* governments means appropriate federal, state or municipal governments and agencies

## ANNEX 3

## STAP ROSTER TECHNICAL REVIEW

Björn Kjerfve  
Professor of Marine and Geological Sciences  
University of South Carolina

**Integrated Management of Land-based activities in the São Francisco Basin**

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This GEF project is a US\$ 22.2 million water management program for the 640,000 km<sup>2</sup> tropical Rio São Francisco basin in northeastern Brazil. The population of the river basin is 13,000,000. The Rio São Francisco has its headwaters in Minas Gerais south of Belo Horizonte, and discharges 120 km<sup>3</sup> annually (3,800 m<sup>3</sup> s<sup>-1</sup> on the average) into the South Atlantic Ocean on the border between Sergipe and Alagoas. On the 3,200 km route to the sea, the river traverses a gradient of climatic zones, the climate becoming increasingly drier as the river winds through the Sertão. The richest *penaeid* shrimp fishery in Brazil occurs where the river discharges into the Atlantic. Further offshore flows the Brazil Current towards the south with a transport of anywhere from 20,000,000 to 40,000,000 m<sup>3</sup> s<sup>-1</sup>. Four large dams have been constructed along course of the river and are a major source for hydroelectric power with a combined yield of 10,000 MW. River water is also extensively used for irrigation of agricultural lands. The river has a rich cultural history and played a central role in the development of the interior of Brazil in past centuries. This GEF project appears well justified in terms of the importance of the Rio São Francisco to the continued development of the arid Sertão and is an opportunity for coordinated sustainable development of both river basin and coastal areas.

**Scientific and technical soundness of the project:**

The project is well conceived, and justifications are articulated convincingly. It is encouraging to see this type of project, which is focused on studies and analyses aimed at derivation of an intelligent set of plans for a consensus of optimized management and development of a major river basin.

**Identification of GEF benefits and/or drawbacks of the project:**

A major focus of the project is the coastal areas of Alagoas and Sergipe. It is encouraging to see that there now exists a realization that all activities within a drainage basin potentially have coastal consequences. This vision, which ought to be adopted elsewhere, is an overall benefit, and GEF plays an important role in encouraging this vision. Further, rational development and management of the river resources is of economic benefit to Brazil, the affected riparian states, special interest non-governmental organizations, and everyone living within the São Francisco basin, and thus is a benefit to GEF. There are no obvious drawbacks to the project although it is an expensive project.

**Appropriateness:**

The project as a whole appears to fit well within the context of the goals of GEF, and the operational strategies and priorities of the project would appear to be of high relevance to GEF.

**Regional context:**

The rational development and water management of the Sertão as proposed in this proposal is applauded. This region, a large portion of the São Francisco basin, is as of yet under-developed, at least partially as a result of the arid climatic conditions. However, the Rio São Francisco is a renewable hydroelectric resource on a grand scale. Well managed agriculture irrigation has the potential to enhance regional agricultural production. Better soil management and pollution and erosion control is encouraging. Also, the coastal region holds immense potential for tourism and ecotourism development, and is already a rich shrimp fishery resource.

**Replicability:**

If successfully executed, this project could well serve as a model for how to implement sustainable development in other large and small drainage basins by emphasizing the need for studies, analyses, and consensus solutions.

**Sustainability:**

The results of the project, when implemented, would potentially result in significant sustainable yields: optimum hydroelectric power generation, better water and soil management, pollution control, improved agricultural production as a result of holistic irrigation strategies, a blue-print for coastal tourism development, and optimized fisheries, and as an overall result, enhanced economic development.

**Linkages to other focal areas, programs, and/or action plans:**

This GEF project appears to be well linked to national and regional programs, and as long as project activities take adequate advantage of the international expertise provided by the participating international organizations, the linkages are good.

**Other beneficial or damaging environmental effects:**

The fact that the project will generate feedback between water resource management in the drainage basin and how the coastal area is utilized and developed is an important and novel benefit. There are no damaging environmental effects associated with the project.

**Degree of involvement of stakeholders in the project:**

The stakeholders represent an impressive combination of Federal Government organizations, state government organizations, municipal government organizations, universities, non-governmental organizations, and international organizations. As long as all units listed in the proposal are involved equitably in the execution of the project, there is great potential for successful execution.

**Capacity-building aspects:**

The studies and analyses proposed under this GEF project would benefit both government and non-government organizations by providing a strategic basin-scale blueprint for water management and development but with special attention directed towards the needs and priorities of each sub-region. The execution of the project would also have the potential to enhance the intellectual capacity and infrastructure of universities in the river basin. As a result, the public educational system is likely to improve and maybe also public health facilities.

**Innovativeness of the project:**

The scale of the project, an attempt to develop a holistic water management plan for a major river basin, is a very innovative approach. As long as equitable attention is given to competing political and economic interests such that recommendations represent a balance between competing points of view, and an attempt is made to reach consensus solutions whenever possible, the project has the potential of becoming a success with minimal associated risks.

**Implementing Agency Response**

Prof Dr Kjerfve's review is strongly supportive of this project. No changes in the project were required.

**ANNEX 4****PUBLIC INVOLVEMENT PLAN SUMMARY**

1. The formulation of the proposal for the Integrated Management of the Water Resources of the São Francisco Basin and its Coastal Zone, including its proposed GEF components, has involved extensive and broad-based participation by representatives of the municipal, state and national Governments, academic and research institutions, private sector representatives and non-governmental organizations. The participation process was facilitated by a series of consultative workshops, conducted in Belo Horizonte on 25 November 1997, Penedo on 9 December 1997, and Petrolina on 2 February 1998.

2. Approximately 270 persons representing more than 100 institutions, government agencies and NGOs, participated in the public meetings and provided inputs in drafting this proposal, many of which are expected to participate in the implementation of the project. This project proposal is based on some 135 project concept documents proffered during the public meetings.

3. A list of those institutions that participated in the public meetings convened prior to the preparation of this project document, and which are expected to participate in project implementation as well as subsequent public meetings, is presented below. Governmental organizations are categorized as federal, state, or municipal government level agencies. Nongovernmental organizations and other governmental bodies are also listed. State governmental agencies and nongovernmental organizations are identified by state; namely, Alagoas (AL), Bahia (BA), Minas Gerais (MG), Pernambuco (PE), and Sergipe (SE). Where the participating organizations are known by an acronym, the acronym is also shown.

**4. FEDERAL GOVERNMENT ORGANIZATIONS**

- Ministério do Meio Ambiente dos Recursos Hídricos e da Amazônia Legal - MMA
  - Secretaria de Recursos Hídricos - SRH
  - Secretaria do Meio Ambiente - SMA
  - Coordenação Nacional do Gerenciamento Costeiro - GERCO
  - Companhia de Desenvolvimento do Vale do São Francisco - CODEVASF
  - Instituto Brasileiro do Meio Ambiente - IBAMA
- Comitê Executivo de Estudos Integrados do Vale do São Francisco – CEEIVASF
- Companhia Hidrelétrica do São Francisco - CHESF
- Companhia de Pesquisa de Recursos Minerais - CPRM
- Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA
- Fundação Nacional do Índio - FUNAI
- Ministério Público Federal de Alagoas
- Universidade Federal de Alagoas - UFAL
- Universidade Federal de Minas Gerais - UFMG
- Universidade Federal de Pernambuco - UFPE

## 5. STATE GOVERNMENT ORGANIZATIONS

- Secretaria de Agricultura e Irrigação do Estado de Alagoas (AL)
- Secretaria de Planejamento do Estado de Alagoas (AL)
- Empresa de Pesquisa Agropecuária do Estado de Alagoas - EPEAL (AL)
- Instituto do Meio Ambiente - IMA (AL)
- Núcleo de Meteorologia e Recursos Hídricos (AL)
- Polícia Militar do Estado de Alagoas (AL)
- Secretaria de Recursos Hídricos, Saneamento e Habitação do Estado da Bahia (BA)
  - Superintendência de Recursos Hídricos
- Centro Interamericano de Recursos da Água - CIRA - Salvador (BA)
- Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável - SEMAD (MG)
- Secretaria do Trabalho e Ação Social da Criança e do Adolescente - SETASCAD (MG)
- Centro de Estudos e Pesquisa Educacionais de Minas Gerais - CEPEMG (MG)
- Companhia de Águas e Saneamento - COPASA (MG)
- Companhia Energética de Minas Gerais- CEMIG (MG)
- Fundação Centro Tecnológico –CETEC (MG)
- Fundação Estadual do Meio Ambiente - FEAM (MG)
- Fundação João Pinheiro – FJP (MG)
- Fundação Rural Mineira – Colonização e Desenvolvimento Agrário – RURALMINAS (MG)
- Instituto Estadual de Florestas - IEF (MG)
- Instituto Mineiro de Gestão das Águas - IGAM (MG)
- Processamento de Dados do Estado de Minas Gerais - PRODEMGE (MG)
- Superintendência do Desenvolvimento e Cooperação - SUDECOOP (MG)
- Universidade do Estado de Minas Gerais - UEMG (MG)
- Secretaria de Ciência e Tecnologia e Meio Ambiente de Pernambuco (PE)
- Secretaria de Planejamento, Ciência e Tecnologia - SEPLANTEC (SE)
- Administração Estadual do Meio Ambiente de Sergipe - ADEMA (SE)

## 6. MUNICIPAL GOVERNMENT ORGANIZATIONS

- Prefeitura Municipal de Belo Monte (AL)
- Prefeitura Municipal de Feliz Deserto (AL)
- Prefeitura Municipal de Igreja Nova (AL)
- Prefeitura Municipal de Penedo (AL)
- Prefeitura Municipal de Piaçabuçu (AL)
- Prefeitura Municipal de São Francisco (AL)
- Prefeitura Municipal de Baianópolis (BA)
- Prefeitura Municipal de Catolândia (BA)
- Prefeitura Municipal de Cotegipe (BA)
- Prefeitura Municipal de Cristópolis (BA)
- Prefeitura Municipal de Curaçá (BA)



- Prefeitura Municipal de Dom Basílio (BA)
- Prefeitura Municipal de Bom Despacho (MG)
- Prefeitura Municipal de Divinópolis (MG)
- Prefeitura Municipal de Itaúna (MG)
- Prefeitura Municipal de Lagoa Grande (MG)
- Prefeitura Municipal de Lagoa da Prata (MG)
- Prefeitura Municipal de Pará de Minas (MG)
- Prefeitura Municipal de Pitangui (MG)
- Prefeitura Municipal de Rio Acima (MG)
- Prefeitura Municipal de São Gonçalo do Abaeté (MG)
- Prefeitura Municipal de Três Marias (MG)
- Serviço Autônomo de Água e Esgoto de Sete Lagoas (MG)
- Prefeitura Municipal de Brejo Grande (SE)
- Prefeitura Municipal de Poço Redondo (SE)
- Prefeitura Municipal de Neópolis (SE)

## **7. NONGOVERNMENTAL ORGANIZATIONS (NGOs)**

- Associação de Agricultores - Igreja Nova (AL)
- Associação de Capela - Penedo (AL)
- Associação dos Concessionários do Projeto Marituba - Penedo (AL)
- Associação dos Moradores do Bairro Senhor do Bonfim - Penedo (AL)
- Associação dos Moradores de Ponta Morfina - Penedo (AL)
- Associação dos Moradores do Vale do Boacás - Igreja Nova (AL)
- Associação dos Trabalhadores Rurais de Marizeiro - Penedo (AL)
- Casa do Penedo - Penedo (AL)
- Central Estadual das Associações dos Assentados e dos Pequenos Agricultores de Alagoas - Maceió (AL)
- Colônia Z 12 - Penedo (AL)
- Cooperativa dos Produtores Rurais de Penedo (AL)
- Federação dos Pescadores de Alagoas - Maceió (AL)
- Fundação Teotônio Vilela - Maceió (AL)
- Associação do Canaã - Sobradinho (BA)
- Associação dos Produtores e Irrigantes - Barreiras (BA)
- Fundação de Desenvolvimento Integrado do São Francisco - Ibotirama (BA)
- Fundação de Desenvolvimento Interior do São Francisco - Xique-Xique (BA)
- Movimento Sociedade Alternativa – Juazeiro (BA)
- Projeto Ararinha Azul - Curaçá (BA)
- Fundação Sustentabilidade e Desenvolvimento - Brasília (DF)
- Água - Consultores Associados - Belo Horizonte (MG)
- Associação Ambiental do Alto São Francisco - Lagoa da Prata (MG)
- Associação Mineira de Defesa do Ambiente - Belo Horizonte (MG)
- Associação Municipal da Micro-região do Vale do Itapecerica - Divinópolis (MG)
- Brigada Ecológica - Belo Horizonte (MG)
- Casa Nobre Consultoria - Divinópolis (MG)
- Colônia de Pescadores de Três Marias - Três Marias (MG)

- Comitê da Bacia do Graça - Lagoa Grande (PE)
- Conselho Municipal de Conservação e Defesa do Meio Ambiente - Belo Horizonte (MG)
- Consórcio ECOPLAN/MAGNA/CAB - Belo Horizonte (MG)
- FAHMA Planejamento e Engenharia Agrícola Ltda – Belo Horizonte (MG)
- Fazenda Terra Nova - Paracatu (MG)
- Movimento de Cidadania pelas Águas - Belo Horizonte (MG)
- Partido Verde de Petrolina (PE)

## **8. INTERNATIONAL ORGANIZATIONS**

- Organização dos Estados Americanos – OEA/OAS
- Programa das Nações Unidas para o Meio Ambiente – PNUMA/UNEP
- Banco Mundial – BM/The World Bank

## **9. FOREIGN GOVERNMENT ORGANIZATIONS**

- Tennessee Valley Authority – TVA (USA)

## ANNEX 5

**THE WORLD BANK PROAGUA PROJECT**

The US \$ 8.6 million Sao Francisco Watershed Component of the Watershed Resources Management Project (PROAGUA) is described as follows in The World Bank (Draft) “Project Appraisal Document for a Proposed Loan in the Amount of US\$198.0 Million Equivalent to the Federative Republic of Brazil for a Water Resources Management Project”, dated January 29, 1998:

‘A program that attempts to change the paradigm for water resources management in the Northeast towards efficient and effective allocation and use of the region’s scarce water resources has to include a sound management plan for the Sao Francisco river basin, which is the major river in this region and traverses five States. The Sao Francisco river basin is experiencing a number of problems – among which, the degradation of its upper-basin where over 75% of the river total water flow is generated; intensification of water conflicts within the basin, especially between hydropower and irrigation; and significant potential regional conflicts as the proposal of a trans-basin diversion to supply water to other States (Paraiba, Ceara and Rio Grande do Norte) continues to be the most controversial water issue in the Northeast. Solutions to these complex problems require the creation of a basin committee as well as of local WUAs [water user associations]; participatory management of the basin’s water resources; the implementation of sound water resources management practices; the establishment of A,O&M [administration, operation and maintenance] plans for existing and new infrastructure; the development of a well-coordinated systems [sic] for the allocation of water rights in the basin; the strengthening of Federal, State and local institutions. In particular, solutions depend on political agreement on the principles that should guide the allocation of water rights, by the Federal and State Governments, for users in the Sao Francisco river basin and for the eventual trans-basin diversion. Such agreement may be reached through a National Water Resources Council, the establishment of which is stipulated in the National Water Resources Law, with participation of authorities of the highest possible level (ministers and Governors). One basic principle for negotiation is that of water as an economic good, as defined by the Water Law. This implies that more efficient uses of water, in economic terms, should be of high priority, while some financial compensation could be envisaged for the less efficient, lower priority uses of water. Depending on the magnitude of these compensations, Government subsidies aiming at social equity, currently implicit, could be reduced and become more explicit.

‘This component would support primarily the creation and effective start-up of the Sao Francisco River Basin Committee, as defined by the National Water Law; provide financial support towards the development of WUAs in the basin; and develop a simulation model for water allocation under the principle that water is an economic good, with emphasis on aspects such as: (i) the system of water allocation; (ii) the costs for the different user groups; (iii) revenues of the Water Agency, also to be created as per the Water Law; (iv) the priority investments, at river basin level, that would be financed by the future Sao Francisco Water Agency. The component would be carefully designed to avoid duplication with a number of other initiatives taking place in the basin. To support the creation of the WUAs,

the component would finance small pilot activities in miicro-watershed management, recuperation of river gallery forest, pollution and erosion control, training and education programs, among others.'

## ANNEX 6

**AVAILABLE REFERENCE DOCUMENTS**

1. This annex presents a list of publications on the SFRB and its coastal zone that were referred to during the PDF activities or that were prepared as a result of the PDF activities. These documents, categorized into publications relating to (a) natural resources and the environment, (b) water resources management, (c) regional economy, (d) institutional strengthening and support, and (e) public participation, together with the project concepts presented during the public participation workshops (summarized in Annex 4), form the documented basis for the formulation of the WMP proposed as the outcome of this project.

**2. NATURAL RESOURCES AND ENVIRONMENT**

CEEIVASF. “*Relatório de Trabalho sobre a Situação das Várzeas e Lagoas Marginais no Baixo Curso do Rio São Francisco*” – Versão Preliminar, Elaboração ADEMA-SE e IMA-AL, Brasília, 1997.

CODEVASF/FAO. “*Estimativa da Erosão Anual e Potencial no Vale do Rio São Francisco*”, Brasília, dezembro, 1993.

CODEVASF. “*Estudos Hidrológicos de Subsídio Para os Estudos Fluviomorfológicos do Rio São Francisco*” - Simons & Associates, Brasília, setembro, 1997.

CODEVASF. “*PROJETO CAATINGA - Projeto de Conservação do Meio-Ambiente e de Desenvolvimento Agropecuário Sustentável na Área de Caatinga do Vale do São Francisco*” - Ministério do Meio Ambiente, dos Recursos Hídricos e da Amazônia Legal – Brasília, março de 1996.

CODEVASF. “*Projetos de Irrigação no Vale do São Francisco*” - Ministério do Meio Ambiente, dos Recursos Hídricos e da Amazônia Legal – Brasília, novembro, 1996.

ELETROBRÁS. “*Diagnóstico das Condições Sedimentológicas dos Principais Rios Brasileiros*”, Centrais Elétricas S.A., Diretoria de Planejamento e Engenharia, Rio de Janeiro, agosto de 1992.

Landim, J.M. Bittencourt, A.C.S.P. e Martin, L. “*Esquema Evolutivo da Sedimentação Quaternária nas Feições Deltaicas dos Rios São Francisco (SE/AL), Jequitinhonha (BA), Doce (ES) e Paraíba do Sul (RJ), Dominguez*” – Revista Brasileira de Geociência, São Paulo, dezembro, 1981.

Landim, J.M. Bittencourt, A.C.S.P. e Martin, L. “*O Papel da Deriva Litorânea de Sedimentos Arenosos na Construção das Planícies Costeiras Associadas às Desembocaduras dos Rios São Francisco (SE/AL), Jequitinhonha (BA), Doce (ES) e Paraíba do Sul (RJ), Dominguez*” – Revista Brasileira de Geociência, São Paulo, junho, 1983.

MMA/FMA/DEPAM. “*Programa Para o Gestao Integrada dos Recursos Naturais da Bacia do Rio Sao Francisco*” – Recursos Pesqueiros Como Ponto Focal, Brasilia, julho, 1997.

PLANVASF. Plano Diretor para o Desenvolvimento do Vale do São Francisco, “*Análise dos Recursos Naturais Para a Atividade Agropecuária*”, Convênio Governo Brasileiro - OEA - Brasília, julho, 1989.

PLANVASF. Plano Diretor para o Desenvolvimento do Vale do São Francisco, “*Plano Diretor Síntese*”, Convênio Governo Brasileiro - OEA - Brasília, dezembro, 1989.

PLANVASF. Plano Diretor para o Desenvolvimento do Vale do São Francisco, “*Plano Setorial de Energia*”, Convênio Governo Brasileiro - OEA - Brasília, julho, 1989.

PLANVASF. Plano Diretor para o Desenvolvimento do Vale do São Francisco, “*Programa Para o Desenvolvimento da Irrigação*”, Convênio Governo Brasileiro - OEA - Brasília, junho, 1989.

PLANVASF. Plano Diretor para o Desenvolvimento do Vale do São Francisco, “*Programa de Desenvolvimento das Áreas Indígenas da Região do Vale do São Francisco*”, Convênio Governo Brasileiro - OEA - Brasília, dezembro, 1989.

PLANVASF. Plano Diretor para o Desenvolvimento do Vale do São Francisco, “*Programa Para o Desenvolvimento da Pesca e da Aquicultura*”, Convênio Governo Brasileiro - OEA - Brasília, julho, 1989.

Senado Federal - Comissão Especial Para o Desenvolvimento do Vale do Rio São Francisco. Volume I , “*Notas Taquigrafias dos Painéis e Exposições*”, Brasília, 1995.

SEPLANTEC. “*Processo Erosivo na Foz do Rio São Francisco*” – Relatório Técnico N° 01/97, CPERH, Aracaju, junho, 1997.

Simpson, L.D. “*The São Francisco River: Lifeline of the Northeast*”, Latin America Water Forum, São Paulo, Brazil, January 1997.

### **3. WATER RESOURCES MANAGEMENT**

CODEVASF/FAO. “*Ordenamento dos recursos hídricos da bacia do rio São Francisco: erosão*”. TCP/BRA/2257. Brasília.

CODEVASF/OEA. “*Plano Diretor para o Desenvolvimento do Vale do São Francisco*” – Relatório Final. Brasília: PLANVASF, 1989, 515 p.

CODEVASF. “*Plano de Desenvolvimento do Sistema de Gestão de Recursos Hídricos da Bacia Hidrográfica do Rio São Francisco (PDSG-RH/BHSF)*” Referenciais e metodologias

propostas para concepção, implantação e desenvolvimento do sistema. Brasília, junho, 1997, 52 p.

CODEVASF. “*Projetos de Irrigação no Vale do São Francisco*”. Companhia de Desenvolvimento do Vale do São Francisco, Brasília, novembro 1996.

Costa, W.D. e Costa, V.D. “*Disponibilidades hídricas subterrâneas na região Nordeste do Brasil*”. A Água em Revista, ano V, no. 9, CPRM, Belo Horizonte, novembro, 47-59.

Development & Resources Corporation. “*Plano de desenvolvimento integrado do vale do São Francisco*”. Rio de Janeiro, CODEVASF, 1974.

DNAEE. “*Diagnóstico e planejamento da utilização dos recursos hídricos da bacia do rio São Francisco*”. Brasília, DNAEE/CNEC, 1979, 3v.

DNAEE. “*Plano Nacional de Recursos Hídricos*” - Documento preliminar, consolidando informações já disponíveis. Brasília, 1985, 321 p.

Duda, A.M. “*Addressing Global Environment Issues Through a Comprehensive Approach to Water Resources Management – Perspectives from the São Francisco and Plata Basin*”. GEF, Washington, DC, 1997.

ELETROBRÁS. Reunião específica de energia do Grupo de Trabalho São Francisco - programa de ações; Ata. Rio de Janeiro, 8 de abril, 1996.

FGV. Plano Nacional de Recursos Hídricos – “*Termos de referência para a elaboração de Relatórios de Grandes Bacias*”. Fundação Getúlio Vargas: Relatório Técnico, Rio de Janeiro, agosto, 1997.

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## **GEOGRAPHY OF THE SFRB AND PLANNING CONTEXT**

1. The Upper Sub-basin is located in the southernmost part of the Basin, primarily within the State of Minas Gerais, in a region characterized by rolling hills and tablelands. The climate is humid temperate to sub-tropical, with an average precipitation of approximately 1,250 mm per year. This sub-basin contributes more than 70 percent of the overall flow of the river. Belo Horizonte, the capital of the State of Minas Gerais, is located in this area, as are other moderately sized cities including Patos de Minas, Januaria, and Betim. Development within this reach of the river includes large industrial plants, mainly for steel production and manufacturing of paper and automobiles, diversified mining, and irrigated agriculture based on the large Tres Marias Dam. Agricultural production is primarily soybeans and cattle with higher value crops, such as fruit cultivars grown within irrigated areas. This region also has large areas of cultivated forests of eucalyptus for use in the paper industry and in the production of charcoal for the steel industry. Over half of the population of the basin, or more than 7 million (1994 Census) people, lives in this sub-basin.

2. The Middle Sub-basin is located in the states of Minas Gerais and Bahia and is characterized by two distinct zones. The western portion of the sub-basin is fed by orographic rainfall in the elevated areas, has perennial water courses, and is relatively fertile, supporting *cerrado* or *caatinga* vegetation and agricultural production in both private and public irrigation schemes. The eastern portion of the sub-basin is characterized by intermittent or seasonal water courses, and supports considerably less development. *Caatinga* vegetation dominates in this semi-arid area, and agricultural production is limited to cattle and goat production, subsistence agriculture, and limited irrigated agriculture where water is available. Precipitation averages around 900 mm per year and there are no dams or reservoirs in this sub-basin. The population is rural and sparse, mostly involved in agricultural activities and dependent on the river for irrigation, transportation and water supply, with more than half of the families classified as indigent or poor.

3. The Lower-Middle Sub-basin is located in the states of Bahia and Pernambuco. The river is the boundary between the two states and represents a major source of irrigation water for fruit and vegetable production in the region of Petrolina and Juazeiro. Vegetation is predominantly *caatinga*, distinctive of the *sertão* region of Brazil, and the soils are mostly thin and non-productive. Precipitation averages about 500 mm per year. Development in this region has been strongly influenced by federally sponsored irrigation projects, implemented by the Companhia de Desenvolvimento do Vale do São Francisco (CODEVASF), which provided the base for subsequent private investment in high value export vegetable crops. This sub-basin also contains the majority of the hydroelectric power infrastructure within the Rio São Francisco Basin: the Sobradinho ( $34.1 \times 10^9 \text{ m}^3$ ; 1,050 MW), Itaparica ( $10.7 \times 10^9 \text{ m}^3$ ; 1,500 MW), Paulo Afonso ( $1 \times 10^9 \text{ m}^3$ ; 4,400 MW) and Xingo ( $3.3 \times 10^9 \text{ m}^3$ ; 3,000 MW) dams provide renewable energy for most of Northeastern Brazil. This infrastructure also provides an opportunity for the development of river-borne inter-modal transportation systems as the river was originally marginally navigable in this region through to its upper reaches. In addition, an inter-basin transfer scheme, proposed for construction below the Sobradinho

Dam to supply water to the Northeastern States of Ceara, Rio Grande do Norte and Paraíba, is still being analyzed. Most of the population is located in the cities of Juazeiro in Bahia and Paulo Afonso and Petrolina in Pernambuco.

4. The Lower Sub-basin includes the states of Bahia, Alagoas, Sergipe and Pernambuco; the river forming the border between the states of Bahia and Pernambuco and between the states of Alagoas and Sergipe. Vegetation in this sub-basin is mostly *cerrado* (and *Mata Atlântica* in the humid lower reaches), although there are large semi-arid areas, covered by *caatinga*, in the northernmost portion of the sub-basin. Precipitation varies from 1,300 mm per year along the Atlantic coast to 500 mm per year along the upstream boundary. Population is concentrated near the coast in small municipalities and rural communities, and is generally classified as poor or indigent. Sugar and alcohol are the main agricultural products of the sub-basin, with estuarine and coastal marine fisheries forming an important source of food and income. River navigation was historically important in the transportation of sugar and other agricultural products, and limestone and building materials, but has declined in recent years due to aggradation of the river channel which forced the development of the regional road system.

5. The lowest reaches of the sub-basin contain an extended estuary and estuarine wetlands. The ecological regime of the delta and coastal areas represents an asset that has not been fully defined or protected. Some of this area has been developed for agricultural production using a system of polders and drainage channels. The beach to the south of the delta is a principle nesting area of threatened and endangered sea turtle species, while the oceanic end point of the river debouches across the North East Brazil Shelf to the South West Atlantic LME. This entire area has been significantly modified by the regulation of the river upstream of the estuary and coastal zone (e.g., erosion of river banks, sedimentation, formation of islands in the delta, and erosion of the southern extreme of the delta). These modifications not only affect the estuary by altering flooding cycles, but also impact the nearshore marine environment by modifying the nutrient and sediment content of the river water, affecting marine fauna, and the sediment and turbidity dynamics of the estuary with observed, although unquantified, changes in the aquatic fauna, flora and geomorphology of the river mouth. This project will focus on fully identifying and quantifying these impacts, especially those relating to land-based activities within the watershed, and developing a program of strategic actions to minimize the negative environmental impacts of land-based activities on the coastal marine environment while supporting sustainable economic development in the basin.

6. The Rio São Francisco has been subjected to a significant degree of infrastructural modification as a consequence of public efforts to promote development. The principal Federal entities having responsibilities within the basin are CODEVASF (Development Company of the São Francisco River), CHESF (Hydroelectric Company of the São Francisco River, the major power agency in the basin), and SUDENE, an organization created in 1959 for the purpose of comprehensive planning and support to development in Northeastern Brazil. In 1984 the Executive Committee of Integrated Studies of the Basin (CEEIVASF) was created, within the framework of the Special Commission for Integrated River Basin Studies in Brazil, to undertake specific planning studies in the basin. This Committee was among the first to consider the São Francisco River Basin as a hydrologic unit, but the Committee was restricted by its mandate to the preparation of studies, and it lacked the institutional

independence and financing to successfully implement a comprehensive program of river basin management. Other official organizations with interests in the São Francisco Basin include the Inter-State Parliamentary Commission for the Development of the Rio São Francisco (CIPE) composed of the Presidents of the Legislative Assemblies of the five riparian States, and UNIVALE, a Union of Municipal Authorities in the basin.

7. In 1989, a Master Plan for the Development of the São Francisco River Valley (PLANVASF) was completed, with the assistance of the General Secretariat of the Organization of American States (OAS), and was designed to provide incentives to the public and private sectors for the development of the basin. This plan included proposals for the development of natural and water resources, increased food production through irrigated agriculture, increased power generation supplying the National Network, increased water and sanitation services, improved river navigation, and enhanced environmental protection. This plan was adopted as a part of Federal Law 8851/94, as the Plan of Economic and Social Development of Northeastern Brazil.

8. In January 1997, the Federal Government passed Law 9433/97, creating the National Policy on Water Resources and establishing public institutions (basin committees) for the issuance of water rights and implementation of water use payment systems. With the approval of the National Policy Committee on Water Resources, as established by the National Constitution, the Federal Government is promulgating criteria and guidelines to be followed by states in implementing federal law 9433/97. Presently the States of Bahia, Pernambuco and Sergipe have passed legislation consistent with these objectives, principles and guidelines and are creating institutions to implement the new law at the State level. The States of Minas Gerais and Alagoas are presently modifying or creating water legislation in order to comply with federal regulations. Implementation of these laws will create a climate that should address many of the concerns identified by the Special Commission for Development of the São Francisco Valley. This Commission, created by Act No. 480 of the Federal Senate, concluded that activities undertaken in the basin have been fragmented and sectoral, and that, as a result, the necessary legal or institutional framework for implementing an integrated management approach has not been developed. Implementation of an holistic and integrated program of river basin and coastal zone management was recommended. Strategic programs of action identified through this project and its complementary investment activities (to be implemented through The World Bank, MMA, and Secretariat for Regional Policy (SEPRE)) will seek to catalyze actions to address these issues in a practical and meaningful manner.

9. Activities in the Brazilian Coastal zone are regulated by Federal Law No 7661/88, the National Environment Program. This law, *inter alia*, establishes the National Coastal Management Plan, the principle objectives of which are the sustainable use of natural resources in the Coastal Zone, and preservation, conservation and rehabilitation of ecosystems in the Coastal Zone to promote sustainable development. A coastal zone inventory and macrodiagnostic, including the Rio São Francisco estuary, was completed in 1996 by the Government of Brazil with support from The World Bank. This study identified in a mapping format the major human uses of the coastal zone of Brazil, environmentally sensitive sites, and conservation units and reserves, which, in the Rio São

Francisco coastal zone, are related primarily to agricultural use and conservation of endangered species, including sea turtles.

## ANNEX 8

**PROPOSED WORK PROGRAM**

Project Identifier	GF/1100-98-
Project Name:	<b>INTEGRATED MANAGEMENT OF LAND-BASED ACTIVITIES IN THE SÃO FRANCISCO BASIN</b>
Implementing Agency:	UNEP
Executing Agency:	OAS Ministerio do Meio Ambiente, dos Recursos Hidricos e da Amazonia Legal do Brasil (MMA), Secretaria de Recursos Hidricos (SRH).
Requesting Country or Countries:	Brazil
Country Eligibility:	Under paragraph 9(b) of the Instrument.
Focal Area:	International Waters
Cross-cutting areas	Land Degradation
GEF Programming Framework:	OP 10
Estimated Starting Date	October 1998
Project Duration:	2.5 years.

1. This project develops a watershed management program (WMP) for the SFRB, which discharges into the South West Atlantic Large Marine Ecosystem and Brazil Current. The strategic program of action for the integrated and sustainable management of this system and its coastal zone to be formulated during this project will address the physical, biological, chemical and institutional root causes of the progressive degradation which is affecting the basin and, particularly, the coastal ecosystems. The project will focus on the use of economic instruments and catalyze implementation activities designed to facilitate sustainable development within the basin and coastal zone, and complements basin-scale interventions by the Government of Brazil, financed in part from national sources and by The World Bank through the Program for Water Development (PROAGUA) and other donors. The project forms the Latin American demonstration project under the Global Program of Action for the Protection of the Marine Environment from Land-based Activities (GPA) GEF operational program element.

2. The Rio São Francisco Basin extends over approximately 640,000 km<sup>2</sup>, comparable to the drainage basins of the Colorado or Columbia rivers of North America, and discharges across the North East Brazil Shelf to the Southwest Atlantic Large Marine Ecosystem (LME) and Brazil Current. The river covers a large portion of the area known as the “Drought Polygon of Brazil” as it traverses climatic zones ranging from humid to arid as it flows through five states in Northeastern Brazil; i.e., Minas Gerais, Bahia, Pernambuco, Alagoas and Sergipe. The Federal District of Brasilia and the State of Goias are also sometimes included in the watershed as the headwater tributaries originate in these areas. The basin is generally divided into the Upper, Middle, Lower Middle, and Lower sub-basins, plus the oceanic end point, each with distinct environmental and socio-economic characteristics. The estuarine wetlands

located at the debouchment of the river into the South West Atlantic form a particularly important and environmentally sensitive interface between the riverine and marine environments. The ecological structure and function of this interface, as well as its physical integrity, is currently under threat due to unsustainable hydrological and land use management practices within the basin. Except for flood flows during the wet season, flow is contributed primarily from the humid and semi-humid areas near the headwaters. Tributaries in the arid and semi-arid regions of the Middle and Lower Middle sub-basins are largely intermittent, although flood flows in these streams may cause localized problems of flooding, erosion and sedimentation which affect the entire lower portion of the river system and the coastal zone. Some 13 million people are resident in this basin, principally concentrated in the upper sub-basin.

**3.** Building upon previous studies, this GEF project will help the Government of Brazil to promote sustainable development of the SFRB and its coastal zone, based upon the implementation of a WMP integrating the watershed and coastal zone. The goals of this Project are (i) to assist the Government of Brazil to incorporate land-based environmental concerns into development policies, plans and programs for the Basin and for the protection of its coastal zone; and (ii) to conduct pilot demonstration activities during WMP formulation to gain information needed for management purposes.

**4.** The formulation of the proposal for the Integrated Management of the Water Resources of the São Francisco Basin and its Coastal Zone, including its proposed GEF components, has involved extensive and broad-based participation by representatives of the municipal, state and national Governments, academic and research institutions, private sector representatives and non-governmental organizations. The participation process was facilitated by a series of consultative workshops, conducted in Belo Horizonte in the upper sub-basin during November 1997; Penedo in the lower sub-basin and estuary during December 1997; and, Petrolina in the middle and lower middle sub-basins during February 1998. Follow-up consultations were held with participants in the workshops and with other selected personnel from the SRH/MMA during February 1998 to prepare the project brief, which was subsequently endorsed by the GEF project preparation steering committee, which met in Brasilia during March 1998. Final preparation of the project brief was completed in Washington DC during March 1998 in consultation with representatives of the Implementing Agencies (UNEP, The World Bank, and UNDP).

**5.** Approximately 270 persons representing more than 100 institutions, government agencies and NGOs, participated in the public meetings and provided inputs in drafting this proposal, many of which are expected to participate in the implementation of the project. This proposal is based on some 135 project concept documents prepared during the PDF-B process. A full review of reports and basic documentation available in different Government agencies, both of the Federal Government and the States, and contacts with those agencies, as well as with private sector representatives, academic institutions and NGOs, was also completed during the PDF-B process.

**6.** Proposed Project Components correspond to those identified in the PDF-B Grant Proposal. The project components, comprised of several activities arising from the public



participation process conducted during the PDF phase, are designed to provide information on, and permit formulation of, an WMP for the Rio São Francisco Basin, and are concentrated in four principal activity areas as set forth below. The relationship between these activity areas and the activities defined in the project brief is shown in Table 1. Preliminary descriptions and budgets for each of the 20 proposed components have been prepared by the United Nations Environment Programme, as Implementing Agency, in consultation with the Organization of American States and the Federal Government of Brazil, and are summarized below. It should be noted that many of the components are multi-faceted in nature and include not only specific issue-related activities, but also provide opportunities for stakeholder involvement, citizen and professional environmental education, and institutional strengthening, etc.; however, for the sake of brevity and clarity, each component has been categorized into only one issue area and has not been repeated under its related issue areas.

**Table 1. Proposed Project Activities, Work Program Activity Areas and Components.**

<b>Project Activity</b>	<b>Work Program Activity Area</b>	<b>Component</b>
I. River Basin and Coastal Zone Environmental Analysis	A. River Basin and Coastal Zone Environmental Analysis	1.1 through 1.4
II. Public and Stakeholder Participation	B. Public Participation	2.1 through 2.3
III. Organizational Structure Development	C. Organizational Development	3.1, and 3.3 through 3.5
IV. WMP Formulation	D. Watershed Management Program Formulation	1.5, 3.2, and 4.1 through 4.7

#### **A. COMPONENT I: RIVER BASIN AND COASTAL ZONE ENVIRONMENTAL ANALYSIS**

7. Component I comprises the river basin diagnostic study, and is designed to provide for the collection and analysis of additional field data relevant to the diagnosis of those additional priority issues of concern, identified during the PDF investigations, which were not previously considered during the preparatory phase of the project. These data will contribute to the sound scientific and technical basis for the strategic remedial actions identified in the WMP process. This Component consists of five Activities that will permit quantification of the issues, thereby updating and consolidating older data, and providing for the forecasting of potential future conditions within the system. Based on analyses conducted as a result of PDF activities, some of the proposed Activities target specific, representative locales where specific data and information are required. Detailed work plans, setting forth detailed terms of reference and goals to be achieved during the project, will be developed for each Activity as one of the first actions initiated by the local executing agency in consultation with UNEP and the OAS.

#### **Issue 1: Water Resources Issue Identification**

8. Consideration is given to those issues not previously identified but which were identified during the PDF activities as having impacts on the basin and, as a result, require further study and quantification to determine root causes which will be addressed in the WMP.

Activity 1.1: River Flow, Water Quality and Fisheries in the Lower SFRB and Coastal Zone (AL and SE). This Activity seeks to identify and quantify the extent to which river regulation in the Rio Sao Francisco influences hydrology, sediment and nutrient transport, and fisheries throughout the system and, especially, at the coastal zone in the vicinity of its estuary. Knowledge of the consequences of river regulation, which are likely to include changes in the rate and location of sediment erosion and deposition within the river channel and estuary that affect navigation, river morphology, and shoreland wetlands; modification of the river flow regime that affects sediment and nutrient transport and estuarine fisheries; and, changes in the mass of sediment and nutrients delivered to the river mouth, will form the basis for the determination of strategic actions to optimize the multiple purpose utilization of the water resources of the basin. The results of the project will (i) quantify the historical evolution of the river and its estuary since the dams were built, (ii) permit analysis and modeling of the behavior of the river flow and its effect on the transportation of sediments and nutrients under current and forecast future conditions, (iii) form the basis for determining appropriate (and/or alternative) fisheries management practices, (iv) contribute to a strategy for environmentally-sound reservoir operation, and (v) allow an assessment of the feasibility of river transportation of agricultural products. Project deliverables will include 1. a documented evaluation of the environmental impacts of the river on the coastal zone including wetlands, beaches, and fish habitat; 2. a documented analysis of the use of artificial floods as an hydrological management mechanism; 3. an inventory of aquatic fauna present in the lower Rio San Francisco Basin and historic changes in its composition; and, 4. a documented analysis of different scenarios for reservoir operation to minimize environmental impacts on the estuary (see also Activity 4.4). The project deliverables will also include the documented assessment of the most probably reasons for changes in river morphology and aquatic faunal community composition and distributions necessary to determine the root causes of these changes. GEF: US \$ 500,000; co-funding: US \$ 678,000; total: US \$ 1,178,000.

Activity 1.2: Impact of Mining on Water Resources in the Rio das Velhas (MG). This Activity seeks to identify and quantify the impact of mining activities in the “Iron Quadrangle” of the State of Minas Gerais on water quality. Knowledge of the locations, types, and magnitudes of water quality impacts created will contribute to the identification methods to mitigate negative impacts. The results of the project will (i) provide a quantitative assessment of the nature and location of water quality impacts due to mining activities in the basin, (ii) provide data for an assessment of the severity and magnitude of mining-related contamination of the waters of the Rio Sao Francisco, and (iii) form the basis for determining appropriate mitigation measures. Project deliverables will include a documented inventory of mines and other sources of pollution, a documented strategy for identifying actions necessary to mitigate the negative impacts of mining, and a documented assessment of the downstream impacts of water contamination due to mining. GEF: US \$ 150,000; co-funding: US \$ 325,000; total: US \$ 475,000.

Activity 1.3: Fisheries Impacts on Migratory Fishes in the Middle SFRB (MG and BA). This Activity seeks to determine the impact of commercial and recreational fisheries on migratory fish populations, and to relate changes in species composition and numbers to not only fisheries pressures but also to water quality and river regulation in the middle SFRB (between Tres Marias and Sobradinho lakes, complementing the on-going Jaiba Project downstream of Sobradinho Lake). Knowledge of these impacts will contribute to the sustainable economic development of the middle SFRB and maintenance of the aquatic ecosystem. The results of this project will identify measures for the maintenance of economically viable populations of commercially valuable migratory fish species. The project will be carried out through the direct participation of fishermen presently working in the river. Project deliverables will be a documented inventory of fish species and their migratory patterns, and recommended methods for the sustainable management of fishes consistent with cultural norms. GEF: US \$ 180,000; co-funding US \$ 99,000; total: US \$ 279,000.

Activity 1.4: Development of a Water Quality Monitoring System in the Lower Middle SFRB (BA and PE). This Activity seeks to develop a monitoring program which will acquire water quality data which will contribute to an assessment of point source and nonpoint source pollution of surface and ground waters in the Lower Middle portions of the SFRB. Knowledge of water quality conditions will contribute an assessment of the relative magnitudes of point and nonpoint sources of water pollution in the basin, facilitate determination of priority pollutants and pollution sources, and permit an assessment of downstream impacts. The results of this project will contribute to the development of appropriate, priority pollutants and pollution control programs in support of strategic actions to promote sustainable development in the basin. Further, this project will contribute to the strengthening of basin organizations involved in water quality management and build capacity for water quality monitoring and assessment that can be transferred elsewhere within the region. Project deliverables will include a documented assessment of pollutants and pollution sources in the lower middle SFRB, and a documented framework for mitigating priority pollutants that can be extended throughout the basin. GEF: US \$ 160,000; co-funding: US \$ 816,000; total: US \$ 976,000.

Activity 1.5: Impact of Agriculture on Groundwater Resources in the Rio Verde/Jacare (BA). This Activity seeks to develop a monitoring program will contribute to an assessment of the relationship between rainfall, runoff and groundwater recharge in the Middle portion of the SFRB, and the extent of contaminant- and abstraction-related impacts of agriculture on water availability in the Rio Verde sub-basin. Knowledge of the relationship of irrigated agriculture and groundwater will contribute to the development of a sustainable and conjunctive use of surface and groundwater resources. The results of this project will (i) quantify the volumes of water consumed by irrigated agriculture, (ii) quantify the level of contamination of surface and groundwaters arising from agricultural water use, (iii) identify the degree to which abstraction and contamination of waters impacts the ability of waters to be used by downstream users, and (iv) contribute to sustainable, conjunctive management of the water resources of the Rio Verde sub-basin (see Activity 3.2). Project deliverables will include a documented assessment of the use of surface and groundwaters in the Rio Verde sub-basin which can be extrapolated throughout the irrigation areas of the Middle SFRB. GEF: US \$ 140,000; co-funding: US \$ 254,000; total: US \$ 394,000.

## **B. COMPONENT II: PUBLIC PARTICIPATION**

9. Component II, providing public participation projects, is designed to provide for the collection and analysis of the information on the feasibility and relative costs of certain remedial measures identified during the PDF Activities as well as a basis for transferring such experiences to the public at large. By involving the Basin communities in practical, hands on-type involvement in the identification and field testing of remedial measures, as well as in a dialogue process, actions formulated through the project process will have the advantage of benefiting from community insights and experiences, and of being acceptable to the communities as economically and environmentally sustainable alternatives to presently destructive practices. While the major effort in this area is expected to be undertaken subsequently, one Activity that targets the acquisition of specific information necessary for the determination of water rights and water rate allocations is proposed to be undertaken during this project of the watershed management program preparation process. (public participation activities are set forth under Component IV, Watershed Management Program Formulation.)

### **Issue 2: Sustainable Development and Stakeholder Participation**

10. Consideration is given to activities which identify alternative means of economic production or alternative economic activities which enhance the environment and/or minimize environmental degradation, and which identify and coordinate the interests of persons and agencies having commercial or institutional responsibilities within the basin, including the fisheries, navigation, mining and agro-industrial sectors.

Activity 2.1: Determination of Land Use in the Lower-Middle SFRB. (BA and PE). This Activity seeks to determine land use in the lower middle basin of the Rio Sao Francisco as a prerequisite for the determination of land ownership which is important in the implementation of water charges as set forth under Activity 4.2. The knowledge gained through this project will contribute to the rational allocation of water and water charges and the identification of water user groups. The results of the project will contribute to the determination of water use and its impact on the hydrology of the system, and facilitate implementation of water use charges. This project will also contribute to the identification of degraded lands and riparian areas in need of stabilization. Project deliverables will include documented mapping at an appropriate scale to determine land ownership and condition, and a documented framework for establishing a water use allocation system (see also Activity 4.2 which employs these data for determination of water rates and charges). GEF: US \$ 200,000; co-funding: US \$ 584,000; total: US \$ 784,000.

Activity 2.2: Rehabilitation of Degraded Agricultural Lands for Water Quality Improvement in Selected Sub-basins (MG and BA). This Activity seeks to promote the use of agricultural best management practices and rehabilitation techniques including vegetation to protect water quality in the basin. Through the use of community-based educational programming and pilot scale demonstration projects, this project will demonstrate sound soil and water management techniques, appropriate utilization of agrochemicals, and improved methods of crop

management, irrigation design and maintenance of infrastructure such as roads and irrigation ditches. The results of this project will enhance the capacity of agricultural communities to develop sustainable farming techniques that will contribute to environmentally-sound management of water quality in the basin. Project deliverables will include a documented study of appropriate soil and water management measures and development of a documented training program through which to communicate these measures to farmers. GEF: US \$ 250,000; co-funding: US \$ 354,000; total: US \$ 604,000.

Activity 2.3: Vegetative Stabilization of River Banks (AL and SE). This Activity seeks to determine the feasibility and costs of stabilizing river banks through the cultivation of different native plant species. Complementing the hydrological studies set forth in Activity 1.1, this project provides a practical evaluation of revegetation as a means of controlling erosion of river banks under conditions of variable river flow. The results of this project will contribute the definition of best management practices for the stabilization of river banks in the lower basin. Project deliverables will include a documented demonstration of the efficacy of various native plant species as a means of stabilization of river banks under variable flow conditions. GEF: US \$ 70,000; co-funding: US \$ 212,000; total: US \$ 282,000.

### **C. COMPONENT III: ORGANIZATIONAL DEVELOPMENT**

**11.** Component III, providing projects designed to strengthen and improve institutional and staffing capabilities to implement new laws, regulations, and procedures, is designed to provide for the equipping and training of institutions and individuals identified during the PDF Activities. Such institutional strengthening and capacity building will contribute to the longer-term success of the watershed management measures identified in the Integrated Management of Land-based Sources of Marine Pollution in the SFRB. This Component consists of five Activities that target specific institutions and skills needed within the basin.

#### **Issue 3: Institutional Strengthening**

**12.** Consideration is given to providing an effective framework in which activities of professionals are carried out, including legal, structural, economic and administrative activities.

Activity 3.1: Pilot Implementation of Federal Water Policy in the Maranhão River (MG). This Activity seeks to facilitate implementation, on a pilot basis, of Federal Law 9433/97 and the corresponding State legislation, by testing methods for the creation of a Water Basin Committee and Water Agency, through active popular participation. This will allow identification of the practical problems arising from the application of the law and an assessment of the capacity of stakeholders to organize. The results of this project will identify the best legal instruments for creating a Water Agency, including determination of the composition of its management, and permit evaluation of the implications of implementing a Basin Development Plan in a climate of organizational transparency in which information is accessible to all stakeholders in the Maranhão River. Project deliverables will include a report evaluating the efficacy of several policy instruments for implementing the water law and related state legislation; quantitative evaluation of the pilot scale implementation will be related to measured improvements in both rate of water use and degree of protection of

downstream water quality; and, a documented framework for the implementation of the law in other basins. GEF: US \$ 150,000; co-funding: US \$ 195,000; total: US \$ 345,000.

Activity 3.2: *Conjunctive Use of Surface and Groundwater (BA)*. Based upon quantitative data gathered under Activity 1.5, this Activity seeks to develop, through the use of water rights and water pricing, alternative means of managing surface and ground water use in a selected sub-basin. This project will develop and implement, on a pilot basis, a system of groundwater rights in the sub-basin that will restrict the rate of groundwater abstraction so as to minimize impacts on surface water flows. The results of this project will provide quantitative information on the surface and ground water hydrology of the sub-basin, and contribute to the regulation of water use to ensure sustainable development of available resources. Project deliverables will include the documented granting of water rights and the establishment of an adequate and appropriate administrative framework in the sub-basin, which can be extended to other sub-basins in the SFRB. GEF: US \$ 250,000; co-funding: \$ 480,000; total: US \$ 730,000.

Activity 3.3: *Support to Citizen Management Committees in Selected Sub-basins. (BA and PE)*. This Activity seeks to develop conflict resolution techniques for use under conditions of water scarcity, employing the small committee structures authorized under the federal water law as a mechanism for encouraging discussion and participation of stakeholders in the decision-making process. It is envisaged that several mechanisms will be employed in this process, including citizen management committees, management committees, and technical development committees, whose structure and terms of reference will be established under this Activity. Experiences gained during this project will strengthen citizen participation in the water resources management process, and provide guidance for the establishment of effective (sub-)basin management committees elsewhere in the basin [under the federal water law, these committees will participate in the basin-wide decision-making process of the integrated basin management committee]. The results of this project will enhance rational water use within the basin, integrated management of water resources for economic purposes, including environmental purposes, and the capacity of communities to manage their water resources in a sustainable manner. Project deliverables will include a documented framework for the creation and management of citizen committees that can be extended throughout the basin, and a documented program of public participation in the management of water resources in selected sub-basins. GEF: US \$ 100,000; co-funding: US \$ 175,000; total: US \$ 275,000.

Activity 3.4: *Support to the Creation of an Integrated Water Basin Committee in the SFRB*. This Activity seeks to support the development of an effective and integrated SFRB Committee, as provided for under federal law 9433/97. This project, in concert with activities funded under PROAGUA, will contribute to the implementation of an effective, integrated basin committee, and ancillary agencies and organizations, as a forum for inter-sectoral discussion, technical information exchange, and decision-making regarding the water resources management of the SFRB. The results of the project will develop a framework for the creation of a financially-sustainable basin management agency and contribute to the sustainable use and management of the water resources of the basin, including integration of environmental and coastal zone concerns into the overall management strategy for the system.

The committee thus created will also provide a forum for the interaction of sub-basin committees created under Activities 3.3 and 3.5. Project deliverables will include a documented framework leading to the establishment of an integrated river basin committee and related agencies, consistent with the spirit of federal law 9433/97, in a multiple purpose river basin that can be transferred to other multiple purpose river basins in the region. GEF: US \$ 150,000; co-funding: US \$ 205,000; total US \$ 355,000.

Activity 3.5: *Support to Technical Integration within the Framework of the Integrated Water Basin Committee in the SFRB (AL, BA, MG, PE and SE)* This Activity seeks to provide a forum within the Integrated Water Basin Committee structure identified under Activity 3.4 for on-going dialogue on integrated water resources management issues between stakeholders, across sectoral and state boundaries, in the SFRB in order to promote exchange of issues, experiences, information sharing and transfer of technologies, as a means of harmonizing policies and practices and resolving conflicts between users groups in this multiple purpose water use basin. The project will enhance the abilities of basin committee to manage the water resources of the basin in an effective manner, contribute to the transparent functioning of basin agencies, and provide the framework within which water use and management issues can be resolved. Such a function will be especially important under conditions of water scarcity within the basin. The results of the project will strengthen the ability of basin institutions to carry out their mandates in a coordinated and effective manner, and promote integrated management of the water resources of the Sao Francisco River as a whole. Project deliverables will include the documented framework for the conduct of inter-agency discussions within a multiple purpose basin, and a documented institutional structure and conflict resolution procedure within the context of the Integrated Water Basin Committee. GEF: US \$ 50,000; co-funding: US \$ 270,000; total: US \$ 320,000.

#### **D. COMPONENT IV: WATERSHED MANAGEMENT PROGRAM FORMULATION**

**13.** Component IV, development of the Watershed Management Program, is designed to provide for the synthesis of data and experiences, feasibility assessments and cost analyses developed in the three preceding Components. Included in the principal activities within this Component are Activities that address the legal, institutional, and human and natural resources bases essential for implementation of the remedial actions identified through the WMP process. The six Activities explicitly provide for the cooperative development of a comprehensive Watershed Management Program by both the public and private sectors, based on a multi-sectoral, holistic approach to environmental management and economic development in this Basin and its coastal zone, as provided for in Chapters 18 and 21 of Agenda 21.

##### **Issue 4: WMP Formulation**

**14.** Consideration is given to the synthesis and integration of the results of the studies, demonstrations, and other investigations previously described into a comprehensive, WMP of action for the Rio São Francisco Basin. Pursuant to the GEF Operational Strategy dated February 1996, this program of action will identify priority water-related environmental issues of concern, define the relationship of these issues to national (and state) environmental

planning and economic development plans, establish clear priorities, and determine realistic baseline and agreed incremental costs.

Activity 4.1: *Promote Popular Participation in the SFRB.* This Activity recognizes the need to promote popular participation at the grass roots level throughout the basin, where some representative community-based institutions exist, and to empower decentralized decision-making relating to the determination and implementation of management policies and practices at the local level for the integrated sustainable economic development and management of water resources, including environmental protection and rehabilitation. It is envisaged that workshops, training programs for officials and community leaders, and informational campaigns within schools, civic groups and communities will be among the specific actions undertaken during the implementation of this project. Specific support for the Inter-American Water Resources Network (IWRN) is provided as a means of disseminating information regarding the conduct and findings of this project. The project will promote transparency in decision-making, effective management of water resources at the community level in a manner consistent with the spirit of the federal water law, and determination of appropriate methods and means of integrating community-based decision-making into the structure and function of the integrated basin management committee proposed to be created under Activity 4.5. The results of this project will contribute to holistic and effective decision-making in the basin. Project deliverables will include a magazine for basin-wide distribution to raise awareness, build participation, and inform citizens across sectoral lines; and a documented framework for the creation of effective grass roots participation in water resources management, including the means whereby local level involvement can be integrated into the structure and functioning of the integrated basin management committee. GEF: US \$ 160,000; co-funding: US \$ 217,000; total: US \$ 377,000.

Activity 4.2: *Evaluation of financing mechanisms for sustainable watershed management in the SFRB.* This Activity seeks to build upon activities funded under PROAGUA and the experiences obtained in the pilot-scale development and implementation of water rights and water charges, as provided for under federal law 9433/97, in representative sub-basins of the Rio Sao Francisco (see Activity 3.2) to the entire SFRB. In addition, this Activity seeks to promote a review federal and state legal and financial mechanisms relating to the sectoral uses of water (e.g., agricultural subsidy schemes, urban land use planning regulations, etc. which affect disturbances of the land surface that encourage erosion, water pollution, etc. to the detriment of water courses and water resources management) to identify and propose amendments as appropriate to those mechanisms that affect sustainable use of water resources and the management of watersheds within the SFRB. This project will provide a detailed framework of the allocation and determination of water charges and introductions of watershed management measures, including proposals for legislation and strengthening of administrative mechanisms necessary to implement an equitable water pricing scheme. The results of this project enhance the institutional capability to determine and implement a water use charges program, contribute to the identification of appropriate mechanisms to place water resources management within the basin on a sustainable footing, and encourage the optimization of water resources management policies, practices and programs, thereby creating a sound economic and legal basis for the sustainable development of the basin and its coastal zone. Project deliverables will include a documented framework for the



implementation of water use charges and restructuring of related fiscal, financial and legal mechanisms for water quantity and quality management in the five basin states consistent with an holistic concept of the SFRB. GEF: US \$ 350,000; co-funding: US \$ 300,000; total: US \$ 650,000.

Activity 4.3: Needs Assessment for the Quantitative Evaluation of Water Use and Use Conflicts in the SFRB. This Activity complements the decision-support system to be designed under activities conducted under PROAGUA and the determination of an appropriate economic framework as set forth under Activity 4.2, and seeks to determine the need for a quantitative framework for identifying and resolving quantitative water use and allocation conflicts within the basin in a transparent and equitable manner. This project will identify the need to develop the computational instruments needed to analyze water use conflicts through an integrated, quantitative, mathematical modeling of natural water flows, sectoral consumptive uses, projected inter-basin transfers into and out of the basin, and modifications of natural flows resulting from the operation of dams and reservoirs. It will develop parameters for models which will allow the quantification of potential conflicts among water users in various sectors, including fisheries, municipal, agricultural, navigation and recreational sectors, and contribute to the identification of management alternatives, both structural (i.e., dam and reservoir construction, inter-basin transfers, etc.) and non-structural (i.e. institution of water rights and prices, rules for dam and reservoir operation, etc.), that will contribute to the sustainable management of the river. Project deliverables will include a documented framework for a system of mathematical models of river hydraulics, hydrology and water use in the basin, including the use of the decision support systems and related fiscal and legal mechanisms, allowing for informed decision-making by stakeholders and agencies, and contributing to the sustainable use of water and development of water resources in the basin, including its coastal zone. GEF: US \$ 250,000; co-funding: US \$ 325,000; total: US \$ 575,000.

Activity 4.4: Determination of Operational Policies for Major Reservoirs in the SFRB. This Activity will seek to examine the operational policies of the major reservoirs in the SFRB using hydrological data gathered under Activity 1.1 to develop a framework for implementing multiple purpose reservoir operating procedures. This project will enhance the capacity of basin organizations to manage the water resources of the basin, and contribute to the development of an operational procedure that will optimize economic use of the water resources in the basin, including environmental use, based upon the Tennessee Valley Authority (TVA) experience in operating a cascade of multiple purpose impoundments in the United States of America. The project will strengthen institutional capacities to manage water flows in a climate of changing water demands and in a manner consistent with maintenance of environmental conditions at the river estuary so as to conserve biological resources and minimize deleterious environmental impacts related to river flows. Project deliverables will include a documented operational framework, setting forth the parameters necessary for the development of an operational model of the multiple purpose impoundments in the system, so as to promote sustainable water use and management in the basin. GEF: US \$ 150,000; co-funding: US \$ 116,000; total: US \$ 266,000.

Activity 4.5: Formulation of an Integrated Basin and Coastal Zone Management Program. Formulation of an WMP (WMP) is the principle objective of the project activities. This program of action consists of the identification and harmonization of development initiatives in the SFRB and coastal zone, and the strategic integration and rationalization of those initiatives and proposals for sustainable development in the region. It will include an environmental evaluation of the basin, emphasizing the analysis of priority problems and socio-economic issues relating to environmental practices and their relationship with the education, health, income and organization of local population especially in the coastal zone, as well as the identification and coordination of organizational arrangements. Support to Government efforts at introducing environmental considerations into the laws and regulations at the national and state levels is also part of the WMP. A practical result of the WMP will be the explicit incorporation of the focal areas of interest to GEF into regional development programs, incorporating methods and procedures for the solution of priority environmental problems and obtaining global benefit. Project deliverables will include the documented strategy and program of action for the integrated management of the SFRB and its coastal zone. Specific strategic actions to be proposed under subsequent activities will also be identified. GEF: US \$ 900,000; co-funding: US \$ 280,000; total: US \$ 1,180,000 (inclusive of Administration fees and Monitoring and Evaluation costs).

Activity 4.6: International Seminar on the Protection of Marine Environment from Land-based Activities in the São Francisco River Basin. This Activity seeks to inform, consult, and involve water resources professionals and others in the diagnosis and remediation of environmental concerns relating to the Rio São Francisco Basin. In the first instance, an international seminar would facilitate discussion of the water resources issues of priority concern as a means of building appreciation for the unitary nature of the Rio San Francisco hydrological system and related coastal zone. Subsequently, one further international seminar would facilitate dissemination of the experiences gained in the determination and initial implementation of management actions to a wider audience, enhancing the transfer of knowledge and approaches as encouraged under Chapter 15 of Agenda 21. This project will strengthen international communication and cooperation and potentially lead to enhanced international coordination within the basin of the Rio São Francisco. The results of this project will provide a framework for addressing the priority issues inherent in the management of the Rio São Francisco Basin. Project deliverables will include the proceedings of up to three international seminars on the Rio São Francisco Basin. GEF: US \$ 120,000; co-funding: US \$ 200,000; total: US \$ 320,000.

Activity 4.7: Harmonization of the Environmental and Information Dissemination Network in the SFB. This Activity seeks to develop a framework to extend and harmonize the existing hydrometeorological data collection network, unifying data gathering objectives and methodologies in order to enhance the dissemination of data and information throughout the basin. Data gathered will include not only surface hydrological data and meteorological data but also data on groundwater hydrology. Harmonization of the data gathering network will contribute to the exchange of information between states and agencies, while extension and upgrading the data collection system will facilitate an holistic overview of hydrological and water quality conditions in the system that will contribute to flood forecasting, environmental and hydrological management, and reservoir operations. The results of the project will enhance transparency and sharing of data throughout the basin, which will promote

sustainable utilization and management of available water resources, including environmental use, especially in the coastal zone. Project deliverables will include a documented strategic framework for integrating the network of data gathering on surface and ground water hydrology and meteorological data in the basin as well as the design for an integrated archiving system. GEF: US \$ 150,000; co-funding: US \$ 254,000; total: US \$ 404,000.

**15.** Table 2 presents an indicative work plan under which this two year project will be implemented. Related work elements in which activities must be sequenced in order that relevant information or data might be available for use in later Activities are shown along the same timeline as the approximate date of activity initiation. It should be noted that specific activities may be initiated at any time during the six-month period preceding the indicated start date, as human and financial resources, and prerequisite information availability, warrant. Further, it is anticipated that each Activity is likely to be executed over the period of at least a year.

**16.** The total cost of the project is estimated at US \$ 20,214,000. Total funding for the baseline situation without GEF financing is a minimum of approximately US \$ 9,339,000, as shown in Table 3. For the alternative project, non-GEF financing by the Government of Brazil, the riparian states and other national, public and private sources, is US \$ 6,339,000. Co-financing by other international institutions is US \$ 8,825,000. These investments are assumed to account for national benefits (Table 3). The requested GEF contribution is US \$ 4,430,000, as shown in Table 4. Incremental GEF financing will promote consideration of issues of global environmental concern, such as the mitigation and prevention of land degradation, protection of aquatic flora and fauna, control and minimization of persistent contaminants, and protection and rehabilitation of the coastal zone, into this strategic, sustainable development framework.

**Table 2. Indicative Work Plan showing initiation date for Component activities.**

<b>October 1998</b>	<b>March 1999</b>	<b>October 1999</b>	<b>March 2000</b>	<b>October 2000</b>
Steering Committee Formation	Steering Committee meeting	Steering Committee meeting	Steering Committee meeting	Steering Committee meeting
1.1		4.4		
1.2				
	1.3			
	1.4			
1.5	3.2	4.2	4.3	
2.1				
	2.2			
	2.3			
3.1				
3.4	3.3			
	3.5			
4.1				
		4.5		4.6
	4.7			

**Table 3. Incremental Cost Analysis (US \$).**

	<b>Baseline</b>	<b>Alternative</b>	<b>Increment</b>
<b>Global Environmental Benefits</b>			
<u>Decreased Transportation of Contaminants Into the LME</u>			
Activities 1.2 and 4.9	0	375,000	375,000
<u>Increased Contribution of Nutrients into The LME</u>			
Activities 1.1 and 4.9	0	475,000	475,000
<u>Increased Wildlife Diversity</u>			
Activities 1.1 and 1.3	0	430,000	430,000
<u>Decreased Degradation of Soils</u>			
Activities 2.1/2.3 and 4.9	0	745,000	745,000
<u>Increased Knowledge of River Behavior</u>			
Activities 1.4 and 4.6	0	300,000	300,000
<u>Improved Coordination for River Management.</u>			
Activities 3.1/3.4, 4.4, 4.5, 4.7 and 4.8.	2,000,000	4,675,000	1,675,000
<u>Dissemination of Knowledge</u>			
Activities 4.1/4.3	0	430,000	430,000
<b>Domestic Benefits</b>			
<u>Decreased Transportation of Contaminants into the LME</u>			
Activities 1.2 and 4.9	395,000	395,000	0
<u>Increased Contribution of Nutrients into the LME</u>			
Activities 1.1 and 4.9	409,000	409,000	0
<u>Increased Wildlife Diversity</u>			
Activities 1.1 and 1.3	438,000	438,000	0
<u>Decreased Degradation of Soils</u>			
Activities 2.1/2.3 and 4.9	1,220,000	1,220,000	0
<u>Increased Knowledge of River Behavior</u>			
Activities 1.4 and 4.6	1,070,000	1,070,000	0
<u>Improved Coordination for River Management.</u>			
Activities 3.1/3.4, 4.4, 4.5 4.7 and 4.8.	2,136,000	2,136,000	0
<u>Dissemination of Knowledge</u>			
Activities 4.1/4.3	671,000	671,000	0

**Table 4. Component Financing (US \$).**

<b>WORK ELEMENT</b>	<b>GEF</b>	<b>NON-GEF</b>	<b>TOTAL</b>
1.1 River Flow, Water Quality and Fisheries in the Lower SFB and Coastal Zone	500,000.00	678,000.00	1,178,000.00
1.2 Impact of Mining on Water Resources in the Rio das Velhas/ MG	150,000.00	325,000.00	475,000.00
1.3 Fisheries Impacts on Migratory Fishes in the Middle SFB. MG/BA	180,000.00	99,000.00	279,000.00
1.4 Development of a Water Quality Monitoring System in Lower Middle SFB. BA/PE	160,000.00	816,000.00	976,000.00
<b>Sub-total</b>	<b>990,000.00</b>	<b>1,918,000.00</b>	<b>2,908,000.00</b>
2.1 Determination of Land Use in the Lower Middle SFB. BA/PE	200,000.00	584,000.00	784,000.00
2.2 Rehabilitation of Degraded Agricultural Lands for Water Quality Improvement. MG/BA	250,000.00	354,000.00	604,000.00
2.3 Vegetative Stabilization of River Banks	70,000.00	212,000.00	282,000.00
<b>Sub-total</b>	<b>520,000.00</b>	<b>1,150,000.00</b>	<b>1,670,000.00</b>
3.1 Pilot Implementation of Federal Water Policy in the Maranhao River. MG	150,000.00	195,000.00	345,000.00
4.4 Support to Citizen Management Committees in Selected Sub-basins. BA/PE	100,000.00	175,000.00	275,000.00
3.3 Support to the Creation of an Integrated Water Basin Committee in the SFB.	150,000.00	205,000.00	355,000.00
3.4 Support to Technical Integration within the Framework of the Integrated Commission	50,000.00	270,000.00	320,000.00
<b>Sub-total</b>	<b>450,000.00</b>	<b>845,000.00</b>	<b>1,295,000.00</b>
4.1 Promote Popular Participation in the SFB	160,000.00	217,000.00	377,000.00
4.2 Harmonizing the Environmental and Information Dissemination Network in the SFB	150,000.00	254,000.00	404,000.00

of Marine Environment from Land-based Activities in the SFB	120,000.00	200,000.00	320,000.00
<b>Sub-total</b>	<b>430,000.00</b>	<b>671,000.00</b>	<b>1,101,000.00</b>
4.4 Needs Assessment for the Quantitative Eval. of Water Use and Conflicts in the SFB	250,000.00	325,000.00	575,000.00
4.5 Conjunctive Use of Surface and Groundwater. BA	250,000.00	480,000.00	730,000.00
4.6 Impact of Agriculture on Groundwater Resources in the Rio Verde/Jacare. BA	140,000.00	254,000.00	394,000.00
<b>Sub-total</b>	<b>640,000.00</b>	<b>1,059,000.00</b>	<b>1,699,000.00</b>
4.7 Evaluation of Financing Mechanisms for Sustainable Watershed Management	350,000.00	300,000.00	650,000.00
<b>Sub-total</b>	<b>350,000.00</b>	<b>300,000.00</b>	<b>650,000.00</b>
4.8 Determination of Operational Policies for Major Reservoirs in the SFB	150,000.00	116,000.00	266,000.00
4.9 Formulation of an Integrated Basin and Coastal Zone Management Program.	900,000.00	280,000.00	1,180,000.00
<b>Sub-total</b>	<b>1,050,000.00</b>	<b>396,000.00</b>	<b>1,446,000.00</b>
<b>Sub-total (4.1 through 4.9)</b>	<b>2,470,000.00</b>	<b>2,426,000.00</b>	<b>4,896,000.00</b>
<b>TOTAL (Project Costs)</b>	<b>4,430,000.00</b>	<b>6,339,000.00</b>	<b>10,769,000.00</b>
<b>Additional Financiation</b>			
World Bank Loan		8,600,000.00	8,600,000.00
UNEP		150,000.00	150,000.00
OAS		75,000.00	75,000.00
<b>TOTAL (Agency Contrib.)</b>		<b>8,825,000.00</b>	<b>8,825,000.00</b>
<b>PDF Preparation</b>			
GEF Contribution	341,000.00		341,000.00
Government of Brazil		204,000.00	204,000.00
UNEP		25,000.00	25,000.00
		25,000.00	25,000.00
World Bank		25,000.00	25,000.00
<b>TOTAL (Preparation Costs)</b>	<b>341,000.00</b>	<b>279,000.00</b>	<b>620,000.00</b>

<b>GRAND TOTAL</b>	<b>4,771,000.00</b>	<b>15,443,000.00</b>	<b>20,214,000.00</b>
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## THE GLOBAL PROGRAM OF ACTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT FROM LAND-BASED ACTIVITIES

### **Facts**

About 80% of all marine pollution is caused by human activities on land.

By the year 2000, 75% of the world's population will live within 60 km of the coast.

### **Background**

Numerous global and regional conventions and events relate to the protection of the marine environment, such as:

1976 To present:	the Regional Seas Conventions and related Protocols which govern 15 Regional Seas Programmes
1982	United Nations Convention on the Law of the Sea (UNCLOS)
1989	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
1992	Convention on Biological Diversity
1992	United Nations Framework Convention on Climate Change
1992	United Nations Conference on Environment and Development (UNCED) and Agenda 21.

In 1982, UNEP started addressing issues related to impacts on the marine environment from land-based activities, resulting in the following conventions and decisions:

1995	Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-based Sources
1995	UNEP Governing Council decisions 18/31 and 18/32 pertaining to the Washington Conference and Persistent Organic Pollutants (POPs)
1995	Conference to adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, Washington, DC, USA, 23 October-3 November 1995

### **The Washington Conference**

*Adopted the Washington Declaration on Protection of the Marine Environment from Land-based Activities and a Global Programme of Action*

One hundred and eight Governments, and the European Commission, declared their commitment to protect and preserve the marine environment from the adverse environmental impacts of land-based activities.

They called upon UNEP, in close partnership with the United Nations Development Programme (UNDP), the World Health Organization (WHO), Habitat, and other relevant organizations, to act as Secretariat of the Global Programme of Action.

They called upon UNEP, the World Bank, the UNDP, the regional Development Banks, and all agencies within the United Nations system, to support and strengthen the regional structures in place for the protection of the marine environment.

The GPA is designed to be a source of conceptual and practical guidance to be drawn upon by national and/or regional authorities in devising and implementing sustained action to prevent, reduce, control and/or eliminate marine degradation from land-based activities.

### **Aims of the GPA**

The GPA aims at preventing the degradation of the marine environment from land-based activities by facilitating the realization of the duty of States to preserve and protect the marine environment. More specifically, the GPA aims at:

#### *Identification and assessment of problems:*

1. Identifying nature and severity of problems caused by marine pollution. What is the impact of marine pollution on (i) food security and poverty alleviation; (ii) public health; (iii) ecosystem health and biological diversity; and (iv) economic and social benefits and uses.
2. Assessing the severity and impacts of contaminants (e.g. sewage, persistent organic pollutants, radio-active substances, heavy metals, oils, nutrients, sediment mobilization and litter).
3. Assessing the physical alteration, including habitat modification and destruction, in areas of concern.
4. Assessing the sources of degradation, including (i) point sources (e.g., waste-water treatment facilities or dredging operations); (ii) non-point sources (e.g., urban and agricultural run-off); and (iii) atmospheric deposition caused by vehicle emissions, power plants and industrial facilities, incinerators and agricultural operations.
5. Establishment of priorities.
6. Setting management objectives for priority problems for source categories and areas affected.
7. Identification, evaluation and selection of strategies and measures.
8. Set criteria for evaluating the effectiveness of strategies and measures.

### **UNEP as GPA Secretariat**

UNEP was designated GPA Secretariat, with the task to (i) promote and facilitate implementation of the GPA at the national level; (ii) to promote and facilitate implementation at the regional, including subregional, level through, in particular, a revitalization of the Regional Seas Programme; and (iii) to play a catalytic role with other organizations and institutions in implementation of the GPA at the international level. UNEP should undertake its role as GPA Secretariat in an efficient and cost-effective manner, supported largely by the existing resources, expertise and infrastructure available in all components of UNEP's programmes.

### **Implementation of the GPA**

The implementation is primarily the task of Governments, in close partnership with all stakeholders.

UNEP, as the secretariat of the GPA, and other implementing agencies will facilitate and assist Governments in their tasks.

Formulation of national and regional action programmes is the cornerstone for successful implementation.

Financial sources and mechanisms are to be addressed both at the State level (e.g., polluter charges, revolving funds, private sector participation) and at international level (e.g., multilateral loans and debt-for equity swaps).

### **GPA implementation plan**

UNEP prepared a proposal on “institutional arrangements for implementation of the GPA”, with contributions from Governments, regional seas programmes, intergovernmental and non-governmental organizations, and subsequently presented it to the Commission on Sustainable Development (1996) and UNEP's Governing Council (1997).

In accordance with the relevant provisions of the GPA implementation plan, UNEP accepted the offer of the Government of the Kingdom of the Netherlands to host the GPA Coordination Office in The Hague. The Coordination Office, which is part of UNEP's Water Branch, was officially opened on 24 November 1997 by the Executive Director of UNEP and is operational since the beginning of 1998. At present, 3 programme officers work in this office. It is expected that within the next few months, the professional staff will be 6 persons.

### **GPA Clearing-House**

The GPA recommended the establishment of a clearing-house, as a priority to mobilize experience and expertise, including facilitation of financial cooperation and capacity-building. As a first step towards a basic design and structure of the clearing-house and its linkages to information delivery mechanisms, in 1996 UNEP convened a technical meeting, attended by representatives of 6 Governments, 3 UN organizations and 5 regional seas programmes. The global level of the clearing-house should ensure access to scientific and technical information and experience. Regional clearing-house components are necessary to facilitate user access and to adapt information to local circumstances, for which the Regional Seas Programmes provide the institutional framework.

States were called to take action in Governing Bodies of relevant intergovernmental organizations and programmes to ensure that these organizations and programmes take the lead in the development of the clearing-house with response to the following source categories (not listed in order of priority):

- Sewage - the World Health Organization (WHO)
- Persistent organic pollutants - the Inter-organizational Programme for the Sound Management of Chemicals (IPSMC), the International Programme of Chemical safety (IPCS), and the Intergovernmental Forum on Chemical Safety (IFCS)
- Heavy metals - UNEP, in cooperation with the Inter-organizational Programme for the Sound Management of Chemicals (IPSMC)
- Radio-active substances - the International Atomic Energy Agency (IAEA)
- Nutrients and sediment mobilization - the Food and Agriculture Organization of the United Nations (FAO)
- Oils and hydrocarbons - the International Maritime Organization (IMO)
- Physical alterations, including habitat modification and destruction of areas of concern - UNEP

At the regional level, development of clearing-house components was discussed at a series of workshops.

### **Regional implementation of the GPA**

Governments declared their intention to cooperate on a regional basis to coordinate GPA implementation efforts.

Development of national and regional programmes of action is of primary importance, and therefore UNEP's Regional Seas Programmes constitute a fundamental mechanism for developing and implementing globally and regionally coordinated programmes. In 1996 UNEP convened an intersecretariat consultation on GPA activities, in which 8 regional programmes were represented including others from outside the UN system.

A series of regional workshops of Government-designated experts, as well representatives of relevant international organizations, funding agencies and, whenever possible, the private sector and non-governmental organizations, are being convened during 1996-1998 in the framework of UNEP's Regional Seas Programme. The workshops are, *inter alia*, discussing regional overviews on land-based activities, discussing and agreeing on the development of regional components of the clearing-house, and reaching agreement on regional programmes of action to address land-based activities. Six workshops have been held and three more are planned. With respect to priority pollutants and sources, the workshops held until now identified sewage, physical alteration and habitat modification, and oils as having the highest priorities in most of the regions.

### **Tasks of the GPA Coordination Office**

Based on the Global Programme of Action and the GPA Implementation Plan, the GPA Coordination Office identified eight priority tasks:

- 1) **Develop and facilitate preparation of scientific assessments on the impacts of land-based activities on the marine environment.** Utilize existing mechanisms such as the IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) and the GEF funded project Global International Waters Assessment (GIWA).
- 2) **Foster/facilitate development and implementation of national and regional programmes of action on land-based activities.** Workshops will be organized for national experts with involvement of regional seas programmes on subjects such as development of action programmes in the context of sustainable development, innovative finance mechanisms, legislation, and drafting proposals for funding.
- 3) **Establish and coordinate the GPA clearing-house mechanism.** This mechanism must be able to provide information from different lead agencies on source categories (such as WHO on sewage, IMO on oil and litter, FAO on nutrients and sediment mobilization; IAEA on radioactive substances; UNEP on Persistent Organic Pollutants, heavy metals and physical alterations). This mechanism can also be used for awareness raising, capacity building, exchange of information on availability of expertise, financial resources, metadatabases, progress in implementation of the GPA, etc.

- 4) **Mobilize financial resources.** Based on the identified needs for assistance that requires new and additional financial resources for implementing national and regional action programmes, the GPA Coordination Office in cooperation with relevant UNEP in-house units, can provide assistance by identifying potential donors, establish initial contacts between the potential recipient country and the potential donor and assist in formulating requests for assistance. Establishment of a Small Project Fund and a GPA Donor Dialogue are ideas to develop further in the near future. Presently, developing a global clearing-house mechanism and assisting Governments and regions in developing programmes of action are beyond the existing human and financial resources and capabilities of the GPA Coordination Office.
- 5) **Awareness building and education.** The GPA Coordination Office will develop an awareness raising strategy in cooperation with other UNEP in-house units. This plan will focus on the different target groups and the associated appropriate type of information and the different types of media. The clearing house mechanism plays a key-role in this task.
- 6) **Involvement of non-governmental organizations.** These organizations can contribute significantly to facilitate GPA implementation. They are instrumental in the dissemination of information to the public. The GPA coordination Office has the intention to provide “kiosks” on the clearing house Web-site to these organizations.
- 7) **Reporting and reviewing progress in GPA implementation.** UNEP has the responsibility of reporting regularly on the progress in implementing the GPA. The primary source of information on the status of activities are the reports received from Governments. The GPA Coordination Office will develop a procedure and format for reporting in consultation with Governments.
- 8) **Continued consultations on GPA implementation.** The GPA Coordination Office will continue to seek advice for its present and future work from a variety of sources. In addition to the regular formal channels used by UNEP, informal consultations with Governments, non-governmental organizations and individuals will be held.

*The above eight tasks were discussed in detail during an informal intergovernmental consultation to review the status*

## **ROOT CAUSES ANALYSIS**

**1. Background.** The Rio Sao Francisco is one of the most important rivers in Brazil, being known as the “River of National Unity”. The basin, which drains across the North East Brazil Shelf to the South West Atlantic Large Marine Ecosystem (LME), is well endowed with a rich variety of natural resources, including minerals, fish, wildlife, and lands suitable for agricultural development. As a consequence, the river and its watershed has been subjected to intense economic development pressures, including extensive regulation by hydro-electric and irrigation water supply impoundments, which appear to be increasing. In recognition of these increasing developmental pressures, the Federal Government of Brazil has initiated several actions designed to protect the resources of the region and contribute to the sustainable development of the area. These actions have included the creation of a Senate Committee to investigate the status of the basin, the creation of a river basin development corporation and, more recently, an interstate liaison committee activated with addressing some of the more pressing issues of concern within the basin.

**2. Issues.** In order to move forward with the resolution of some of the issues identified by the Senate Committee, the Federal Government of Brazil invited the United Nations Environment Programme, Organization of American States, The World Bank and the Global Environment Fund Secretariat to field a reconnaissance mission during 1996, which mission resulted in the invitation to UNEP to prepare a request to the GEF for a project development facility grant to develop a WMP for the Basin and its coastal zone as the Latin American demonstration project under the GEF International Waters Program in support of the Global Program of Action for the Prevention of Marine Pollution from Land-based Activities (GPA). In the PDF proposal, five issues were identified on the basis of extant documentation and as the result of discussions between the reconnaissance mission and officials representing local communities, governmental and nongovernmental agencies, and federal agencies. These issues were: the need to assess and quantify perceived problems within the basin, inadequate of stakeholder participation, unsustainable levels of economic development, the need for more effective institutions and the need for enhanced staffing capacity at all levels, and the need for an holistic, integrated approach to problem solving in the basin. During the PDF process, additional issues were identified, including: land degradation, declining fisheries, hydrological changes in river flows, increasing urbanization and industrialization (mining and agro-industrial development), and water quality degradation of surface and ground waters.

**3. Problems and Symptoms.** Each of the foregoing issues is indicative of specific problems or consequences, identified during the PDF and subject to refinement and quantification during this project, which have direct impacts on the biological and water resources within the basin.

**3.1 Problems related to poorly quantified environmental impacts.** Reported problems related to poorly quantified environmental impacts include the biological consequences of modified river flows as the result of river regulation; the contamination of reservoirs and modification of the near shore marine nutrient balance due to river regulation; the changed

character of the sources, sinks and composition of sediment loads throughout the basin as the result of interception and downstream scour arising from river regulation; modification of the water quality (and, thereby, the biological integrity of the system) as a result of human economic activities (e.g., mining, industrial development, and urbanization in the headwaters area of the river, and industrial development, agricultural development based on irrigated agriculture and urbanization in the lower portions of the basin) that discharge untreated or poorly-treated wastes to the system; and, the cumulative effects of upstream activities on the coastal and nearshore environment, including changes in fish habitat, populations and species composition, altered estuarine depositional and erosional dynamics, effects on riverine and marine transportation, and subtle and explicit impacts on human health and economic activity.

**3.2 Problems related to stakeholder involvement.** Problems related to stakeholder involvement historically have been related to the lack of appropriate fora for encouraging stakeholder participation, and the highly sectoral nature of development within the basin (see economic development below). In recent years, the efforts of the federal government to increase the living standards in the previously impoverished basin have focussed on a top-down style of implementation that has rarely recognized the wider context of social concerns other than economic development. Recently, a wider appreciation of the success of community-based, bottom-up development approaches, such as that embodied in Brazil's federal water law 9433/97, have initiated the process of increasing stakeholder participation across traditional sectoral lines. This process, in a basin as diverse and complex as the SFRB, will take some time to evolve and mature.

**3.3 Problems related to economic development.** Problems related to economic development include poorly regulated exploitation of lands and natural resources for commercial purposes, the highly sectoral nature of develop which also is strongly segmented along geographical lines in this relatively large basin, and the focus on the development of large, single purpose development areas generally managed (historically) by parastatal or state-owned corporations. In some cases, despite their geographic proximity, the sectoral nature of develops within the basin often create conflicts or the potential for conflicts over rates, timing, and types of water use, the prime example being the conflict between release of water for hydro-power generation purposes with the natural flooding cycle of the lower reaches of the river system (at its seaward extent).

**3.4 Problems related to institutions and human resources.** Problems related to institutions, both legal and regulatory, and agency structures, historically have been related to lack of appropriate laws and regulatory regimes for controlling environmental pollution, and implementing and undertaking compliance monitoring and policing of violators. Related to the lack of institutional capacity, problems related to human resources include a paucity of trained staff, lack of authority to control environmental problems, and fragmented and parochial jurisdictions that have failed to bring a comprehensive and cohesive approach to watershed management in the SFRB. Initiatives set forth in federal law 9433/97 provide mechanisms to rectify many of these shortcomings. Funding, which has been in chronic short supply, has not allowed creation of laboratories, police forces, and other necessary appurtenances to control and regulate environmental pollution and degradation. Further, actions that were able to be undertaken were fragmented among agencies and between states

often resulted in less than effective management of the river and watershed. Currently, local and national initiatives are strengthening water resources institutions in the basin.

**3.5 Problems related to lack of an holistic management approach.** Problems related to the lack of a unified vision of the SFRB as an integrated whole include inter-sectoral conflicts over water usage, competing rather than complementary demands for water, and a piecemeal approach to water resources development in the basin. The Senate Committee on the Sao Francisco Valley identified this lack of an integrated, holistic management approach as the principle issue facing sustainable development in the basin.

**3.6 Problems of land degradation.** Problems related to land degradation include draining of coastal wetlands, conversion of lands for agricultural purposes, and disruption of the land surface for mining and residential purposes. Industrial farming operations not only disturb large areas of land, but also the land clearing practices which have resulted in the deforestation of river banks and uplands, and the water use regimes and types of crops and livestock, have aggravated the severity of land degradation in the basin.

**3.7 Problems of fisheries.** Problems related to fisheries include contamination of fishes by heavy metals and agro-chemicals, and changes in species composition due to modification of river flow regime, constraints on migratory ranges, and harvesting pressures.

**3.8 Problems of hydrology.** Problems related to hydrological processes include alteration of flood regimes due to river regulation and altered land use practices which modify the way in which water is applied to and lost from the land surface. Changes in hydrological processes create a cascade of sedimentological chemical, and biological consequences throughout the system which further modify the structure and functioning of the aquatic ecosystem that is the river. Likewise, the draining of wetlands and creation of polders in the estuarine reaches of the river has further altered river flow patterns often in negative ways.

**3.9 Problems of urbanization and industrialization.** Problems related to urbanization and industrialization include surface or open cast mining for many metals and minerals, irrigated agricultural development, agro-industrial product processing (alcohol, vegetable and sugar processing), and residential area encroachment without adequate wastewater treatment and solid waste management. Mining operations contribute to sedimentation and contamination in the river by disturbing the land surface and direct and indirect runoff from slimes dumps and slag heaps. Poorly regulated use of agro-chemicals and the potential lack of irrigation scheduling (which affects the quantity and quality of irrigation water return flows) contribute to the eutrophication and salination of the river.

**3.10 Problems of water quality.** Problems related to water quality include contamination of surface and ground waters, including bacteriological contamination, heavy metal contamination, contamination by synthetic organic (agro-) chemicals, organic matter loading, and suspended sediment load modification, many of which have a significant anthropogenic component.



**4. Root Causes.** Despite the apparent proliferation of problems in the SFRB, there would appear to be relatively few root causes which contribute to the majority of the problems observed. These root causes will be quantified during this project.

**4.1 Anthropogenic causes.** People have contributed almost exclusively to the degradation of the SFRB. Although increased economic development in the basin has succeeded in improving the quality of life for many of the citizens of the basin (as intended), rates of exploitation of the natural resource base have increased, while primary extractive industries continue to deplete the reserves of minerals and metals that underlie these industries. In the first instance, the redistribution of population in the basin has led to increased urbanization throughout the basin, which in turn has contributed untreated human wastes and other contaminants to the system. These populations have also created an increased demands for foodstocks which have been met by overfishing and (potentially) cultivating marginal lands (through expansion of irrigation schemes and increasingly large additions of agro-chemicals to maintain soil fertility). Superimposed on these causative factors are modifications of the natural hydrological regime of the river which, while contributing to the production of “clean” energy for use by the people and industries of the basin and throughout Brazil, have proven especially destructive to organisms dependent on the quantity, quality, timing and rate of water flows for reproduction and survival (especially in the estuarine and coastal marine endpoints of the basin), and to groundwater sources dependent upon surface water flows for recharge.

**4.2 Legal and institutional causes.** While human land use activities have contributed significantly to the degradation of the Rio Sao Francisco ecosystem, legal and institutional shortcomings have historically exacerbated these problems by failing to control or regulate human actions in the watershed, and by the failure of existing mechanisms to view the basin as a unit, in which actions taken at specific sites have a cumulative effect throughout the system. While most of these shortcomings have been, or are currently proposed to be, rectified through state, federal and external interventions and initiatives, substantial and costly actions are needed to overcome the historic lack of regulation, and lack of an holistic approach to ecosystem and economic development.

**5. Actions Identified to Address Root Causes.** To help in overcoming the historical inertia inherent in the causative factors identified above, emphasis in project design has been given to those actions which address root causes that can be humanly managed; i.e., those anthropogenic causes and legal and institutional causes that can be modified through planning and subsequent implementation of corrective actions. Natural root causes generally cannot be effectively controlled by human actions and hence are of lesser importance from a watershed management perspective (although knowledge of these causes is an essential starting point from which to implement interventions to address human and institutional causes). The following actions have been proposed to address the human causative factors of environmental degradation in the SFRB.

**5.1 Acquisition of basic scientific information and dissemination of knowledge.** Project activities have been developed to acquire supplementary baseline information to support determination of root causes (e.g., the interactions between hydrology, sediments, nutrients

and biological responses in the lower reaches and coastal zone of the SFRB), provide quantitative insights into specific watershed management practices (e.g., sewerage system needs and reservoir operations, respectively), and investigate alternative courses of action to ensure sustainable use practices (e.g., stabilization of river banks impacted by hydrological variability in river flows, and rehabilitation of mining lands). In addition, a further group of activities has been proposed as a means of synthesizing and disseminating information gathered through diagnostic studies. These include, *inter alia*, activities which demonstrate ways in which citizens can contribute to the protection of community water resources, which address the need for public informational programming to enhance citizen participation in the decision-making process, and which train community-based extension agents to disseminate information on issues and mitigation measures to citizens.

**5.2 Promotion of financially-sound, integrated watershed management.** Project activities have also been developed to identify alternative, sustainable economic activities which will contribute to the maintenance of the ecological integrity of the SFRB. These projects include, *inter alia*, activities which address the conjunctive use of water resources in the SFRB, which investigate alternative means to achieve a sustainable fishery in the basin, and which strengthen local government water resources management capabilities in specific sub-basins as a prototype for use elsewhere in the basin.

**5.3 Development of an holistic institutional watershed management framework.** Project activities have been developed to provide an integrated management framework within which river basin management activities can be identified and carried out. Project activities in this category include, *inter alia*, activities which address the needs to harmonize technical approaches for data acquisition and share information within the basin of the Rio Sao Francisco, and which encompass the synthesis and integration of the strategic elements of the foregoing project activities in the WMP, or integrated watershed management plan.

**5.4 Support to river basin management and regulatory agencies.** Finally, project activities have been developed to provide directed support to create and strengthen the operational capabilities of river basin committees and related civic organizations. These activities include, *inter alia*, activities which promote the establishment of a basin committee and refine the role of the existing agencies within the basin.

**6. Concluding remarks.** Significant progress has been made in the definition of issues and problems (and their root causes in some instances) within the SFRB. Work proposed under the GEF International Waters focal area builds on this progress in seeking to extend local actions to the basin and contiguous coastal areas of the Rio Sao Francisco. This work is predicated upon the principles of civic involvement, public participation, and responsible governmental action at all levels of government, and embodies a comprehensive program of research, demonstration projects, and information dissemination designed to identify a framework for subsequent remedial measures and management actions that will result in the sustainable economic development of this region.

## ANNEX 3

## STAP ROSTER TECHNICAL REVIEW

Björn Kjerfve  
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University of South Carolina

**Integrated Management of Land-based activities in the São Francisco Basin**

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This GEF project is a US\$ 22.2 million water management program for the 640,000 km<sup>2</sup> tropical Rio São Francisco basin in northeastern Brazil. The population of the river basin is 13,000,000. The Rio São Francisco has its headwaters in Minas Gerais south of Belo Horizonte, and discharges 120 km<sup>3</sup> annually (3,800 m<sup>3</sup> s<sup>-1</sup> on the average) into the South Atlantic Ocean on the border between Sergipe and Alagoas. On the 3,200 km route to the sea, the river traverses a gradient of climatic zones, the climate becoming increasingly drier as the river winds through the Sertão. The richest *penaeid* shrimp fishery in Brazil occurs where the river discharges into the Atlantic. Further offshore flows the Brazil Current towards the south with a transport of anywhere from 20,000,000 to 40,000,000 m<sup>3</sup> s<sup>-1</sup>. Four large dams have been constructed along course of the river and are a major source for hydroelectric power with a combined yield of 10,000 MW. River water is also extensively used for irrigation of agricultural lands. The river has a rich cultural history and played a central role in the development of the interior of Brazil in past centuries. This GEF project appears well justified in terms of the importance of the Rio São Francisco to the continued development of the arid Sertão and is an opportunity for coordinated sustainable development of both river basin and coastal areas.

**Scientific and technical soundness of the project:**

The project is well conceived, and justifications are articulated convincingly. It is encouraging to see this type of project, which is focused on studies and analyses aimed at derivation of an intelligent set of plans for a consensus of optimized management and development of a major river basin.

**Identification of GEF benefits and/or drawbacks of the project:**

A major focus of the project is the coastal areas of Alagoas and Sergipe. It is encouraging to see that there now exists a realization that all activities within a drainage basin potentially have coastal consequences. This vision, which ought to be adopted elsewhere, is an overall benefit, and GEF plays an important role in encouraging this vision. Further, rational development and management of the river resources is of economic benefit to Brazil, the affected riparian states, special interest non-governmental organizations, and everyone living within the São Francisco basin, and thus is a benefit to GEF. There are no obvious drawbacks to the project although it is an expensive project.

**Appropriateness:**

The project as a whole appears to fit well within the context of the goals of GEF, and the operational strategies and priorities of the project would appear to be of high relevance to GEF.

**Regional context:**

The rational development and water management of the Sertão as proposed in this proposal is applauded. This region, a large portion of the São Francisco basin, is as of yet under-developed, at least partially as a result of the arid climatic conditions. However, the Rio São Francisco is a renewable hydroelectric resource on a grand scale. Well managed agriculture irrigation has the potential to enhance regional agricultural production. Better soil management and pollution and erosion control is encouraging. Also, the coastal region holds immense potential for tourism and ecotourism development, and is already a rich shrimp fishery resource.

**Replicability:**

If successfully executed, this project could well serve as a model for how to implement sustainable development in other large and small drainage basins by emphasizing the need for studies, analyses, and consensus solutions.

**Sustainability:**

The results of the project, when implemented, would potentially result in significant sustainable yields: optimum hydroelectric power generation, better water and soil management, pollution control, improved agricultural production as a result of holistic irrigation strategies, a blue-print for coastal tourism development, and optimized fisheries, and as an overall result, enhanced economic development.

**Linkages to other focal areas, programs, and/or action plans:**

This GEF project appears to be well linked to national and regional programs, and as long as project activities take adequate advantage of the international expertise provided by the participating international organizations, the linkages are good.

**Other beneficial or damaging environmental effects:**

The fact that the project will generate feedback between water resource management in the drainage basin and how the coastal area is utilized and developed is an important and novel benefit. There are no damaging environmental effects associated with the project.

**Degree of involvement of stakeholders in the project:**

The stakeholders represent an impressive combination of Federal Government organizations, state government organizations, municipal government organizations, universities, non-governmental organizations, and international organizations. As long as all units listed in the proposal are involved equitable in the execution of the project, there is great potential for successful execution.

**Capacity-building aspects:**

The studies and analyses proposed under this GEF project would benefit both government and non-government organizations by providing a strategic basin-scale blueprint for water management and development but with special attention directed towards the needs and priorities of each sub-region. The execution of the project would also have the potential to enhance the intellectual capacity and infrastructure of universities in the river basin. As a result, the public educational system is likely to improve and maybe also public health facilities.

**Innovativeness of the project:**

The scale of the project, an attempt to develop a holistic water management plan for a major river basin, is a very innovative approach. As long as equitable attention is given to

competing political and economic interests such that recommendations represent a balance between competing points of view, and an attempt is made to reach consensus solutions whenever possible, the project has the potential of becoming a success with minimal associated risks.

### **Implementing Agency Response**

Prof Dr Kjerfve's review is strongly supportive of this project. No changes in the project were required.