Integrated Management of Land-Based Activities in the São Francisco River Basin ANA/GEF/UNEP/OAS



Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone – SAP

**Final Report** 

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# Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone – SAP

Final Report

August/2004

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Landscape – São Francisco River

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## Preface

he objective of the Strategic Action Program for the Integrated Management of the São Francisco Basin and its Coastal Zone – SAP, is to propose an action program, covering a period of approximately 4 years, targeted at resolving conflicts and revitalizing the São Francisco River Basin and its coastal zone (Figure 1).

The SAP was prepared between July and November 2003, as the final step in the "Project for the Integrated Management of Land-based Activities in the São Francisco River Basin", approved by the Global Environment Facility (GEF) in 1998. This project is known locally as the GEF São Francisco Project, and has been characterized by intense public participation and discussions within the Committee for the São Francisco River Basin (CBHSF). It is important to note that more than 12,000 people and 404 institutions participated in this effort.

During the plenary meeting of the CBHSF, from 1 to 3 October 2003, after the Plans and Programs Work Group (GT-CBHSF) had examined all the strategic actions proposed, the Committee voted unanimously to support continuation of the SAP preparation and negotiation process, and to provide the technical and political support required for its consolidation.

Consequently, the SAP reflects the results of this consultative participation and stands as a major contribution to improving the process of environmental management in the Basin and its coastal zone, thus making it possible to conceive and implement an integrated management model, adjusted specifically to the context of the Basin. The report is divided into eight chapters. Chapter 1 presents the background, process of preparation and basic content of the SAP, including its national and international ramifications, and lessons learned during the course of implementation of the GEF São Francisco Project.

The major geographic, environmental and socio-economic characteristics are presented in Chapter 2.

Chapter 3 deals with the institutional framework within which development of the Basin and its coastal zone is conducted.

Chapter 4 provides strategic guidelines for management of the Basin and its coastal zone.

The Strategic Action Program, designed to be implemented over a four-year period, together with its principal components and activities, is described in Chapter 5. Chapter 6 deals with issues of program implementation.

Chapters 7 and 8 include a selected bibliography and a listing of the major participants and collaborators involved in development of the Project.

The five annexes to this document relate to decisions made by the CBHSF at its plenary meeting in Penedo (AL), with respect to the SAP, the institutions and staff involved in activities, the causal chain, legislation pertinent to water-resources management at both the federal and state levels, and investments allocated under the Multi-Year Plans (PPAs) of the Federal Government and of the Governments of the States that share the Basin.



Source: ANA/GEF/UNEP/OEA Project

Figure 1. Location of the São Francisco River Basin and coastal zone

Background, content, process, scope and lessons learned from the SAP

## Background, content, process, scope and lessons learned from the SAP

Aerial view – Irrigation in the São Francisco Valley



#### 1.1. Background

The São Francisco River Basin and its Coastal Zone are areas of strategic importance to the development of a vast region of Brazil. Thus, these areas have been targeted for constant government attention and are increasingly subject to demands on the part of local and regional society.

The various interventions to which the river and its most important tributaries have been subjected have generated complex alterations in its flow system, with repercussions on its coastal zone.

Studies and projects carried out in the Basin have never assumed an approach that encompasses the entire area, including the coastal zone, and neither has an integrated-management approach ever been applied.<sup>1</sup>

A portion of the Basin is in the semi-arid region, which extends into the northern part of Brazil's Northeast Region. The São Francisco River, with an annual average flow of 2,850m<sup>3</sup>/ second, accounts for roughly two-thirds of the freshwater available in the entire Northeast Region. It is for this reason that the possibility of sharing this water, through an inter-basin transfer scheme, with other Northeastern states that do not share the Basin has been a recurring theme since Imperial times.

The highly complex ramifications of the proposal for transposition of the São Francisco's waters, the current situation in the Basin and its coastal zone, and the potential for conflict among states that share the Basin, have led to efforts that seek to prioritize measures for revitalizing the River, so that future population-growth and socio-economic development demands will not result in the adoption of approaches that ultimately jeopardize the sustainability of the Basin and its coastal zone.

In 1995, the Special Commission for the Development of the São Francisco Valley was created, by Federal Senate Act 480, with the objective of fostering discussion of the strategies, policies, programs and priorities to be applied for development of the region, encompassing such topics as poverty reduction, the need to maintain a balance between socio-economic development and environmental protection, and the rehabilitation of degraded lands in the Basin.

- <sup>1</sup> Final report Special Commission for the Development of the São Francisco Valley Federal Senate Brasília 1995
- Similar concepts have been cited in evaluation reports involving projects financed by the World Bank.

In 1996, the Brazilian Government requested that the Organization of American States (OAS), in collaboration with the United Nations Environment Programme (UNEP), prepare a request for funding from the GEF Project Development Facility, for the preparation of a two-stage program for water-resources management and planning in the São Francisco River Basin. With the assistance of UNEP and OAS, a PDF/B<sup>2</sup> proposal was prepared and submitted in the amount of US\$ 341,000, and approved by the GEF Council.

The PDF/B resources made available to Brazil led to the preparation of a project proposal entitled "Integrated Management of Land-based Activities in the São Francisco Basin."This proposal was approved during July 1998, in the amount of US \$ 22.214 million, as Project GF/1100-99-14. The GEF contributed US\$ 4.771 million of the total project cost.

It was proposed that the United Nations Environment Programme perform the role of implementing agency, in view of the nature of the task that comprises initial strategic programming, whereas UNEP's partnership with the OAS flows from the latter's experience in carrying out similar work throughout Latin America.

Initially, the Secretariat of Water Resources of Brazil's Ministry of Environment (SRH/MMA) was designated as the local executing agency. Subsequently, in 2001, legislative changes in the framework of the National Water Resources Policy (PNRH) resulted in the creation of the National Water Agency (ANA), which has since assumed the role of local executing agency.

In March 1997, the GEF Council approved the request submitted by the Brazilian Government. A grant under the PDF/B enabled preparation of a project proposal known as Integrated Management of Land-based activities in the São Francisco Basin – Project GF/1.100/99-14, that was approved in July 1998, in the amount of US\$ 22.214 million, of which the GEF provided US\$ 4.771 million.

Execution of the project made it possible to develop a Diagnostic Analysis of the Basin (DAB), the first version of which was published in July 2003. Subsequently, a preliminary draft of the Strategic Action Program for the Integrated Management of the São Francisco Basin and its Coastal Zone (SAP) was concluded in December 2003.

The DAB was prepared on the basis of information gathered and conclusions drawn from the 28 Activities implemented in the São Francisco River Basin and its coastal zone during the period from September 1999 to April 2003. Later on, these conclusions were discussed in detail with the technical and scientific communities, and with representatives of local stakeholders in the area in question.

Essentially, this implies that, though the starting point was the DAB, many of the strategic actions and activities recommended in this report stem from interactions that took place subsequent to the diagnostic analysis. These interactions took the form of proposals raised by participants at the Brasília Seminar, meetings of the CBHSF Work Group, and workshops held in the four physiographic regions of the Basin.

#### 1.2. Format of the SAP

The SAP encompasses two duly-justified and detailed major components: Strategic Actions and Strategic Activities. Each activity includes the products, objectives, expected benefits and beneficiaries, institutional partners, reference budget and schedule:

I. Implementation of the Integrated Water Resources
Management System for the Basin and its coastal zone
SIRGHI;

<sup>&</sup>lt;sup>2</sup> PDB/B is a GEF preliminary request for funding document, that paves the way for a Cooperation Project and grants.



Box 1

### The GEF São Francisco Website http://www.ana.gov.br/gefsf/

Information on over 3 years of research and demonstration projects carried out under the 29 Activities that comprise the project on Integrated Management of Land Based Activities in the São Francisco River Basin (ANA/GEF/UNEP/OAS)—GEF São Francisco is available over the Internet.

Executive Summaries of the Final Reports on the Activities, the Diagnostic Analysis of the São Francisco River Basin and its Costal Zone–DAB, and the Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone–SAP are available in PDF format for download.

With a view to forming a borderless virtual community for the exchange of information on the São Francisco River Basin, the Website was developed with the following aspects in mind:

- Design: the layout of the site was designed for ease of navigability and adequate representation of GEF Projects;
- Content: within an information-technology architecture, the Website seeks to provide a comprehensive overview of the Project, including all of the Project's principal outputs, executive summaries of the major documents, and an overview of its stakeholders in order simultaneously to fulfill an array of institutional, technical, journalistic, educational, and communications needs, in both English and Portuguese;
- Technology: within a keyword-searchable database, the Website provides a management system for circulating the content in such a way as to allow an infinite number of people to publish reports directly onto the website from any part of the world;
- Support: a user's manual is available to provide guidance for users of the Website.

The GEF São Francisco Website seeks to provide a simple system for the management and dissemination of knowledge on the São Francisco River Basin and its Coastal Zone. II. Sustainable Use of Water Resources and rehabilitation of the Basin and of its Coastal Zone.

The two components focus principally upon strengthening of institutions and public participation, sustainable water-resources development, and environmental protection, rehabilitation and conservation. Permeating this approach is the concept of social inclusion targeted at the population of the Basin.

Execution of these actions must necessarily entail the active support and participation of the São Francisco River Basin Committee (CBHSF) and of the federal and state entities that are active in the Basin and its coastal zone.

Moreover, the SAP served as a basis for the preparation of the Basin Plan, as called for by Law 9.433/97 and CBHSF guidelines. Aside from the parts that can be carried out using grant funding from the Global Environment Facility - GEF, the SAP encompasses an array of activities and their corresponding investments necessary for consistent development of water-resources policies in the Basin and its coastal zone. This preliminary evaluation of the investment requirements was taken as a reference when defining 'the Basin's investment needs'.

The SAP proposes a series of priority strategic actions that have been identified by a diverse array of stakeholders, including the federal government, states, municipalities, private institutions and NGOs, that comprise the membership of the São Francisco Basin Committee. This strengthens the strategic participation of the institutions involved in the management of water-resources of the Basin, thereby endowing them with characteristics needed to transcend boundaries, and enabling actions to be replicated or adapted in other regions.

Furthermore, these actions are compatible among themselves and are clearly linked to components of Multi-Year Action Plans (PPAs) prepared by the federal government and the states directly involved in the Basin and its coastal zone. The SAP also defines the institutional framework needed to generate, sustain, and support the commitment to the actions indicated therein, and assesses the necessary financial, technical and human resource requirements for implementing the program over a four-year period.

The SAP consolidates the planning cycle, in the sense that the Basin Plan is constantly being updated and revised through application of control and adjustment instruments adopted as a result of a broad-based process of public participation that has characterized the entire preparatory process. Additional contributions of new knowledge can be incorporated and the institutional efforts refined, based upon predetermined indicators and performance evaluations, to attain the final objective of sustainable development of the water resources of the Basin.

One of the merits of SAP is that it provides stakeholders in the Basin and its coastal zone, the CBHSF and other interested parties, with a ready reference document that defines strategic actions and guidelines for integrated overall management of water resources. At the same time, priority actions to be executed are specified with the aim of revitalizing the Basin. Moreover, it orients studies and provides details for the formulation of projects and interventions so as to enable their evaluation within the framework of the Basin Plan. In this manner, the SAP seeks to contribute to the consolidation of actions performed by the Basin Committee, providing it with a work agenda for the early years of its operation. The SAP should, therefore, be regarded as a working document, to be used by local institutions for improving methodologies and strategies, with the overall aim of promoting sustainable development in the Basin and its coastal zone. It provides a means for harnessing the power of current water-resources management instruments and enabling their incorporation into policies, programs and plans while, at the same time, interacting with other natural resources management models.

#### 1.3. Preparation of the SAP

The drafting of the SAP marks the conclusion of the first stage of the Project. It is the culmination of studies and actions carried out under the 29 Activities, and of analyses of the causal links among the problems addressed under those Activities. It was precisely through these Activities that it became possible to identify the proposed actions, and focus them, with a view to correcting/mitigating the more critical problems.

In preparing the SAP, an effort was made to encompass all of the integrated management activities focused on the São Francisco River Basin and its coastal zone. To this end, a process of consultation was launched that entailed broad stakeholder participation, similar to that employed in the formulation of the DAB. Aside from the 210 events carried out during execution of the DAB and SAP Activities, seven additional meetings, with strong public participation, were held specifically for the purposes of SAP preparation, thus providing opportunities for wide-ranging discussion of its objectives, consistency, completeness and methodologies, and of its intermediate and final outputs. The purpose of this process was to gather information on local concerns and solicit contributions to the SAP, while disseminating information on the progress of the work.

Five meetings were held: the Brasilia Seminar, which took place between 24 and 25 August 2003; workshops in Belo Horizonte on 9 September 2003, Aracaju on 12 September 2003, Petrolina on 15 September 2003, and Barreiras on 17 September 2003. These venues correspond to the Upper, Lower, Lower-middle and Middle physiographic regions of the São Francisco River Basin, respectively. In addition, the 2<sup>nd</sup> Plenary Meeting of the CBHSF took place in Penedo (AL), from 1 to 3 October 2003. Two further meetings were held by the Plans and Programs Work Group (GT-CBHSF), created by the CBHSF as a counterpart to the effort made by the GEF/ANA/ UNEP/OAS during the SAP preparation process. During the course of the Project a total of 217 public events, in the form of seminars, workshops, working meetings and plenary meetings, were held.

The preparation work for activities under the DAB and SAP entailed the work of approximately 200 consultants who prepared the documents and proposals discussed during these events, and consolidated the outcomes into final reports.

#### 1.3.1. Public participation

The GEF São Francisco Project entailed ample involvement of society, with strong participation of the general public from the outset of the 29 activities. The results of this process culminated in the formulation of the Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone (DAB), reaching its peak with the preparation of the Strategic Action Program for Integrated Management of the São Francisco Basin and its Coastal Zone (SAP).



The execution phase of activities and of the DAB involved 11,503 people from 284 institutions, comprising 41 federal, 66 state and 67 municipal bodies; 60 NGOs; 43 private companies; and 7 international organizations.

As Table 1 shows, 594 stakeholders from the Basin and its coastal zone, representing a total of 196 institutions, participated in the SAP formulation phase. These institutions included 15 federal bodies, 40 state level entities, 36 municipal institutions, 80

NGOs, 20 private companies, and 5 international organizations.

The total consolidated number of institutions that contributed to the Project amounted to 483. These include 50 federal organizations, 102 state institutions, 110 municipal entities, 150 NGOs, 63 private companies, and 10 international organizations. Overall, considering all of these events, the SAP formulation efforts involved participation of some 200 consultants, 1,262 collaborators and 12,097 participants, representing the 483 entities.

Final	N° of participants by institution						
Event Location/Date	Federal	State	Municipal	NGOs and Companies	International	Total	
Seminar							
Brasilia-DF	81	12	0	21	5	119	
August 25-26, 2003							
Regional Workshop							
Upper São Francisco	24	27	15	25	,	112	
Belo Horizonte-MG	26	36	15	20	1	113	
September 9, 2003							
Regional Workshop							
Lower São Francisco	7 - 7	21	0	11	1	50	
Aracaju-SE	17					50	
September 12, 2003							
Regional Workshop							
Lower-Middle São Francisco	7.4	10	0	2	0	25	
Petrolina-PE	14	10	9	2	0	25	
September 15, 2003							
Regional Workshop							
Middle São Francisco	0.4	0.5	10	0.1	0	150	
Barreiras-BA	24	25	18	91	0	158	
September 17, 2003							
Plenary Meeting							
CBHSF	10	20	07	40		110	
Penedo-AL	13	30	27	48	1	119	
October 1-3, 2003							
Overall total	175	134	69	208	17	594	

With respect to the SAP, it is worth noting that 35% of the participants in these events represented NGOs or private companies; i.e., the participants were not representatives of public authorities, but rather of civil society in general.

It can thus be concluded that there has been intense public interest in the work of formulating the SAP and that participation has not been limited to public-sector representatives or employees of government entities alone.

Table 1 shows that 35% of the total of participants were representatives of NGOs or of private companies.

It is worth noting, in figure 2, that the percentage participation by private entities, including both NGOs and private companies, increased from 36% in the DAB, to 51% in the SAP, demonstrating that such participation was significantly stronger in the second stage of the Project. This indicates that there was greater intensity of interest displayed by these entities during the phase of preparing actions than during the diagnostic phase.



#### 1.3.2. Principal recommendations and comments

This entire process culminated in an analysis, under the DAB, and in targeted recommendations for preparation of the SAP. To validate these key steps, public debates were held in Brasilia and in the four physiographic regions of the São Francisco River Basin. In order to ensure ample opportunity for public debate and, consequently, enrichment of the SAP preparation process, participants at all of these events were provided opportunities to speak and put forward recommendations and comments.

As Table 2 shows, the 134 recommendations were distributed on a relatively even basis among the different components, however, their distribution by event was less even. As can be seen, participants in the Brasilia Seminar showed greater interest in issues relating to Component II, whereas, at the Regional Workshop in Petrolina, participants opted to focus greater attention upon those relating to Component I.



Landscape - Semi-arid region

Aside from these events, the SAP document was examined in detail and debated on two different occasions, in Belo Horizonte and in Aracaju, by the project preparation team and the Plans and Programs Work Group established by the CBHSF. It was this analysis and debate that enabled the CBHSF Work Group to prepare and remit its position on the subject to the CBHSF. This step was critical to the entire process, since it made it possible for the inputs of civil society to be transmitted in an appropriate form to the Basin Committee.

This process culminated in the CBHSF Plenary Meeting in Penedo, at which the two CBHSF documents appended to Annex 1 of this report were drafted: Recommendations of the Plans and Programs Work Group in support of the SAP, and CBHSF Decision No. 03, which provides for the São Francisco River Basin Plan.

Table 2. Number of recommendations and comments per component of the SAP, raised during public events							
Event	SAP Themes						
Location/Date	Component I	Component II	Total				
Seminar Brasilia-DF	7	16	22				
August 25-26, 2003	1	15					
Regional Workshop, Upper São Francisco	15	12	28				
Belo Horizonte-MG, September 9, 2003	15	15					
Regional Workshop, Lower São Francisco	16	10	34				
Aracaju-SE, September 12, 2003	10	10					
Regional Workshop, Lower-Middle São Francisco	12	2	15				
Petrolina-PE, September 15, 2003	15	2					
Regional Workshop, Middle São Francisco	16	10	35				
Barreiras-BA, September 17, 2003	10	17					
Overall total	67	67	134				

#### **1.4. National and international scope of the SAP**

The results of the GEF São Francisco Project were consolidated in the diagnostic analysis, which, in turn, became a tool of enormous importance in the preparation and adoption of the SAP. Aside from proving an extremely valuable experience, the diagnostic analysis has also generated a wealth of information on the São Francisco River Basin and its coastal zone, making it possible to begin exchanging experiences, not only within the framework of the São Francisco Basin, but also with other regions of Brazil and even with other countries.

Parallels have been drawn with the experience of the Nile River Basin and the building of the Aswan High Dam. In both the São Francisco and the Nile basins, agriculture was revitalized by annual flooding of the river banks. On the São Francisco River, annual flooding ceased with the construction of a series of hydroelectric plants in the Lower-middle region of the Basin, which not only altered the natural rise and fall of its waters, but also changed the conditions that had previously supported a highly varied ichthyofauna.

On the Nile, seasonal variations in water levels still result in a replenishing of sediments on the river banks, since the Aswan Dam is a relatively large distance from the river mouth, whereas at the estuary of the São Francisco, such sediments have been reduced by a factor of over twenty fold.

Many of the strategic environmental and institutional issues raised during the SAP preparation process are similar



Box 2

### The São Francisco River Basin Committee (CBHSF) Website

#### http://www.cbhsaofrancisco.org.br/

The Website of the São Francisco River Basin Committee (CBHSF) is one of the outputs of activity 4.1 – Promotion of Public Involvement in the São Francisco River Basin, and is targeted at empowering the Basin Committee to carry out participative and decentralized management of water resources throughout the São Francisco River Basin.

The site provides a powerful tool for raising the profile of the Basin Committee, by enabling it to publicize information on its founding and development, and to post updated reports on its activities, in Portuguese, English and Spanish.

In line with its underlying principles of decentralized public participation, and in compliance with current laws governing the management and use of water-resources, the CBHSF website not only serves as a forum for debate but also provides news on issues of interest to Basin Committee members, such as:

- the mobilization process that led to the Committee's foundation;
- its composition and organizational structure;
- full documentation, including its bylaws and the decree under which it was founded;
- reports and minutes of meetings, its mission statement and rules of procedure.

to those encountered in other regions and basins of the world. Among them:

- Exchanges and sharing of information and knowledge among all the participating institutions, states and entities involved, with the objective of consolidating a strong system of environmental coordination;
- Point and non-point sources of pollution, and proposed solutions, with the call for participation by those responsible for the pollution as well as those who suffer its consequences;
- Limitations upon the capacity to act effectively and efficiently in controlling environmental impacts, especially with regard to the degradation of ecosystems by pollution, erosion and the spread of invasive species (such as the aquatic plant known as "cabelo" in the Lower São Francisco River). Such negative impacts pose limitations in the areas of human, financial and (especially) social resources;
- The importance of understanding and consolidating awareness with regard to environmental issues when formulating and deploying customized activities suitable for adaptation or replication in other areas, taking into account regional and cultural factors and the degree of social development;
- Understanding of how environmental impacts can serve to orient sector-specific policies, through public participation and full assimilation of implications by all stakeholders;
- The wide variety of types of water use in the Basin, demanding harmonized solutions for the implementation of integrated water-resources management; and
- The importance of public involvement throughout the process, from identification of problems to the formulation of solutions, including monitoring of implementation and, most importantly, the role of the Basin Committee as the legitimate institutional forum for decision making, implementation and monitoring of actions, by means of the harnessing of cooperative participation of stakeholders, that has proven one of the richest experiences to emerge from the GEF São Francisco Project.

#### 1.5. Lessons learned from the GEF São Francisco Project

Several important lessons can be drawn from the entire process of conception and preparation of the DAB and the SAP, and their subsequent validation through the Activities, meetings, seminars and workshops. The major lessons are listed below:

- Considerable gaps still exist in our knowledge of the interactions between water and land use. Such knowledge is essential for defining critical areas and priorities. Training is the key to closing this gap, coupled with the activities of the Basin Committee;
- The GEF São Francisco Project demonstrated not only that it was possible, but also developed a process, to draft an analytical and participative diagnosis through the authentic exercise of democracy and negotiation. Due consideration was given to the contributions of all stakeholders in drawing up the strategic action program for the development of the São Francisco River Basin;
- Public involvement of more than 12,000 people in the debates on the two phases of the GEF São Francisco Project was, without any doubt whatsoever, expressive and spontaneous.
- The degree of participation in events and debates revealed the depth of interest in themes relating to the São Francisco River Basin and was reflected in the numbers of concrete recommendations put forward by participants;
- After the relatively large number of entities that participated in the preparation of the DAB, more and different entities came forward to participate in the SAP.
- There was a sharp increase in the number of NGOs participating in the SAP formulation, as compared to the number that participated in the DAB, demonstrating that, as the project began to address concrete problems rather than the abstract framework of the diagnostic analysis, the degree of interest intensified;

- The spirit of public involvement was significant and permeated all stages of the work. Commitment on the part of all those directly or indirectly involved in the project and of interested parties in the various questions and themes raised; the sense of identity of stakeholders; and the clarity of objectives as they were transmitted to the stakeholders, were identified as being the most critical elements of this involvement;
- Direct involvement of stakeholders in project execution, through open debate of findings and conclusions, served to reduce tensions created by ideological discourse, devoid of factual or technical-scientific foundations. Radical discourse proved unable to withstand the salutary and refreshing effects of freely expressed ideas, and tensions tended to dissipate as grandstanding gave way to dialogue. It was thus possible, for example, to deal with environmental aspects of the Project without resorting to radical posturing;
- Another important factor that contributed to the change in attitudes was participation by the public. This proved to be of inestimable importance in the decision-making process. When the responsibility inherent to decision making is fully comprehended, reactions tended to become more moderate and decisions more rational, as those charged with tasks realize that they may well in future be held accountable by the public for their decisions;

<sup>•</sup> Despite application of the principles of public involvement during the course of the Activities, the initial preparation of the DAB did not take such full advantage as it might have of the insights<sup>3</sup> put forward by the various institutions and stakeholders<sup>4</sup>. Such contributions are of inestimable worth and importance in ensuring continued innovation, especially in light of the perception, stressed by a number of authors, that knowledge creation involves both ideals and ideas. This shortcoming was corrected during preparation of the SAP, which more fully reflected all that had been discussed at the various events;

<sup>&</sup>lt;sup>3</sup> Experiences and discernment.

<sup>&</sup>lt;sup>4</sup> Actors and interested parties directly and indirectly involved.



n: CODEVA

Box 3

### São Francisco River Basin Information Network - RISF

Within the scope of Activity 4.7.C. – Meta-data Based Reference Information System on the São Francisco River Basin - a database containing all references to the São Francisco Basin located in Brazilian Federal Government institutions was established under coordination of the Brazilian National Water Agency – ANA.

Such an information network entails cooperation among the entities that produce and share information, with a view to lowering costs and distributing outputs to society. RISF thus operates in a context in which a very large number of international and national initiatives with similar aims are taking place.

Information on international initiatives can be obtained through the Federal Geographical Data Committee – FGDC, a US-based organization whose website is: www.fgdc.gov. Information on the São Francisco River can be found on the ANA website at: http://:risf.ana.gov.br.

In view of the vast area of the São Francisco Basin, the information network was planned to go into effect in phases. In the first phase, the goal was to establish data libraries by merging the databases of various Brasilia-based governmental agencies. These, aside from the Brazilian Water Agency - ANA (Agência Nacional de Águas) included:

- São Francisco and Parnaíba Valley Development Company CODEVASF (Companhia de Desenvolvimento dos Vales do São Francisco e do Parnaíba)
- The Brazilian National Electric Energy Agency ANEEL (Agência Nacional de Energia Elétrica)
- The Brazilian Institute of Environment and Renewable Natural Resources – IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recurso Naturais Renováveis)
- The Mineral Resources Research Company CPRM (Companhia de Pesquisa e Recursos Minerais)
- The National Institute of Meteorology INMET (Instituto Nacional de Meteorologia)
- The National Department of Works for Combating Drought DNOCS (Departamento Nacional de Obras Contra a Seca)
- The Secretariat of Water Resources SRH (Secretaria de Recursos Hídricos)

In the near future ANA will be incorporating additional data from other entities to the RISF.

- When expressing objectives and priorities, or when justifying the processes whereby the GEF São Francisco Project was prepared, clarity proved to be the most important attribute of communication. Such clarity should be pursued, from the initial drafting of terms of reference, through to the conclusion of the process. Clear and concise communication proved to be one of the key requisites for ensuring efficient and effective public participation in the tasks of Project preparation and execution;
- Actions pursued had to take due account of a diversity of sub-regional situations, and allow for the heterogeneity of interests involved, and the disparate capabilities of stakeholders, participants and beneficiaries, as was clearly reflected by a wide range of attitudes and behaviors displayed by stakeholders;
- The federal and state institutions involved have gradually assumed greater responsibilities in the execution of tasks allotted to them during the course of Project preparation. Such engagement and participation has increased as their perception of the importance of the Project has grown;
- The role of municipalities has proven to be of inestimable importance in the implementation of the Project. Municipal participation, however, must not become too closely associated with the administration of individual mayors, but rather, should seek to include the broader general public. There is a danger of the Project losing favor when administrations change, and project continuity demands that support depend not upon one single faction of local government, but rather, upon a commitment sanctioned by the entire community;
- The Basin Committee has demonstrated its capacity to fulfill its role in the integrated management of the resources of the São Francisco River Basin. At a meeting held on 2 October 2003 in Penedo, Alagoas, the Committee proved that it was able to make decisions and consolidate the support of local communities. The contribution of the CBHSF Work Group was of inestimable value to this outcome, in that the Work Group formally

conveyed the conclusions of the entire public consultation process to the CBHSF, as significant contributions to the decision-making process of that body;

- The support provided by the Project to the CBHSF unquestionably enabled the GEF to improve the quality of water-resources management in the Basin, thereby enhancing the value of the work well beyond the scope of its financial contribution;
- The financial support of the GEF to the São Francisco Project is, however, for a limited time period. Additional financial inflows generated by payment for the water use must be secured, and the Basin Agency must be consolidated, if the CBHSF is to continue to perform its vital role in managing the Basin in an integrated manner. Consequently, in the second stage of the Project, it is essential that the Basin Agency be implemented and endowed with the means of ensuring that the Project will move forward, perpetuating the benefits engendered during this first stage;
- The Basin Committee has played the role of fostering inter-institutional understanding, as it facilitates discussion of questions of importance to the Basin within the framework of its Regional and Technical Chambers. In so doing, the CBHSF has proven to be a solution to one of the major problems identified by the Project;
- It has also become clear that the Committee must be provided with permanent guidance, with respect to the objectives of its actions, and that this can be achieved only through systematic elaboration of Basin Plans, as called for under Law 9.433/97. Initially, such orientation is provided by the SAP;
- The drafting of federal and state Multi-year Action Plans (PPAs) represents an important step forward in bringing greater discipline to investment flows. Although expenditures are only authorized when justified under projects included under PPAs, in practice, two difficulties arise; namely: a lack of coordination between federal and state planning authorities in the drawing up of PPAs, and, even when projects are included within PPAs, they are often held up owing to spending constraints;



#### Box 4

# Geo-referenced information system for the Upper Rio das Velhas Basin

During preparation of Activity 2.1 - Environmental Assessment of the Impacts of Mining on Water Resources in the Upper Rio das Velhas Basin - in 2001, a database was established for the Minas Gerais Water Management Institute - IGAM (Instituto Mineiro de Gestão das Águas), containing information on the following thematic blocks in the region:

- availability of surface and ground water
- water quality in the hydrographic basin and the impacts of mining
- developments in land use and susceptibility to erosio
- water use in productive and mining activities
- environmental awareness

Aside from numeric data for each of these thematic blocks, the following maps, containing information on the Rio das Velhas Basin, are available on the Geo-referenced Information System – GIS:

#### location

- isohvetal points and pluviometers
- watercourses, fluviometers and water-quality measurement stations
- surface water hydrology
- location of concession area
- hydro-stratographic units
- conservation units and water waterfalls
- mining activities
- geology
- geology of the iron-bearing quadrilateral
- hypsometry/relie
- classes of decliviti
- nedolo
- vegetation cover and land use in 1985
- vegetation cover and land use in 1999
- municipal boundaries
- simplified morpho-structural diagram of the iron-bearing quadrilateral
- summary of potential water availability
- geo-pedological units
- environmental awareness of water-resources pollution
- principal results of water-quality diagnoses
- basic units for environmental analysis

- Systematic preparation and implementation of the Basin Plan, through broad-based participation and debate with society in general, will define real investment priorities in the Basin by the various spheres of government, while providing instruments for the resolution of difficulties arising from activities specified in PPAs at the federal and state levels. A Basin Plan will bolster public and political support for inclusion of the necessary investments in the respective PPAs;
- Though the financial contribution of the GEF is relatively modest and limited in time, it plays an important role in the establishment of a system that is certain to be of utmost importance to decisions involving the future of the São Francisco River Basin and, provided that the actions put forward in the SAP are successful, this strategic program is likely to stimulate investments amounting to billions of reals (dollars);
- With respect to the physical, economic and environmental aspects of the São Francisco River Basin, it is striking that the whole region is dotted with 'islands'

of economic development, situated within enormous 'voids' characterized by extremely low Human Development Indices (HDIs). Outside the 'islands' of development are areas where extreme poverty stimulates careless extraction of natural resources, as an imperative for survival, and causes significant environmental degradation. The 'islands' themselves are also marred by poor water and soil use practices, with the result that the entire Basin is in serious environmental jeopardy;

• The course of the Lower São Francisco River and its estuary, a region marked by extremely low HDI, suffers from anthropogenic environmental degradation that severely limits possibilities for generating income, and traditional fisheries have practically disappeared. There is thus a pressing need to provide local populations with economic alternatives for improving the quality of their lives.

The two previous lessons lead to a third of even broader scope: the need for revitalization of the Basin, the most viable instrument for which is the SAP.

Aerial view of the São Franscisco River showing the twin cities of Petrolina (PE) and Juazeiro (BA)

Pão de Açúcar-AL

80

Characteristics of the Basin and its coastal zone



## Characteristics of the Basin and its coastal zone

Aerial view of the Sobradinho Dam

The São Francisco River Basin is a vast and complex system encompassing various Brazilian states. From the jurisdictional standpoint, the political-administrative organization of the São Francisco River Basin involves the federal government, state and Federal District authorities, and also municipal authorities, which, according to Brazil's Constitution, are autonomous within the Brazilian Federation. In order to harness synergies capable of contributing to Brazil's development on a sustainable basis, the management model for the São Francisco River Basin must entail intense interaction, integration and negotiation among all of these parties.

Table 3: Area, population and number of municipalities in the Basin, by State, in the Sao Francisco River Basin <sup>1</sup>							
State	Area		Populat	Population		Municipalities	
	Km <sup>2</sup>	%	Inhabitants	%	No.	%	
Minas Gerais	234,684	36.8	7,595,274	57.2	240	47.7	
Goiás	3,041	0.5	107,858	0.8	3	0.6	
Federal District	1,355	0.2	22,000	-	1	0.2	
Bahia	305,866	48.0	2,663,527	20.1	114	22.7	
Pernambuco	69,607	10.9	1,614,565	12.2	69	13.7	
Alagoas	14,321	2.3	1,002,900	7.5	49	9.7	
Sergipe	8,046	1.3	291,831	2.2	27	5.4	
Total	636,920	100	13,297,955	100	503	100	

able 3: Area, population and number of municipalities in the Basin, by State, in the São Francisco River Basi

Source: IBGE-Census 2000/ANA/GEF/UNEP/OAS

In addition to this decentralized and federative framework, under the terms of Law 9.433/ 97, the basic unit for water-resources management is the hydrographic basin, thus making negotiation and political integration across political boundaries imperative.

Another setback has been institutional weaknesses and fragmentation, with countless organizations dealing with development and water-resources issues, at the federal, state and municipal levels, with little coordination among them.

The creation and installation, at the end of 2002, of the São Francisco River Basin Committee - CBHSF, is a clear indication of progress achieved toward implementation of a National Water Resources Management System. The establishment of the Basin Committee is evidence of a new form of State organization, in which elected government officials are not the principal participants, since the Committee also reserves seats for representatives of organized civil society.

<sup>1</sup>The area of the São Francisco River Basin and its physiographic regions was obtained using the officially defined borders of the Basin, at a scale of 1:100,000. The area was computed by CODEVASF from a Lambert conical projection re-projected as an Albers Equivalent.

Practically every imaginable type of water resources use can be found in the Basin. For this reason the region provides an important focus for studies on how to optimize and harmonize various forms of water use, namely: generation of electricity, shipping, irrigation, fishing, tourism and leisure, dilution of wastes, household and industrial water supply, mining, and others. Moreover, aside from these disparate forms of use, it is necessary to ensure adequate flows for preservation of the environment.

The São Francisco River Basin is marked by socio-economic disparities and environmental vulnerabilities, in which wealthy areas with high population densities coexist alongside areas with severe poverty and low population densities.

The Metropolitan Region of Belo Horizonte (RMBH) is located in the Upper São Francisco River Basin. The City of Belo Horizonte is the capital of the State of Minas Gerais. With 26 municipalities and an area of 6,255 km<sup>2</sup>, the State of Minas Gerais represents less than 1% of the entire São Francisco River Basin. However, its 3,900,000 inhabitants (according to the 2000 census) correspond to roughly 29.3% of the population in the entire Basin.

Data on the physical and socio-economic aspects of the São Francisco River Basin were revised and updated during preparation of the Diagnostic Analysis of the Basin (DAB). During that process, those involved, in close cooperation with such institutions as CODESVASF, CHESF and EMBRAPA, took the opportunity to reevaluate and redefine much of the statistical data on the Basin, making it possible to portray current realities more accurately. Among the studies carried out to provide technical-scientific bases for preparation of the SAP was the delineation of a new physiographic division of the São Francisco River Basin. This delineation coincided with the conclusion of the Final Report of the Federal Senate Monitoring Commission on the São Francisco River Revitalization Project, that "there is a need for broad discussion in academic and administrative circles with the aim of updating these limits."

This new physiographic division, which the Federal Senate termed a 'new geography,' was proposed by the Federal Senate Commission on the grounds that the current divisions had become outdated.

The proposed new framework preserves the current four physiographic divisions (Upper, Middle, Lowermiddle and Lower), but redefines the borders between the Lower-middle and Lower São Francisco River Basin, following a line that passes close to the town of Belo Monte (AL) (Figure 1 and Appendix 2). This boundary is based on geological, geomorphological, hydrographic, and climatic criteria that provide the foundations for the physiographic homogeneity that should be considered within a proposed Basin Plan, to be developed from the DAB and SAP. The criteria developed for this re-delineation may stimulate further and deeper studies, based on the same criteria, in the event that further divisions are proposed within the Basin. In this regard, the CBHSF and the National Council of Water Resources (CNRH) are considering whether the Middle São Francisco River Basin should be further subdivided.



Source: Project ANA/GEF/UNEP/OAS

Figure 3. Recommended new physiographic division of the São Francisco River Basin

The proposal for the new subdivision was presented and discussed at the VI Symposium on Water Resources of the Northeast, convened by the Brazilian Association of Water Resources (ABRH) in Maceió between December 3rd and 6th, 2002, and at the II Congress on Planning and Management of Coastal Zones in Portuguese-Speaking Countries, held in Recife, from October 12th to 19th, 2003.

Approximately 343,784 km<sup>2</sup> of the São Francisco River Basin, corresponding to 54% of the total area, are in the so-called Drought Polygon. A total of 251 municipalities lie within this area, which has a population of more than 5,680,000.

The Basin drains an area that extends from upstream regions in Minas Gerais, with rainfall of more than 2,000 mm, to semi-arid and arid zones in the states of Bahia and Pernambuco, where rainfall amounts to less than 350 mm, to the mouth of the River where rainfall levels gradually increase to about 1,300 mm per year.

Table 4 summarizes the main physical, natural and socioeconomic characteristics of the Basin, by physiographic region.



Paisagem – Pirapora-MG



Box 5

# New geographical classification of the São Francisco Basin

The Final Report of the Federal Senate Committee on Monitoring of the Project for Revitalization of the São Francisco River, published in November 2002, made the following recommendations with respect to the physiographic regions of the São Francisco River Basin, under the heading 'New Geography'.

"In view of the progressive socioeconomic and environmental differentiation taking place along the course of the São Francisco River, occurring principally since the formation of the Sobradinho reservoir and construction of the Xingó dam, this Committee believes that the current boundaries of the Middle, Sub-middle and Lower São Francisco are outmoded. From observations made, we consider it would be most fruitful to engage academic and administrative circles in a deep discussion, with a view to reviewing these boundaries, in the light of the following:

- a) the new reality brought on with the formation of Sobradinho Lake, extending over 300 kilometers, as a new and specific unit on the course of the river that, in view of its characteristics and dimensions, requires a specific approach;
- b) integration of the Paulo Afonso Xingó stretch of the Lower-middle São Francisco, in view of the filling of the canyon, thereby providing a new configuration for this stretch, given that the realities of the Lower São Francisco have been significantly altered since the building of the Xingó dam".

The first subdivision delimiting the large physiographic regions of the São Francisco River Basin were drawn up in 1967 by the United States Bureau of Reclamation – USBR. With support from the Federal University of Alagoas, the GEF São Francisco Project has undertaken an analysis of the various physiographic regions, and has proposed the following new divisions, in consonance with the Federal Senate recommendation:

- Upper, from its headwaters to its confluence with the Jequitaí MG
- Middle, from its confluence with the Jequitaı́ to the Sobradinho dam  $-\,{\rm PE}/{\rm BA}$
- Lower-middle, from Sobradinho dam to Belo Monte AL
- Lower, from Belo Monte the Estuary AL/SE

In order to draft these new limits and to verify the possibility of subdividing the Middle São Francisco (the area of which is some 400,000 square kilometers), in 2004, with the support of the GEF São Francisco Project, the São Francisco and Parnaíba Valley Development Company – CODEVASF, will be carrying out a survey, using modern technological resources and satellite imaging, with a view to determining the precise boundaries of the four physiographic regions, thereby bringing them into line with current realities.

Table 4: Physical and Socio-economic characteristics of the Sao Francisco River Basin, by physiographic region.								
Characteristic Total or Average		Upper	Middle	Lower-middle	Lower and Adjacent Coastal Zone			
Area, km2	636,920	99,387 401,559		115,987	19,987			
Area, %	100%	15.6% 63.1%		18.2%	3.1%			
Length of main stem, km	2,863 km	1,003	1,152	568	140			
	Minas Gerais (MG),							
	Federal District (DF),		MG,	BA,	55			
States encompassed	Goiás (GO),		DF,	PE,	PE,			
	Bahia (BA), Pernam-	IVI G	GO, and	AL, and	AL, and			
	buco (PE), Alagoas		BA	SE	SE			
	(AL), and Sergipe (SE)							
Number of municipalities <sup>2</sup>	503	194	173	93	78			
	13,297,955 (100)			2,021,289	1,422,881			
Population and (%)		6,489,402 (48,8)	3,364,383 (25,3)	(15,2)	(10,7)			
Urbanization, %	100	93	57	54	51			
Population density, popu-					68.7			
lation per km <sup>2</sup>	20.1	62.9	8.0	16.8				
Elevation, m		1,600 to 600	1,400 to 500	800 to 200	480 (sea level)			
Slope of main stem,					0.10			
m/km		0.70 to 0.20	0.10	0.10 to 3.10				
Prevailing climate		Tropical humid and	Tropical semi-arid	o	Sub-humid			
		temperate	and subhumid dry	Semi-arid and arid				
Availability of water,	7.004	( 000	25.2/7	899	1,172			
m³/per person /year	7,024	6,003	15,167					
Median annual rainfall, mm	1,036	2,000 to 1,100 (1,372)	1,400 to 600 (1,052)	800 to 350 (693)	350 to 1,500 (957)			
Median temperature, °C	18 to 27	23	24	27	25			
Median annual sunlight, hours		2,400	2,600 to 3,300	2,800	2,800			
Median annual evapora-	904	1 000	1 200	1,550	1,500			
tion/ transpiration, mm	090	1,000	1,500					
Contribution to the flow, %	100	41.7	54.6	1.9	1.8			
Maximum median		Pirapora, 1,303 in	Juazeiro, 4,393 in	Pão de Açucar, 4,660	Eaz 1680 in March			
monthly flow, m <sup>3</sup> /s		February	February	in February	F02, 4.000 III Marcii			
Minimum median		Pirapora, 637 in	Juazeiro, 1,419 in	Pão de Açucar, 1,507	Foz, 1,536 in Sep-			
monthly flow, m <sup>3</sup> /s		August	September	in September	tember			
Sediments 106/t/vr and		Pirapora	Morpará 21 5	luazeiro 12 9	Propriá 0 41			
$(area km^2)$	9.8 (636,920)	8,3	(344 800)	(510 800)	(620.170)			
		(61,880)	(510,800)		(020,170)			
Predominant vegetation		Cerrado and forest remnant	Cerrado, "caatinga" and small, high alti- tude forest	"Caatinga"	Semi-deciduous			
					seasonal forest, man-			
cover					grove swamps and			
					coastal vegetation			
Basic sanitation, % of								
homes								
- Water supply		90	43	37	33			
- Sewers		71	13	22	9			
- Sewage treatment		80%	1%	17%	1%			

Table 4: Physical and socio-economic characteristics of the São Francisco River Basin, by physiographic region.

continued...

<sup>&</sup>lt;sup>2</sup>The sum of 538 municipalities (rather than 503) results from some being counted twice, as they are located in 2 physiographic regions.
continued...

			1,243 between Pira-		
			pora and Petrolina/		
Neuineble unternueur lun	2.0/1		Juazeiro, 104 in	60 between Piranhas	148 from Belo Monte
Navigable waterways, km	2,061		Paracatu, 155 in	and Belo Monte	to the mouth
			Corrente, and 351 in		
			Grande		
		Três Marias (396),	Sobradinho (1,050),	Paulo Afonso I, II,	
Principal hydroelectric		Rio das Pedras (9.3),	Panderos (4.2), Cor-	III and IV (3,986),	
dams (power output		Cajuru (7.2), Queima-	rentina (9.0),	Moxotó (440),	
potential, MW)		dos (10.5), Parauna	Rio das Fêmeas	Itaparica (1,500),	
		(4.1)	(10.0)	Xingo (3,000)	
Irrigated area, ha and (%)	342,712 (100)	44,091 (12.9)	170,760 (49.8)	93,180 (27.2)	34,681 (10.1)
		Industry mining and	Farming, livestock,	Farming, livestock,	Farming, livestock,
Major economic activities		livesteck	industry and aqua-	power generation, min-	fishing and aquacul-
		IIVESLOCK	culture	ing and agribusiness	ture
HDI	0.343 to 0.802	0.549 to 0.802	0.343 to 0.724	0.438 to 0.664	0.364 to 0.534

According to CHESF, the median long-term flow at the mouth is 2,850 m<sup>3</sup>/s, though this figure is now being reassessed.<sup>3</sup> Figure 4 shows average monthly rainfall and flow measurements for the Basin as a whole.

# 2.1. Conservation and environmental protection areas in the São Francisco River Basin

State and federal environmental protection and conservation areas, including indigenous reserves, represent only a small portion of the land uses in the São Francisco River Basin, as Figure 5 shows.



Photo: Alain Dhomé

Serra da Canastra-MG



hoto: Alain Dhomé

Landscape – São Francisco River

<sup>3</sup>The natural flow levels between hydroelectric plans in the São Francisco River Basin are now being reevaluated through studies contracted by the National System Operator (ONS), with the support of the Ministry of Mines and Energy, ANEEL, and ANA. The project is entitled "Review of the Series of Natural Flows in the Principal Basins of the National Interconnected System (SIN)" and aims to improve the planning of water resources utilization. The study is scheduled to be completed in November 2003.



Source: Project ANA/GEF/UNEP/OAS

Figure 4. Average Rainfall and Flow measurements in the São Francisco River Basin



Source: IBAMA

Figure 5 - Conservation Units in the São Francisco River Basin



Box 6

## The São Francisco River is 2,863 km in length

In 2002, the São Francisco and Parnaíba Valley Development Company - CODEVASF, carried out a detailed survey of the full length of the São Francisco River.

This study found that the true source of the São Francisco is the Samburá river, close to the traditional source of the river in the Serra da Canastra, in Minas Gerais.

Satellite imaging showed that the basin of the Samburá covers a larger geographical area than does the São Francisco upstream from their confluence, and that the Samburá is longer than the portion of the São Francisco upstream from their confluence.

The elevation of the thalweg of the rivers at their confluence is: 664.944 m. for the Samburá, and 666.108 m. for the São Francisco. Flows measured in August 2002 for the Samburá were 16.6 m3/sec.; and for the São Francisco 5.3 m3/sec. It was also found that, at the confluence, the Samburá has a broader channel and a greater flow than the São Francisco, and that the thalweg of the latter is higher than that of the Samburá, hitherto regarded as the tributary.

Measurements of the length of the river, carried out using maps on various scales and satellite images, show that the São Francisco River is 2,716 kilometers long, from its estuary on the Atlantic seaboard, to the confluence of these two rivers. It was also found that the Samburá river is 147 kilometers in length. Thus, the total length of the São Francisco River is 2,863 kilometers.

#### 2.2. Potential use conflicts

Approximately 27% of the land area of the São Francisco River Basin is suitable for farming purposes. Using standards issued by the United States Bureau of Reclamation (USBR), 3,000,000 hectares have potential for irrigation. According to the São Francisco Valley Development Plan (PLANVASF), published in 1989, this total could be increased to as much as 8,000,000 hectares, if more flexible criteria, with pumping up to 60 meters, are adopted.

Having utilized practically all the São Francisco River's hydroelectric power generation potential, irrigated farming is now the principal economic vocation of the Basin.

Joint evaluations carried out by the electricity generation companies and CODEVASF in 1989, indicated that up to a 800,000 hectares of irrigated agriculture could be sustained without creating water-use conflicts between these two water users. Once the irrigated area exceeds that point, negotiations will be necessary to establish water allocation rules and priority criteria.

In 2003, the irrigated area amounted to 342,712 ha, as is shown in Figure 6. Consequently, there is ample potential for expanding irrigation without entering into conflicts with the power generation industry.

This scenario, however, is indicative of the importance of water resources management in the São Francisco River Basin, and, unquestionably, implementation of the SAP will assist in mitigating potential conflicts before they occur.

The major currently operating and planned hydroelectric plants for the São Francisco River Basin are shown in Figure 7.



Source: ANA/Codevasf.

Figure 6. Irrigated Areas



Source: Aneel.

Figure 7 – Current and Planned Hydroelectric Plants in the São Francisco River Basin

#### 2.3. Socioeconomic challenges

The Diagnostic Analysis of the Basin (DAB), highlighted a series of economic disparities within the Basin. The Basin encompasses areas of considerable wealth, as well as areas of severe poverty; areas of high demographic density stand in contrast to enormous demographic voids; and highly industrialized areas coexist alongside areas of subsistence agriculture.

Three major socioeconomic indicators provide an overview of the contrasts that exist within the São Francisco River Basin. The Infant Mortality Rate (IMR, per 1000 live births) ranges from 25.66 in Minas Gerais, to 64.38 in Alagoas, and is generally higher than the average rate for Brazil, which is 33.55 (IBGE, 2000). The Human Development Index (HDI), ranges from 0.633 in Alagoas, to 0.844 in the Federal District. In some municipalities HDI drops as low as 0.343, whereas the average HDI for Brazil as a whole is 0.769. Per-capita GDP (Gross Domestic Product), ranges from R\$2,275 (US\$ 758) in Alagoas, to R\$5,239 (US\$ 1,746) in Minas Gerais, whereas the figure for Brazil as a whole is R\$ 5,740 (US\$ 1,913) (IBGE, 1999).

#### 2.4. Availability of water

#### Surface waters

Though not very intense considering the huge area covered by the São Francisco River Basin, the flows of the São Francisco River are comprised of the combined flows of a number of fairly large secondary level tributaries.<sup>4</sup> At least seven of these tributaries have average flows of more than 100 m<sup>3</sup>/s and, taken together, they contribute a total of 1,506 m<sup>3</sup>/s, or approximately 73%, of the regulated flow downstream of the Sobradinho Dam, which is 2,080 m<sup>3</sup>/s.



#### Box 7

### Towns with over 100,000 population

As the table below shows, there are 14 towns with populations of over 100,000 in the São Francisco River Basin. Taken together, these towns have a combined population of almost five million.

Towns with over 100,000 population in the São Francisco River Basin.

Town/State	Population
• Upper São Francisco	
Belo Horizonte-MG	2,229,697
Contagem-MG	536,408
Betim-MG	303,588
Santa Luzia-MG	184,721
Sete Lagoas-MG	184,286
Divinópolis-MG	183,707
Patos de Minas-MG	123,708
Sabará-MG	114,557
Conselheiro Lafayete-MG	102,417
<ul> <li>Middle São Francisco</li> </ul>	
Montes Claros-MG	306,258
Barreiras-BA	131,335
<ul> <li>Lower-middle São Francisco</li> </ul>	
Petrolina-PE	218,336
Juazeiro-BA	174,101
<ul> <li>Lower São Francisco</li> </ul>	
Arapiraca-AL	186,150
Total	4,979,629
Source: IBGE, 2000.	

The combined populations of these towns account for roughly 32.78% of the total population of the São Francisco River Basin. It is worth pointing out that nine towns in the Rio das Velhas sub-basin, located in the Upper São Francisco physiographic region, account for a population of 3,963,089.

<sup>&</sup>lt;sup>4</sup> Resolution 30 of the National Council of Water Resources (CNRH, Conselho Nacional de Recursos Hídricos) (Annex 2), adopted on 11 December 2002, establishes the methodology for the classification of hydrographic basins and defines the main stem of the São Francisco River as being 'of the first order'.

When rivers, streams, brooks, creeks and rills are taken into account, the São Francisco River has 168 tributaries, of which 99 are perennial and 69 are intermittent. The most important perennial tributaries are: the Paracatu, Urucuia, Carinhanha, Corrente, and Grande rivers on the left bank; and the Velhas, Jequitaí, and Verde Grande rivers on the right bank. Tributaries located downstream of the Grande River are within the Drought Polygon and tend to be intermittent; i.e., they are dry during part of the year and large torrents during the rainy season.

Overall, flows in the São Francisco River amount to  $7,024 \text{ m}^3$  per person per year. When these flows are

converted to volume and correlated to the availability of water to the population in each physiographic region, the highest volumes are to be found in the Middle São Francisco River Basin (15,167 m<sup>3</sup>/person/year), despite the fact that tributaries in this region contribute the lowest flows to the main stream. The Upper São Francisco River Basin has the next highest volume per capita, with 6,003 m<sup>3</sup>/person/year, followed by the Lower São Francisco River Basin, with 1,172 m<sup>3</sup>/person/ year, and the Lower-middle São Francisco River Basin, with 899 m<sup>3</sup>/person/year. Figure 8 shows the distribution of water availability (m<sup>3</sup>/person/year) within the São Francisco River Basin.



Xingó Dam – AL/SE



Source: ANA.

Figure 8. Water-resources availability (m³/person/year) in the São Francisco River Basin

Box 8

## Basic sanitation and environmental control in the São Francisco River Basin

Coverage rates for such essential services as water supply, sewage collection and treatment, in the São Francisco River Basin, are below the rates for Brazil as a whole, as the table below shows.

#### Basic Sanitation Indicators

Physiographic region of the Basin	Water supply %	Sewage mains %	Sewage treatment %
Upper	83.60	52.20	6.20
Middle	67.90	12.20	1.20
Lower-middle	61.30	25.80	17.40
Lower	54.10	18.70	1.10
São Francisco River Basin	79.40	49.90	3.20
Brazil	86.50	59.00	21.20

Source: Secretariat of Urban Development of the Presidency of the Republic - SEDU. Brasilia. 2003.

Indiscriminate dumping of domestic and industrial wastes has seriously compromised water quality in such rivers as the Pará, Paracatu, Paraopeba, Verde Grande, Jequitaí, Abaeté, Urucuia, Rio das Velhas, Grande, Corrente, and many others.

The situation is even more serious in the Metropolitan Region of Belo Horizonte where water pollution, caused by the dumping of effluents from domestic drains and industrial wastes, is exacerbated by massive amounts of inorganic wastes resulting from the mining and processing of minerals. The situation is gradually being brought under control, with start of operations, in 2001, of the Arrudas sub-basin Sewage Treatment Station (STS), and the Onça sub-basin STS that is due to go into operation in 2004.

The remaining loads of organic pollution discharged into the São Francisco River Basin amount to 498 tons of  $BOD_5/day$ , corresponding to 7.8% of the total for Brazil. Of these, 314 tons are discharged in the Upper São Francisco, 81 tons in the Middle, 59 tons in the Lower-middle, and 44 tons in the Lower São Francisco River Basin.

It can thus be perceived that the highest loads of organic pollution are concentrated in the Upper São Francisco. Industrial pollution, which is likewise concentrated in the Upper and Lower-middle São Francisco, is of a lesser degree of intensity in terms of its effects as environmental pollution, as a consequence of more effective control on the part of statelevel environmental authorities, and a gradual increase in awareness on the part of industry with respect to the environment.

#### Groundwater

Groundwater resources of the São Francisco River Basin, though extensively utilized, have not been fully appraised.

In areas of metamorphic and igneous bedrock, aquifers are formed within fractures. In the semi-arid region, the aquifer tends to be covered by a thin mantle of weathered rock, 1 to 5 meters in thickness. In this area, the yields of wells average 2 m<sup>3</sup> per hour, at an average depth of 50 m. In more humid areas, the mantle is thicker, ranging from 10 to 100 m, and wells tend to produce average flows in the range of 8 m<sup>3</sup>/h at a depth of 85m.

The number of abandoned and disused wells is generally quite high, and saline water is often found.

Elsewhere in the Basin, limestone bedrock is found, primarily in the portion of the Basin that overlies the Bambuí karst aquifer. Wells in this region have average yields of 14  $m^3/h$ , at an average depth of 85 meters, and are intensely used.

The highly porous Urucuia-Areado aquifer system, located in the Middle São Francisco region, provides the primary water source for human settlements and for irrigation, with wells averaging 90 m in depth and having average yields of 10 m<sup>3</sup>/h.

Figure 9 shows the principal aquifer systems in the São Francisco River Basin, including several sedimentary aquifers located in the Lower-middle region of the Basin, more specifically, in the State of Pernambuco.



Source: ANA.

Figure 9. Principal aquifer systems in the São Francisco River Basin

#### 2.5. Demand for water resources

Much research remains to be done to determine present and future demands for water, by region, by economic sector, and by water source. Assessments are needed of the water-producing potential of hydro-geological water sources and small tributaries, especially in areas where the greatest agricultural demands are concentrated, and particularly along very fragile watercourses.

Demand for water in the San Francisco River Basin is currently estimated at 203 m<sup>3</sup>/s, corresponding to 9% of overall Brazilian demand. The highest demand for water occurs in the Middle São Francisco River Basin (70.2 m<sup>3</sup>/s), followed by the Upper São Francisco River Basin (57.3m<sup>3</sup>/s), the Lower-middle São Francisco River Basin (57.4m<sup>3</sup>/s) and finally the Lower São Francisco River Basin (17.9m<sup>3</sup>/s).

						(				
Dhyciographia	A ****	Flo	w*			Demar	nd (m³/s)			Domand
Physiographic	Area (lum <sup>2</sup> )	Q	Q <sub>95</sub>	Hickory	Dural	Live-	Tuduchuu	Turingtion	Tatal	
Region	(KM-)	(m³/s)	(m³/s)	Urban	Kurai	stock	Industry	Irrigation	TOLAT	u <sub>95</sub> (%)
Hanau	00 207	1,189	289	24.0	2.2	2.5	11 4	744	<b>F7</b> 2	10.0
Upper	99,387	(1,189)*	(289)*	26.8	2.2	2.5	11.4	14.4	57.3	19.8
N/I: alalla	401 550	1,522	531	A (	2.0	2.0	0.0	50.0	70.0	13.2
Wilddle 401,559	(2.711)*	(820)*	4.6	2.8	3.2	0.8	58.8	70.2	(8.5)*	
	115 007		25	2.0	0.0	٦ 4	0.4			229.6
Lower-middle	115,987	111	25	2.8	2.3	1.4	0.4	50.5	57.4	(6.8)*
1	10.007	28	8		7.4	0.7	0.2	744	17.0	223.7
Lower 19,987	(2.850)*	(853)*	1.1	1.4	0.7	0.3	14.4	17.9	(2.1)*	
Total	636,920	2,850	853	35.3	8.7	7.8	12.9	138.1	202.8	23.8*

Table 5. Availability and demand for water in the São Francisco River Basin (SAP - Reviewed).

Q: natural contribution of each stretch; Q95: flow with 95% confidence of recurrence; \*Availability is considered by physiographic region. Source: SRH/MMA and ANA, 2003

The highest demand/availability ratio, amounting to 19.8%, is to be found in the Upper São Francisco River Basin, followed by the Middle São Francisco River Basin (8.5%),the Lower-middle São Francisco River Basin (6.8%), and Lower São Francisco River Basin (2.1%).

# 2.6. Principal impacts of interactions between water resources and the environment

Broken down by physiographic region, the major impacts related to interactions between water resources and the environment are as follows:

#### Upper São Francisco River Basin:

- erosion, including that originating from rural roads, producing sediment loads that affect water courses creating water quality problems and silting of river beds;
- urban, industrial and mining activities that generate wastes, sewage and a variety of pollutants, jeopardizing water quality in streams and lakes that receive these discharges.

#### Middle São Francisco River Basin:

- widespread pollution caused by agriculture and seweage discharges, jeopardizing the quality of surface and ground waters; and
- intensive use of surface and ground waters for irrigated farming.

#### Lower-middle São Francisco River Basin:

- widespread pollution caused by agriculture and sewerage, including discharges into intermittent water courses;
- uncontrolled discharges and inadequate disposal of solid wastes;
- water shortages owing to the intermittent nature of tributaries.



Box 9

### Ichthyofauna of the Lower São Francisco River

In 1998/99, Costa et al. (2000), having analyzed the ichthyofauna in 8 locations in Alagoas and Sergipe in the Lower São Francisco, reported finding 33 fresh-water fish species, some of which were exotic, and 14 sea-water or estuarine species. These species are identified in the table below.

Fresh-water species	
Scientific name	Local name
Steindacherina elegans	Aragu
Leporinus piau	Piau-preto
Leporinus sp.	Piau-três-pintas
Schinzodou knerii	Piau-branco
Salminus hilarii	Tubarana-branca
Centropomus pectinatus	Robalo
Prochilodus sp.	Curimatá
Prochilodus argenteus	Xira
Prochilodus costatus	Curimatá
Pseudoplatystoma coruscans	Surubim
Serrasalmus rhombeus	Piranha-preta
Serrasalmus pirava	Piranha-vermelha
Serrasalmus brandii	Pirambeha
Myleus micans	Pacu
Pimelodus maculatus	Mandi-amarelo
Cichla ocollaria	
Ciclia ocenaris	Tucunare
Lankiasiluwus alayandui	Niguina
Deieudenimeledus zungene	Decemão
Psieudopimeiodus zungaro	Pacamao
Hopilas malabaricus	Iraira
Cichiasoma sp.	Cara
Colossoma macropomum	Tambaqui
Pachyurus franccisci	Curvina-branca
Pachyurus squamipinnis	Curvina
Hypostomus commersonii	Carí
Hypostomus margaritifer	Cari-pintado
Sternopygus macrurus	Sarapó
Oreochromis niloticus	Tilápia
Plagioscion squamosissimus	Pescada-do-piauí
Cyprimus carpio	Carpa
Acestrorhyncus lacustris	Lambiá
Parauchenipterus gaeatus	Cumbá
Astronotus ocellatus	Apaiari
Sea or estuarine species	
Scientific name	Local name
Bagre sp.	Bagre
Selenaspis herzbergii	Bagre
Caranx sp.	Xaréu
Eurreges brasiliensis	Carapeba
Centropomus paralellus	Camurim
Centropomus pectinatus	Robalo
Tarpon atlanticus	Camurupim
Anchoviella lepidentostole	Pilombeta
Stellifer sp.	Cabeca-de-coco
Lutianus sp.	Caranha
Mugil brasiliensis	Curimã
Muail so	Tainha
Hyporhamphus sp	Agulha
Geres sn	Carapicu
deres sp.	ourupicu



### Lower São Francisco River Basin and its coastal zone:

- physical impacts caused by upstream dams on the ichthyofauna, loss of biodiversity owing to reduced nutrient concentrations, and flood control structures that inhibit fish from going up river to spawn (piracema); Erosion on the banks and bed of the São Francisco River;
- modification of the sediment balance and flooding patterns at the estuary.

Suspended sediment concentrations in the Basin are shown in Figure 10. Based on measurements made during the GEF São Francisco Project in 2001, the discharge of sediments at the mouth amounted to only 0.41 million tons/year, suggesting that there has been a reduction of 97% in the loads, as compared to measurements effected by CODEVASF between 1966 and 1968, that recorded loads of 12.5 million tons/ year.



Photo: Alain Dhomé



Box 10

### Exotic species, endangered species and impacts upon the ichthyofauna of the Lower São Francisco River

In the Lower São Francisco, particularly, introduced exotic species include: Tucunaré (Cichla ocellaris and Cichla sp.), Tambaqui (Colossoma macrppomum), Nilotic Tilápia (Oreochromis niloticus), Carp (Cyprinus carpio), Apaiarí (Astronotus ocellatus), Pescada do Piauí (Plagioscion squamosissimus) and a hybrid known as Tambacu. These species, especially the Tucunaré, have caused impacts upon the regional ichthyofauna.

Fishermen of Alagoas in the Lower São Francisco speak of falling catches or the 'disappearance' no less than 12 fish species: Mandim (Pimelodus macalatus), Aragu (Steindacherina elegans), Cumbá (Parauchenipterus galeatus), Lambiá (Acestrorhyncus lacustris), Niquim (Lophiosilurus alexandri), Xira (Prochilodus argenteus), Dourado (Salminus brasiliensis), Surubim (Pseudoplatystoma caruscans), Pirá (Conorhynchus conirostris), Pilombeta (Anchoviella lepidentostole), Piau Cutia (Leporinus sp.) and Piaba Mantêga (Moenkkausia costae). Control of the landing of catches of these fish, in the 1998/99 period, corroborates the perceptions of these fishermen.

Negative environmental impacts upon fish stocks that may be due to dams have been analyzed by a number of authors, and the transformation of the river from a fast-flowing to a slow-flowing stream, and the consequent changes in characteristics of the water, have led to the disappearance, in the Xingó reservoir, of fish species typically found in fast-flowing well oxygenated waters. This was probably the plight of the Carí-espinho (Pterygoplichthys etentaculatus). Among the fish species that have been impeded from migrating upstream are: the Piau-branco (Schinzodon knerii), Matrichão (Brycon lundi), Curimatá (Prochilodus affinis), Pacu (Myleus micans) and the Pirá (Conorhynchus conirostris). Aside from these, fish species typically found in sea water, such as Robalo (Centropomus pectinatus) and Pilombeta (Anchoviella lepidentostole), are occasionally found below the dam, but are no longer encountered above it.

Aerial view – Lower São Francisco



Source: Codevasf/Planvasf/Embrapa.

Figure 10 - Average Suspended Sediment Concentrations in Surface Water in the São Francisco River Basin





### Institutional Context



# Institutional Context

andscape – semi-arid region



The fact that the Basin and its coastal zone encompass six states (Goiás, Minas Gerais, Bahia, Pernambuco, Alagoas and Sergipe), 503 municipalities and part of the Federal District (Figure 11), and that its waters are subject to the jurisdiction of numerous federal and state institutions, justifies the complex and multidisciplinary nature of the institutional model adopted, that must seek to create synergies, rather than provoking divisions or antagonisms.

Until approval of Law 9.433/97, water in Brazil had always been treated in a fragmented sectoral manner, dissociated from other natural resources.

Water needs to be treated as the common underlying element for ensuring environmentally sound approaches to the development of the Basin and its coastal zone, in the pursuit of sustainable growth. The legal framework to this effect already exists, and now it is necessary to put it into practice. Formulation of the SAP represents the initial step for attaining this objective. The institutional framework, and the federal and state legislation relating to the Basin and its coastal zone, are detailed in Annex 3 of this report.

The principal regional institutions involved in management of the Basin and its coastal zone, and their respective responsibilities for projects connected to the SAP, are listed in Table 6.

Bodies and companies	Role in the Basin	Interface with SAP
ADENE/ SUDENE	Former and investments with Good incertion	Designed Development
(NE+ES+North of MG)	Ensure resources and investments with fiscal incentives	Regional Development
<b>CHESF</b> (AL, BA, CE, PB, PE, PI, RN, SE)	Generate, transmit and distribute electric power	Monitoring of fisheries, water quality
CODEVASF (BA, SE, AL, PE, MG, PI)	Promote water and land use for development of the Basin	Irrigation, environment, geopro- cessing
DNOCS (PI, CE, MG, RN, PB, PE, AL, SE, BA)	Execute Federal Government policy in terms of: works and improvements in areas subject to drought and floods; irrigation; settlement of communities in areas served by irrigation or in special areas; provision of basic sanitation services in specific areas; emergency assistance in cases of catastrophes and cooperation with municipalities	Irrigation, aquaculture and wells.
FRANAVE (São Francisco River)	River transport and development of new shipping lines	Revitalization of river transport.

Table 6. Governmental bodies and companies involved in the São Francisco River Basin and its Coastal Zone.



Source: ANA/Codevasf.

Figure 11. State and municipal boundaries in the São Francisco River Basin.

Table 7 shows the federal bodies, and Table 8 the state bodies in the São Francisco River Basin.

National bodies and com- panies	Role in the basin	Interface with SAP
Ministry of Environment – MMA	Environmental and water resources policies	EEZ, coastal zone, environmental and water resources policy
Secretariat of Water Re- sources – SRH	Water resources policy	Formulation of governmental Water Resources policies
Ministry of Agriculture, Livestock and Supply – MAPA	Agricultural development	Aquaculture, micro-basin management, land use and rural exten- sion services
Ministry of Communications - MC	Telephone, radio broadcasting and postal systems	Information and communication technology in environmental protection and management of water resources
Ministry of Science and Technology – MCT	Scientific and technological research	CT-Hydro; human-resources training and product development, and the sustainable management, conservation, and integrated and efficient use of water
Ministry of Agrarian Devel- opment - MDA	Social inclusion	Rational use of water and land resources, ensuring better incomes and sustainability for small farmers
Ministry of Education – ME	Education at all levels	Environmental education
Ministry of Mines and Energy - MME	Electric power and mining	Mining and renewable energy
ELETROBRAS	Planning and finance for expansion of the electricity generation and distribution system	Definition of priorities and investment
Ministry of Planning and Budget – MPO	Strategic planning and oversight of Multi- year Plans - PPA	Definition of government investment priorities for 4-year periods, always extending into the first year of incoming administrations, and studies of development axes
Ministry of Health - MS	Promotion of public health, protection and recovery	Improving quality of life and control of water-borne diseases
National Health Foundation - FUNASA	Water and sewerage	Provision of water and sewerage facilities for towns of less than 30,000 population
Ministry of Transport – MT	Transportation in general	Maintenance of waterways, shipping
National Water Agency – ANA	Regulation and execution of the National Water Resources Plan (PNRH) and implementation of the Water Law (Federal Law No. 9.433/97)	Execution of water resources projects: PROÁGUA, GEF São Francisco, RISF, P1MC
National Electric Energy Agency - ANEEL	Regulation of the electric power market	Definition of need for hydroelectric power plants, development and control of their operations
Operator of the National Electric System – ONS	Operation and administration of the Nat- ional Electricity Grid in Brazil	Operation of reservoirs associated with hydroelectric plants
National Waterway Transport Agency - ANTAQ	Integration of waterway and land transport- ation systems	Strategic development corridors
Brazilian Agricultural Re- search Enterprise EMBRAPA	Generation, adaptation and transfer of tech- nology for agribusiness	Water quality
Brazilian Institute of En- vironment and Renewable Natural Resources -IBAMA	Execution of the National Environmental Policy	Fishing, water quality, environmental education, remote sensing

Table 7. Principal national governmental bodies and companies involved in the São Francisco River Basin and its Coastal Zone.	
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State hodies	Pole in the basin	Interface with SAP
	Flectric nower generation and distribution	Environmental education restoration of rinar-
(MG)	Electric power generation and distribution	ian forests and water quality
COPASA	Water supply and sewerage	Pollution control
(MG)	Tatel supply and severage	
SEMAD	Environmental policy	EEZ, environmental and water-resources policy
(MG)		
SEAGRI	Water and land conservation	Micro-basin management and land use
(MG)		
EMATER (MG)	Economic, social, environmental and rural development guidance	Technical and rural assistance
RURALMINAS	Services and technology in support of agricultural engineering and	Sanitation and water resources
(MG)	mechanization, and management of rural-development programs	
	and projects	
IGAM (MG)	Planning and administration for preservation of water quantity	Water resources management
	and guality	5
IEF (MG)	Forestry policy, preservation and conservation of flora and fauna,	Preservation and conservation of fauna and
	sustainable development of renewable natural resources and fish-	flora
	eries, research into biomass and biodiversity	
	Industrial support agency	Sustainable industrial development
SAAF	Water supply and sewerage	Water and sewerage
(MG)	water supply and sewerage	water and sewerage
SEDIAN	Planning and management	Planning
(MG)	r anning and management	Taining
	Research and development provision of services and diffusion of	Research and development
(MG)	technology	Research and development
	Water supply and sewerage	Basic sanitation
(DF)	water supply and sewerage	busic sumation
SEMARH	Formulation coordination and execution of environmental and	EE7 environmental and water-resource policy
(DF)	water-resources policies	
SEMARH	Coordination and formulation of state environmental, water-re-	EEZ, environmental and water-resource policy
(GO)	sources, biodiversity and forestry policies	
SIMEGO	Monitoring of weather, climate and water resources	Water resources management
(GO)	с , ,	5
CPRH	Licensing, legislation, monitoring, control and environmental	Environmental policies
(PE)	education	
COMPESA	Execution of government water supply and sewerage policies	Water supply and sewerage
(PE)		
SCTMA	Formulation, support and execution of state scientific, technolog-	EEZ, environmental and water resources poli-
(PE)	ical and innovation development policies; planning, coordination	cies
	and implementation of state environmental and water-resources	
	policies	
IPA	Generation, adaptation and transfer of knowledge and technology	Research and development
(PE)		
COELBA	Electricity distribution	Electric power distribution
(BA)		
CERB	Execution of water-resources programs, projects and actions:	Management of water resources
(BA)	perennialization of rivers, drilling of wells, construction of dams	
	and combating drought; execution of other programs, projects and	
	actions relative to infrastructure works	

Table 8. Dringinal state bodies involved in the São Francisco Diver Pasin and its Coastal Zone

Continued...

CRA         Formulation and execution of the state policy for environmental, forestry and water resources         Employmental, forestry and water-resources development           CBA         Rural technical assistance and research, classification of services         Technical assistance and rural extension           CBA         products and support for livestock and agro-industrialization         Technical assistance and rural extension           CBA         products and support for livestock and agro-industrialization         Technical assistance and rural extension           CBA         Supply of water and severage         Water supply and severage           CBA         Supply of water and severage         Water supply and severage           CBA         Execution of public policies relative to electric power, transport- ation, communication, management of water resources and basic sanitation; regulation, control and inspection of the quality of public services provided by concessions, permits or licenses.         Verslight of water, transportation, sanitation and communication services           SEN PLAN         Planning, science and technology         Planning, science and technology         Versight of water resources           SEM PL         Pormulation and execution of state policy for environmental forestry and water-resources (BA)         Water-resources development         Versight of restry and water-resources           SEAGRI         Formulation, and execution of state policy for environmental ducin ducin, specrich and general pollution control; conservinto and t	Continued		
(BA)         management, forestry and water-resources development         policy           EBDA         Rural technical assistance and rural extension based on the principles of sustainable development         Technical assistance and rural extension services           EMBASA         Supply of water and severage         Water supply and severage           (BA)         Supply of water and severage         Water supply and severage           (BA)         Supply of water and severage         Water supply and severage           (BA)         StiFLFRA         Execution of public policies relative to electric power, transport- opublic services provided by concessions, permits or licenses.         Oversight of water, transportation, sanitation and communication services           SEPLAN         Planning, science and technology         Planning, science and technology         Vater-resources           SERA         Development and execution of state policy for agriculture, irriga- tion and execution of state policy for agriculture, irriga- to and management, forestry and water-resources         molicy           SEARRI         Formulation, and execution of State policy for agriculture, irriga- to and monomental educ- resonace         policy           ODEMA         Formulation, coordination and execution of State Environmental (SE)         policy           COHIDRO         Rural engineering, farm mechanization and management of in- seponses to droughts and floors.         foreal mubilization and envinon- communities	CRA	Formulation and execution of the state policy for environmental	Environmental, forestry and water-resources
EBDA         Rural technical assistance and research, clasification of farm based on the principles of sustainable development         Technical assistance and rural extension services           EMBASA         Supply of water and severage         Water supply and severage           SAAE         Supply of water and severage         Water supply and severage           SAAE         Supply of vater and severage         Water supply and severage           SAAE         Supply of vater and severage         Oversight of water, transportation, sonitation and communication, senitation sanitation, regulation, control and inspection of the quality of public services provided by concessions, permits or licenses.         Oversight of water, transportation, sonitation and communication services           SEMARH         Planning, science and technology         Planning, science and technology         Vater-resources management           (BA)         agreemt, forestry and water-resources         Environmental, forestry and water-resources         Environmental, forestry and water-resources           SEMARH         Formulation and execution of state policy for environmental mane form         Environmental, forestry and water-resources           SEAGR1         Formulation, coordination and execution of state policy for agriculture, irriga- rigated areas         Scial mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDR0         Rural engineering, farm mechanization and management for responses to droughts and	(BA)	management, forestry and water-resources development	policy
(BA)         products and support for livestock and arro-industralization based on the principles of sustainable development         services           EMBASA         Supply of water and severage         Water supply and severage           (BA)         State         Supply of water and severage         Water supply and severage           (BA)         State         Supply of water and severage         Water supply and severage           (BA)         ation, communication, management of water resources and basis         and communication services           SEPLAN         Planning, science and technology         Planning, science and technology           (BA)         Iline water use and management of water resources         Water-resources management           (BA)         Iline water use and management of water resources         Environmental, forestry and water-resources           (BA)         Iline water use and management of water resources         Policies for agriculture, irrigation and land reform           (BA)         agement, forestry and water-resources development         Policies for agriculture, irrigation and land reform           (BA)         tion and execution of state policy for environmental         Social mobilization and environmental educ- ation, specific and agereral policy constraint and environmental educ- ation, specific and agereral policy constraint and environmental educ- ation           (SE)         Policy         Social mobilization and environmental e	EBDA	Rural technical assistance and research, classification of farm	Technical assistance and rural extension
based on the principles of sustainable development           EMBASA         Supply of water and severage         Water supply and severage           (BA)         SARE         Supply of water and severage         Water supply and severage           (BA)         SARE         Supply of water and severage         Water supply and severage           (BA)         Sentration of public policies relative to electric power, transport.         Oversight of water, transportation, sanitation and communication, services provided by concessions, permits or licenses.           SEPLAN         Planning, science and technology         Planning, science and technology           (BA)         Inite water use and management of water resources         Water-resources management           SEMARH         Formulation and execution of state policy for environmental mane.         Environmental, forestry and water-resources           SEAGRI         Formulation and execution of state policy for agriculture, irriga.         Policies for agriculture, irrigation and land reform.           (SE)         Policy.         Coll mobilization and exervino mental educ-reation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of incompany specific and general pollution control; enservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of incompany specific and general pollution control; enservation at the estuary           DEFESA CIVIL (SE)<	(BA)	products and support for livestock and agro-industrialization	services
EMBASA (BA)         Supply of water and severage         Water supply and severage           (BA)         Supply of water and severage         Water supply and severage           (BA)		based on the principles of sustainable development	
(BA)           SAAE         Supply of water and severage         Water supply and severage           (BA)         SEINFRA         Execution of public policies relative to electric power, transport           (BA)         attion, communication, management of water resources and basic sanitation; regulation, control and inspection of the quality of public services provided by concessions, permits or licenses.         Oversight of water, transportation, sanitation           SEPLAN         Planning, science and technology         Planning, science and technology           (BA)         Development and execution of state policy for agriculture, irriga- (BA)         Water-resources           SEMARH         Formulation and execution of state policy for agriculture, irriga- tion and land reform.         Policies for agriculture, irriga- policy           SEAGRI         Formulation, coordination and execution of State Environmental ADEMA         Formulation, coordination and execution of state policy for agriculture, irriga- tion and land reform.         Policies for agriculture, irriga- tion           COHIDRO         Rural engineering, farm mechanization and management of ir- seponses to droughts and foods.         Brownomental section use of water in irrig- ation           DEFESA CIVIL (SE)         State Civil Defense policy: planning for and promoting prompt responses to droughts and foods.         Brownomental services in poor communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension responses to droughts and foods. <td>EMBASA</td> <td>Supply of water and sewerage</td> <td>Water supply and sewerage</td>	EMBASA	Supply of water and sewerage	Water supply and sewerage
SAAE         Supply of water and severage         Water supply and severage           (BA)         ation, communication, management of water resources and basic sanitation; regulation, control and inspection of the quality of public services provided by concessions, permits or licenses.         Oversight of water, transportation, sanitation and communication services           SEPLAN         Planning, science and technology         Planning, science and technology         Vater resources management.           (BA)         Ine water use and management of water resources         Environmental, forestry and water-resources policy for environmental man- form         Environmental, forestry and water-resources policy           SEAGRI         Formulation and execution of state policy for anyiculture, irriga- policy         Policies for agriculture, irrigation and land reform           ADEMA         Formulation, coordination and execution of State Environmental (SE)         Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of in- sigated areas         Support for the rational use of water in irrig- ation           DEFES A CIVIL (SE)         State Civil Defense policy; planning for and promoting prompt regions at droughts and floods.         Preventive measures in the event of floods and droughts           DEFES A CIVIL (SE)         Health surveillance, technical assistance and rural extension services         Recovery of ichtyrofauna, erosion control, econtrol in degrad	(BA)		
(BA)         Oversight of water, transport- ison, communication, management of water resources and basic sanitation, regulation, control and inspection of the quality of public services provided by concessions, permits or licenses.         Oversight of water, transportation, services           SEPLAN         Planning, science and technology         Planning, science and technology         Planning, science and technology           (BA)         Inerview and management of water resources         Planning, science and technology         Planning, science and technology           (BA)         Inerview and management of water resources         Planning, science and technology         Planning, science and technology           (BA)         Inerview and management of water resources         Environmental, forestry and water-resources           SEMARH         Formulation and execution of state policy for agriculture, irriga- tion and land reform.         Policy           ADEMA         Formulation, coordination and execution of state Environmental ADEMA         Social mobilization and environmental educ- ation; specific and general pollution control; conservition at the estuary           COHIDRO         Rural engineering, farm mechanization and management of in- rigated areas         Support for the rational use of water in irrig- ation           DEFESA CIVIL (SE)         State foil Defense policy; planning for and promoting prompt responses to droughts and floods.         Proventive measures in the event of floods and droughts           DESO         Water supply and severa	SAAE	Supply of water and sewerage	Water supply and sewerage
SEINFRA       Execution of public policies relative to electric power, transport.       Oversight of water transportation, sanitation         (BA)       ation, communication, management of water resources and basic       and communication services         SEPLAN       Planning, science and technology       Planning, science and technology         (BA)       Development and execution of public policies, measures to discip-       Water-resources management         SEMARH       Formulation and execution of state policy for exvironmental man-       Environmental, forestry and water-resources         SEAGRI       Formulation and execution of state policy for agriculture, irriga-       Policies for agriculture, irrigation and land reform.         ADEMA       Formulation, coordination and execution of state policy for agriculture, irrigation and environmental educ-       Social mobilization and environmental educ-         (SE)       Policy.       Social mobilization and every       Conservation at the estuary         COHIDRO       Rural engineering, farm mechanization and management of irrigated areas       Support for the rational use of water in irrigation         DESO       Water supply and severage       Environmental cooperation services in poor communities         EMDAGRO (SE)       Health surveillance, technical assistance and rural extension       Secore of the rational use of water in irrigation of degraded areas         SEPLANTEC/       Formulation, coordination and execution of the st	(BA)		
(BA)       ation, communication, management of water resources and basic sanitation; regulation, ontrol and inspection of the quality of public services provided by concessions, permits or licenses.       and communication services         SEPLAN       Planning, science and technology       Planning, science and technology         (BA)       Development and execution of public policies, measures to discip- SEMARH       Water-resources management         (BA)       agement, forestry and water-resources SEMARH       Formulation and execution of state policy for environmental man- tion and land reform.       Environmental, forestry and water-resources Policy         SEAGRI       Formulation, coordination and execution of state policy for agriculture, irriga- tion and land reform.       Policies for agriculture, irriga- ation; specific and general pollution control; conservation at the estuary         COHIDRO       Rural engineering, farm mechanization and management of ir- responses to droughts and floads.       Scipport for the rational use of water in irrig- ation         DEFESA CIVIL (SE)       State Civil Defense policy: planning for and promoting prompt responses to droughts and floads.       Preventive measures in the event of floads and droughts         DEFESA CIVIL (SE)       Health surveillance, technical assistance and rural extension responses to droughts and floads.       Support for the rational use of water in irrig- ation         CSED       Policy       Formulation, coordination and execution of the state research FAP       Support for the ratational execution of the state research FAP <td>SEINFRA</td> <td>Execution of public policies relative to electric power, transport-</td> <td>Oversight of water, transportation, sanitation</td>	SEINFRA	Execution of public policies relative to electric power, transport-	Oversight of water, transportation, sanitation
saritation; regulation, control and inspection of the quality of public services provided by concessions, permits or licenses. SEPLAN Planning, science and technology (BA) SRH Development and execution of public policies, measures to discip SEMARH Formulation and execution of state policy for environmental man. Environmental, forestry and water-resources SEAGRI Formulation and execution of state policy for environmental man. ADEMA Formulation and execution of state policy for environmental man. ADEMA Formulation and execution of state policy for environmental man. ADEMA Formulation, coordination and execution of State Environmental (SE) Policy. COHIDRO Rural engineering, farm mechanization and angement of ire- Support for the rational use of water in irrig- ation DEFESA CIVIL (SE) State Civil Defense policy: planning for and promoting prompt responses to droughts and floods. DEFESA CIVIL (SE) Health surveillance, technical assistance and rural extension SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research etwork SEPLANTEC/ Formulation, coordination and execution of the state research etwork SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SEPLANTEC/ Formulation, coordination and execution of the state research SECONT Preservices for the state senvironm	(BA)	ation, communication, management of water resources and basic	and communication services
public services provided by concessions, permits or licenses.           SEPLAN         Planning, science and technology         Planning, science and technology           (BA)         SRH         Development and execution of public policies, measures to discip-         Water-resources           SEMARH         Formulation and execution of state policy for any informental man-         Environmental, forestry and water-resources           (BA)         agement, forestry and water-resources development         Policy           SEAGRI         Formulation and execution of state policy for any informental man-         Environmental, forestry and water-resources           (BA)         tion and land reform.         Social mobilization and environmental educ-           ADEMA         Formulation, coordination and execution of State Environmental         Social mobilization and environmental educ-           (SE)         Policy.         conservation at the estuary         conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir-         Support for the rational use of water in irrig-           (SE)         rigated areas         ation         berviconmental coperation services in poor           (SE)         State Civil Defense policy: planning for and promoting prompt         Preventive measures in the event of floods and droughts           DESO         Water supply and severage         communities		sanitation; regulation, control and inspection of the quality of	
SEPLAN         Planning, science and technology         Planning, science and technology           (BA)         SRH         Development and execution of public policies, measures to discip- line water use and management of water resources         Water-resources management           (BA)         line water use and management of water resources         Environmental, forestry and water-resources           (BA)         agement, forestry and water-resources development         policy           SEAGRI         Formulation and execution of state policy for agriculture, irrigation and land reform         Policies for agriculture, irrigation and land reform           ADEMA         Formulation, coordination and execution of State Environmental         Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir- rigated areas         Support for the rational use of water in irrig- ation           DEFESA CIVIL (SE)         State Civil Defense policy: planning for and promoting prompt responses to droughts and floods.         Preventive measures in the event of floods and droughts           DESO         Water supply and severage         Environmental coperation services in poor communities           SEPLANTEC/         Formulation, coordination and execution of the state research         Support for the establishment of an inter-instit- utional research network           (SE)         Surces policy		public services provided by concessions, permits or licenses.	
(BA)           SRH         Development and execution of public policies, measures to discip.         Water-resources management           (BA)         line water use and management of water resources         Environmental, forestry and water-resources policy           SEAGRI         Formulation and execution of state policy for agriculture, irrigation and land reform.         Environmental, forestry and water-resources development           ADEMA         Formulation and execution of state policy for agriculture, irrigation and land reform.         Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir- responses to droughts and floods.         Support for the rational use of water in irrig- ation           DESO         Vater supply and severage         Environmental cooperation services in poor communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension services         Recovery of ichthyofauna, erosion control, services           SEPLANTEC/         Formulation, coordination and execution of the state research survei policy         Management of water resources           CASAL         Water supply and severage         Cooperation for environmental services in poor communities           EPLANTEC/         Formulation, coordination and execution of the state water-re- sources policy         Support for the establishment of an inter-instit- utional research network	SEPLAN	Planning, science and technology	Planning, science and technology
SRH         Development and execution of public policies, measures to discip- line water use and management of water resources         Water-resources management           (BA)         line water use and management of water resources         Emvironmental man- line water vacuum of state policy for environmental man- formulation and execution of state policy for agriculture, irriga- of the mulation, coordination and execution of State Environmental (BA)         Environmental, forestry and water-resources policy           SEAGRI         Formulation, and execution of state policy for agriculture, irriga- tion and land reform.         Environmental reform         Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir- rigated areas         Support for the rational use of water in irrig- ation           DEFES CIVIL (SE)         State Chil Defense policy: planning for and promoting prompt responses to droughts and floods.         Environmental cooperation services in poor communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension services         Support for the establishment of an inter-instit- utional research network           (SE)         Sources policy         Support for the establishment of an inter-instit- utional research network           SEPLANTEC/         Formulation, coordination and execution of the state research (SE)         Support for the establishment of an inter-instit- utional research network           SEPLANTEC/ SRH </td <td>(BA)</td> <td></td> <td></td>	(BA)		
(BA)         line water use and management of water resources           SEMARH         Formulation and execution of state policy for environmental man- (BA)         Environmental, forestry and water-resources policy           SEAGR1         Formulation and execution of state policy for agriculture, irriga- (BA)         Policies for agriculture, irrigation and environmental educ- reform           ADEMA         Formulation, coordination and execution of State Environmental (SE)         Policy.           COHIDRO         Rural engineering, farm mechanization and management of ir- rigated areas         Support for the rational use of water in irrig- ation; specific and general pollution control; conservation at the estuary           DEFESA CIVIL (SE)         State Civil Defense policy; planning for and promoting prompt responses to droughts and floods.         Prevent measures in the event of floods and droughts           DESO         Water supply and severage         communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension services         Recovery of ichthyofauna, erosion control, restoration of degraded areas           SEPLANTEC/         Formulation, coordination and execution of the state research (SE)         Surport for the establishment of an inter-instit- utional research network           SEPLANTEC/         Formulation, coordination and execution of the state research (AL)         Cooperation for environmental services in poor communities           EMATER         Technical assistance and rural extension se	SRH	Development and execution of public policies, measures to discip-	Water-resources management
SEMARH         Formulation and execution of state policy for environmental man- agement, forestry and water-resources development         Environmental, forestry and water-resources policy           SEAGRI         Formulation and execution of state policy for agriculture, irriga- tion and land reform.         Policies for agriculture, irrigation and environmental educ- ation, specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir- rigated areas         Support for the rational use of water in irrig- ation           DEFESA CIVIL (SE)         State Civil Defense policy: planning for and promoting prompt responses to droughts and floods.         Preventive measures in the event of floods and droughts           DEFESO         Water supply and severage         Environmental cooperation services in poor communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension services         Recovery of ichthydanua, erosion control, restoration of degraded areas           SEPLANTEC/ FAP         Formulation, coordination and execution of the state research policy         Support for the restablishment of an inter-instit- utional research network           SEPLANTEC/ SED         Formulation, coordination and execution of the state research (SE)         Sources policy           CASAL         Water supply and severage         Cooperation for environmental services in poor communities           FAPEAL (AL)         Formulation, coordination and execution of the state research	(BA)	line water use and management of water resources	
(BA)         agement, forestry and water-resources development         policy           SEAGRI         Formulation and execution of state policy for agriculture, irrigat         Policies for agriculture, irrigation and land           (BA)         tion and land reform.         Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir- (SE)         Support for the rational use of water in irrig- diverses           OHIDRO         Rural engineering, farm mechanization and management of ir- (SE)         Support for the rational use of water in irrig- diverses           DEFSO         State Civil Defense policy: planning for and promoting prompt responses to droughts and floods.         droughts           DESO         Water supply and severage         Environmental cooperation services in poor communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension services         Recovery of ichthyofauna, erosion control, services           SEPLANTEC/         Formulation, coordination and execution of the state research SEPLANTEC/ SRH         Formulation, coordination and execution of the state water-re- communities           SEPLANTEC/ SRH         Formulation, coordination and execution of the state research SCE)         Maagement of water resources in poor communities           EMATER         Technical assistance and rural extension services         Erosion control, r	SEMARH	Formulation and execution of state policy for environmental man-	Environmental, forestry and water-resources
SEAGRI         Formulation and execution of state policy for agriculture, irriga- tion and land reform.         Policies for agriculture, irrigation and land reform           ADEMA         Formulation, coordination and execution of State Environmental (SE)         Policy.         Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir- (SE)         Support for the rational use of water in irrig- ation           DEFESA CIVIL (SE)         State Civil Defense policy: planning for and promoting prompt responses to droughts and floods.         Preventive measures in the event of floods and droughts           DESO         Water supply and severage         Environmental cooperation services in poor communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension services         Recovery of ichthyofauna, erosion control, restoration of degraded areas           SEPLANTEC/         Formulation, coordination and execution of the state research sources policy         Support for the establishment of an inter-instit- utional research network           (SE)         sources policy         Cooperation for environmental services in poor communities           EMATER         Formulation, coordination and execution of the state water-re- (SE)         Management of water resources           SEMATER         Formulation, coordination and execution of the state research (AL)         Erosion control, restoration o	(BA)	agement, forestry and water-resources development	policy
(BA)         tion and land reform.         reform           ADEMA         Formulation, coordination and execution of State Environmental         Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary           COHIDRO         Rural engineering, farm mechanization and management of ir- rigated areas         Support for the rational use of water in irrig- ation           DEFESA CIVIL (SE)         State Civil Defense policy: planning for and promoting prompt responses to droughts and floods.         Preventive measures in the event of floods and droughts           DESO         Water supply and severage         Environmental cooperation services in poor communities           EMDAGRO (SE)         Health surveillance, technical assistance and rural extension services         Recovery of ichthyofauna, erosion control, services           SEPLANTEC/         Formulation, coordination and execution of the state research sources policy         Support for the establishment of an inter-instit- utional research network           CSE         sources policy         Cooperation for environmental services in poor communities           EMATER         Technical assistance and rural extension services         Erosion control, restoration of degraded areas           SEI         Sources policy         Cooperation for environmental services in poor communities           EMATER         Formulation, coordination and execution of the state research (AL)         Establishment of an inter-institutional re	SEAGRI	Formulation and execution of state policy for agriculture, irriga-	Policies for agriculture, irrigation and land
ADEMA       Formulation, coordination and execution of State Environmental       Social mobilization and environmental educ- ation; specific and general pollution control; conservation at the estuary         COHIDRO       Rural engineering, farm mechanization and management of ir- rigated areas       Support for the rational use of water in irrig- ation         DEFESA CIVIL (SE)       State Civil Defense policy: planning for and promoting prompt responses to droughts and floods.       Preventive measures in the event of floods and droughts         DESO       Water supply and severage       Environmental cooperation services in poor communities         EMDAGRO (SE)       Health surveillance, technical assistance and rural extension services       Recovery of ichthyofauna, erosion control, restoration of degraded areas         SEPLANTEC/       Formulation, coordination and execution of the state research (SE)       Support for the establishment of an inter-instit- utional research network         SEPLANTEC/SRH       Formulation, coordination and execution of the state water-re- sources policy       Management of water resources         EMATER       Technical assistance and rural extension services       Erosion control, restoration of degraded areas         GL)       Formulation, coordination and execution of the state research (AL)       Establishment of an inter-institu- utional research network         TASAL       Water supply and severage       Cooperation for environmental services in poor communities         EMATER       Technical assis	(BA)	tion and land reform.	reform
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#### 3.1. Institutional framework

During the SAP formulation period, the institutional framework for managing land and water resources in the Basin was analyzed from the standpoint of the principal potential approaches to the management of water resources, with a view to integrating governmental and private initiatives and maximizing synergies.

#### 3.1.1. Current institutional instruments

The National Water Resources Management System was established by Law 9.433/97, and its administrative structure is shown in Figure 12 which also shows the scope of the activities and inter-relationships between the various bodies engaged in water-resources management activities, including the Basin Committee.



Penedo-AL



#### Federal level

#### National Water Resources Council – CNRH

Established by Decree 2.612, of 3 July 1998, the National Water Resources Council began operations in November

1998 as the principal legislative and deliberative body in the hierarchy of the National Water Resources Management System.

It is responsible for fostering links with, and promoting planning of water-resources policies among, national,



Box 11

## Is desertification taking place in the São Francisco River Basin?

Having reviewed the literature, analyzed satellite images, conducted mapping of the Lower-middle São Francisco region in Pernambuco and Bahia and carried out field inspections, it has been concluded that no accentuated soil degradation on a scale that could be shown on the maps (1: 100.000) or which could be described as desertification is taking place.

Reports indicating that desertification is taking place in Brazil and the identification of centers of desertification in the semi-arid areas have been overstated and require further and more in-depth research. Aside from simply not corresponding to reality, as is the case of Cabrobó-PE, such reports may reflect an unreal and distorted image of the situation in the interior of Brazil's Northeast region, and thus contribute to perpetuating economic stagnation, rather than serving to stimulate investment and promote development on sustainable bases.

It is worth stressing that areas in which significant environmental degradation has been reported are smaller than the minimum mapping unit used for cartographic purposes, and may be classified as areas requiring special attention. Adoption of such a classification is a more adequate approach to dealing with such areas. Moreover, the definition of a policy for monitoring and protecting riparian strips and slopes, classified as Areas for Permanent Preservation in accordance with the Brazilian Forestry Code, is also recommended.

#### Areas of degradation

- The banks of the Salitre River, in the municipality of Campo Formoso

   BA, with accentuated formation of gullies (voçorocas)
- Carnaíba do Sertão BA, lime quarrying
- Township of Pau-Preto BA, stone quarrying
- Between Curaçá and Paulo Afonso BA, formation of gullies (voçorocas)

regional, state and local governmental bodies and user organizations; arbitrating disputes between State Water Resources Committees (CERHs); debating projects involving the use of water resources that extend beyond the jurisdictions of the states where they are to be carried out; deliberating on questions submitted by State Water Resources Committees and Basin Committees (Basin Committees); analyzing proposals for amending legislation pertinent to water resources and National Water Resources Policy; establishing complementarity among the directives for the implementation of the National Water Resources Policy and the functioning of the National Water Resources Management System; approving proposals for the institution of Basin Committees and establishing criteria for the drafting of their bylaws; approving and executing the National Water Resources Plan, and determining the steps necessary to accomplish its goals; and, establishing general criteria for authorizations and charges, under the provisions of Law 9.433/97.

#### National Water Agency – ANA

The National Water Agency (ANA) is a special autonomous body linked to the Ministry of Environment, that is responsible for both regulating multiple water uses and implementing the National Water Resources Management System.

ANA carries out its work in association with public and private bodies that comprise the system, and among its responsibilities are: ensuring compliance with federal legislation pertinent to water resources; issuing legislative instruments relating to the National Water Resources Policy; stimulating and supporting initiatives directed toward the establishment of Basin Committees; authorizing and controlling the use of water resources in rivers belonging to the Nation; instituting water-use charges, in association with the Basin Committees, and receiving, distributing and investing the proceeds of such charges in accordance with Article 22 of Law 9.433/97; planning and promoting steps to prevent or mitigate the effects of droughts and floods, in association with state and municipal Civil Defense organizations; defining and overseeing the operation of reservoirs by public and private agents in order to guarantee multiple uses of water resources; organizing, establishing and managing the National Water Resources Information System; providing support to states for the establishment of bodies responsible for state-level management of water resources; proposing to CNRH the adoption of incentives, including financial premiums, for qualitative and quantitative conservation of water resources; drafting technical studies and provide support for the definition, by the CNRH, of water-use charges, and assisting ANA in the definition of guidelines for the investment of federal financial resources; and, stimulating research and human-resources training in the management of water resources, in accordance with the provisions of Law 9.984/00.

#### **Federal Level**

#### Secretariat of Water Resources - SRH

Located within the Ministry of Environment (MMA), the Secretariat of Water Resources (SRH) is responsible for formulating the National Water Resources Policy, and supporting the National Water Resources Council (CNRH) in the monitoring, execution and approval of the National Water Resources Plan. It performs the role of Executive Secretary of the CNRH and provides technical training on issues relating to water resources and policy formulation, and conducts awareness-raising programs on the importance of conserving water resources.

#### State level

#### State Systems for the Management of Water Resources

Like the National Water Resources Management System, the state water resources management systems are made up of state councils for water resources, state water-resources management bodies, basin committees, and basin water agencies.

#### State Water Resources Councils - CERH

As the central consultative, legislative and deliberative bodies responsible for management of water resources at the state level, these Councils are charged with establishing the principles and guidelines that will orient state water-resources policies, in much the same way as the CNRH does at the federal level.

#### State-level Public Water Resources Management Bodies

The state-level water resources management bodies are responsible for formulation and implementation of State Water Resources Plans (PERH), in coordination with public and private bodies and agencies, and non-governmental water-resources organizations that participate in the State Water Resources Management System (SEGRH). Their responsibilities include the licensing and supervision of the use of water resources within the state sphere.

#### **Basin level**

#### **Basin Committees - CBH**

Also known as the "Parliaments of the Waters", these committees are made up of governmental representatives from the federal, state and municipal spheres, representatives of civil society, and water users.

At the river basin level, the Basin Committees (CBHs) perform a legislative, consultative and deliberative role, and are responsible for promoting discussion of issues relating to water resources and coordinating the work of other agencies in this area. Among their responsibilities are: performing first-level arbitration of water resource conflicts; approving a water-resources plan for implementation in the basin; monitoring the execution of the water resources plan and suggesting the necessary measures for attaining the plan's goals; informing the national and state water-resources councils (CNRH and CERHs) of the minimum water uptake needs, water sources and discharge levels exempted from water-use authorization or licensing requirements in effect in each region and at each jurisdictional level; establishing mechanisms for the instituting of water-use charges and proposing the rates to be charged; and, establishing criteria and promoting cost sharing arrangements for the multiple use of water resources in the public or collective interest.

#### Water Agencies

Water Agencies, once they have been sanctioned by the National Council for Water Resources (CNRH), are intended to play the role of executive secretariat to their respective basin committees. Their purpose is to manage the financial resources accruing from water-use charges, and to administer the system.

The establishment of these water agencies must be conditioned by financial viability assessments, once systems of water-use charges have been established for the respective basins. Among the responsibilities of Water Agencies are: ensuring an up-to-date balance of water use and securing availability of water resources; maintaining a register of water-resources users; collecting, through delegation, fees for the use of water resources; analyzing and issuing reports on projects and works financed by revenues accruing from water-use charges; monitoring the financial administration of revenues obtained through water-use charges; managing information systems on water resources; entering into agreements, obtaining financing and commissioning services necessary for conduct of their activities; drafting budget proposals for submission to the Basin Committee; promoting the necessary studies for the management of water resources; formulating a water-resources plan for approval by the Basin Committee; proposing to the Basin Committee categories and rates to be charged; and, submitting an investment plan for revenues collected and proposing cost sharing arrangements for multiple, common or collective water use projects.



#### 3.1.2. Mechanisms for public participation

Public participation in the management of water resources in Brazil has grown in recent years. Such participation is always more intense when there are conflicts of interest, either over quantities of available water, or the conservation of water resources.

Decentralized decision making has proven an approach capable of legitimizing and strengthening the role of water-user organizations in river basins. The aim of decentralized decision making is to promote collective action and, thereby, to generate joint responsibility on the part of the various agents that participate in deliberations affecting water use.

To achieve effective public participation, it is essential to respect the specific characteristics of each region, in terms of both public participation in institutional management, and their approaches to water resources projects. Such characteristics are reflected in the institutional organization of each of Brazil's states, and in the levels of public and private participation achieved.

In states of the Northeast, where the critical issue is a lack of water, the states have attempted to assist water users in setting up channels of participation, both at the riverbasin level and at the level of local strategic reservoirs. In the South and Southeast regions, where water-quality is the main problem, inter-municipal river basin associations or consortia, and basin committees, have been established as fora for fostering orderly discussion and decision-making.

Such social participation, however, is still just beginning and very fragile. More widespread participation of water users in public decision-making requires integrated, decentralized and participatory action. This implies involving the entire institutional system for water-resources management in actions directed toward integrated river basin management, through the strengthening of participation in public initiatives, in line with concerns expressed by society.

One striking example of such public participation occurred during the process of establishing the São Francisco River Basin Committee (CBHSF), in 2001 and 2002, when a total of 58 formal meetings were held, involving 6,770 people.

From the national standpoint, the formulation of the SAP has sought to orient its strategic action program through the following activities: (i) successful experimentation; (ii) regional conditioning of factors relating to water resources and their management; and (iii) local regional institutional characteristics.

#### 3.1.3. Role of states and municipalities in water-resources management

Under the Brazilian legal framework, the Federal government is responsible for legislating on water resources, instituting the National Water Resources Management System, and defining criteria for authorizing the exercise of water-use rights. On the other hand, states have dominion over "surface and groundwater, flows, springs and deposits, except when these result from public works effected by the Federal government."

Protecting the environment, combating all forms of pollution, and recording, monitoring and controlling the exercise of concession rights to prospect for and exploit water resources, are shared responsibilities of the Federal Union, the States and the Municipalities, each acting in its respective sphere of jurisdiction.

The federal government, states and municipalities share responsibilities for implementing environmental standards. With respect to legislation, it is the responsibility of the Federal Union to establish general standards, and of the states and municipalities to approve supplementary regulations.

## Contribution of tributaries to the flow of the São Francisco River

The principal flow of the São Francisco, though not very intense consider ing the total area of its Basin, receives the flows of other secondary water courses that are of considerable caliber and flow. No less than seven of these tributaries have flows of over 100 m<sup>3</sup>/s, and their total contribution to the principal stream amounts to some 1,500 m<sup>3</sup>/s, equivalent to approximately 73% of the regulated flow downstream from the Sobradinho dam.

All told, the São Francisco River has 168 tributaries, considering rivers, creeks, streams, brooks and rills. Of these, 99 are perennial and 69 are intermittent streams. The larger rivers that flow into the São Francisco on a year-round basis are shown in the Table below:

#### Flows of the principal rivers that form the São Francisco

Left bank	Area km²	Average flow m <sup>3</sup> /s
Paracatu – MG/G0/DF	45.600	436
Urucuia – MG/GO	26.000	251
Carinhanha – MG/BA	18.000	150
Corrente – BA	35.000	251
Grande – BA	76.000	262
Right bank		
Paraopeba – MG	12.500	115
Das Velhas – MG	29.000	292
Jequitaí – MG	8.830	46
Verde Grande – MG/BA	30.500	19

Source: ANA. Brasilia. 2002.

Although the Table shows the Verde Grande River as a year-round water course, water stress caused by irrigation since 1985 have resulted in its bed frequently being left dry.

The permanent flow of the São Francisco River is due to the location of its headwaters and of a great portion of its upper reaches in a region with a tropical climate and heavy rainfall, thereby providing it with sufficient water to cross the crystalline semi-arid region. Moreover, much of its course flows over sedimentary regions from which it receives highly significant groundwater contributions. However, the bed of the São Francisco also crosses large areas in which it receives no contributions from tributaries during the dry season, thereby resulting in significant water losses through infiltration, rapid runoff and evaporation. Since the Federal Constitution delegates power, clearly, only those entities that have legislative authority can successfully exercise such power. Thus, the Federal Union issues general rules which the states and municipalities may complement or supplement, provided their measures do not clash with those of the other spheres.

Federal institutions can delegate or transfer the authority to exercise powers relating to the management of water resources to water agencies or basin agencies, in accordance with the terms of Article 44 of Law 9.433/97, and other applicable legal provisions.

The role of municipalities, defined under Brazil's Constitution as autonomous entities of the federation, is of fundamental importance, as it is the municipality that bears responsibility for organizing those aspects of environmental management deemed necessary to address local issues, water being preeminent among them. Municipalities must assume responsibility for evaluation, and for the establishment of norms, criteria and standards, relating to the control and maintenance of the quality of the local environment.

Municipalities thus need to seek empowerment and networking capabilities, so as to imbue their representation on the Basin Committees and Water Agencies with greater legitimacy and relevance. As will be explained in greater detail later in this report, this is one of the great contributions that the SAP is providing for integrated water-resources management.

Methodologies have been developed within the SAP to promote municipal-level management and establish the conditions necessary to enable municipalities to take on a greater role in water resources management. To this end, municipalities need:

- adequate administrative and organizational structures;
- qualified technical staff;
- sustainable financial resources;
- ensured continuity (municipal environmental bodies often do not survive changes in the political administration);

- linkages with other governmental agencies and institutions; and
- conflict management and resolution skills.

Brazilian environmental policy has created opportunities for greater municipal participation, through changes in environmental licensing that emphasize the municipality's status as a federative body and the delegation of specific environmental-management functions, especially those closest to local interests.

The establishment of partnerships and associations among municipalities has proven an efficient strategy for promoting exchanges of experiences and ideas. These partnerships and associations may also provide instruments and conditions for proposing and enacting joint actions in the environmental field and, more especially, in the water resources area.

#### 3.1.4. Role of the São Francisco River Basin Committee – CBHSF

The São Francisco Basin Committee, an innovative approach to effective water-resources management, has now been instituted. The Basin Committee acts as a veritable parliament for deliberation of water-resources management issues, and has played a major role in assessing actions proposed in the SAP.

Its scope encompasses the entire length of the São Francisco River Basin, and its membership comprises representatives of organized civil society and water users, as well as representatives of Executive-Branch institutions from the three spheres of government, which account for half of its total membership.

The principal objectives of the Basin Committee include: integrating water-resources management with environmental protection; securing the technical, economic and financial feasibility of investment programs and projects,



#### Box 13

### Waters from the São Francisco River Basin feed the Basin of the Tocantins River

A detailed analysis of the combined use of surface water in the sub-basin of the Fêmeas River, an area comprising 6.300 km<sup>2</sup>, was carried out under Activity 3.2. of the GEF São Francisco Project by the Superintendency of Water Resources of Bahia – SRH/BA (Superintendência de Recursos Hídricos da Bahia).

The sub-basin of the Fêmeas River is located within the basin of the Rio Grande, one of the left-bank tributaries of the Middle São Francisco, located in the west of the State of Bahia, on the border with the States of Goiás and Tocantins.

The principal aquifer in this region corresponds to cretaceous sediments of the Urucuia Group, the terrain slopes gently to the East, and the dominant vegetation is 'cerrado'.

It was found that, in the sub-basin, the contribution of groundwater to the flow of rivers is greater than 90%, thereby characterizing its dominance in generating the flows of the Fêmeas River and of its tributaries and, consequently, also of the Rio Grande. The rainy season lasts from October to April, during which time 94% of the total annual rainfall occurs. The flow of these rivers is permanent throughout 12 months of the year.

By means of geo-electrical soundings at 80 locations, and static-level measurements taken in 139 wells, the level and base of the aquifer were defined. The drafting of a groundwater map showed two important aspects relating to the geometric and spatial distribution of equipotential points, namely:

- the rivers depend fundamentally upon the Urucuia Aquifer, since their basic discharge corresponds to the volume of water replaced by the Aquifer, and;
- there is a division of the Urucuia Aquifer, within the São Francisco Basin, by means of an underground watershed, running approximately in a north-south direction, dividing the underground flow to the east, to the Fêmeas Basin; and to the west, to the basin of the Tocantins River.

Mouth of the São Francisco River

Photos: Alain Dho

and providing support for integrated public and water-resources sector policies, with the aim of fostering sustainable development in the São Francisco River Basin as a whole; and, promoting interfaces between national and state water resources-management systems, including the integration of municipal policies and regional proposals for plans, programs and projects into the directives and goals established for the São Francisco River Basin, with a view to ensuring the conservation and protection of water resources in the entire Basin.

#### Mouth of the São Francisco River

In order to achieve these objectives, Law 9.433/97 empowers the Basin Committee to:

- promote discussion of issues relating to water resources and foster links with participating bodies;
- arbitrate, initially at an administrative level, conflicts relating to water resources;
- approve the Basin Water Resources Plan pursuant to the guidelines established by the National Water Resources Council and the National Water Resources Plan, while integrating and harmonizing the Water Resources Plans for the sub-basins of tributaries to the São Francisco River with the Water Resources Plan for the São Francisco River Basin as a whole;
- monitor execution of the Water Resources Plan for the Basin and suggest steps for attaining its goals;
- propose, to the CNRH, minimum water uptake, derivation and discharge levels, as defined under state waterresources policies, to be exempted from water-use authorization or licensing requirements;
- establish mechanisms for water-use charges and propose rates for fees to be charged in the Basin, in association with the committees for the major tributaries and in consonance with state water-resources policies;
- deliberate on priorities for investment of revenues accruing from water-use charges, and forward its conclusions to the National Water Resources Council, in accordance with Article 22 of Law 9.433/97;

- promote the establishment of a basin Water Agency, to serve as its Executive Secretariat, and deliberate the Water Agency's budget proposal;
- establish criteria and promote cost sharing of works for multiple, common or collective use, and develop further actions;
- develop and support environmental-education initiatives, in accordance with Law 9.795/99, that established the National Environmental Education Policy;
- approve the Basin Committee's bylaws, in accordance with provisions of the CNRH.

The Basin Committee should have a Water Agency empowered to perform the functions of its Executive Secretariat.

The role of Regional Consultative Chambers in the Basin Committee also merits mention. These are boards, formed to reflect the physiographic divisions of the Basin, whose duties include: promotion of links between subbasins committees; recommendation of requests from sub-basins committees; support for shared-management initiatives within the scope of the Basin; discussion and presentation of suggestions relating to issues within their sphere of authority to the Basin Committee; promotion of actions carried out in the area of the Basin; coordination, within the scope of their activities, of mobilization for the renewal of the terms of office of Basin Committee members; and, convening of public meetings approved by plenary sessions of the Basin Committee.

#### 3.1.5. Non-Governmental Organizations

In parallel to the work of governmental institutions and the Basin Committee, there are a considerable number of Non-Governmental Organizations (NGOs) working in the Basin and its coastal zone. These are non-profit entities whose efforts are directed toward various aspects of environmental protection and community development, and some are dedicated to aspects of water-resources management. Some of these NGOs are concerned with regional development, while others have a more strictly local role.

These NGOs could be important partners in the implementation of the SAP, as they could potentially institute a model for private-state integration, as will be discussed later in this report.

The Federal Government's policy of decentralization has sought to redefine the way in which governmental actions are carried out, retaining at the central level only those powers that cannot be delegated, and transferring as much management responsibility as possible to the local level. Brazilian legislation regulating activities of the third sector adopts the premise that 'what is public is not a monopoly of the state'.

Thus, an approach based upon participatory management and partnerships is being adopted, in accordance with the following general principles:

- in order to ensure legitimacy and efficiency, no administrative or political process should be launched without first securing community participation;
- planning and management responsibilities should be shared between public authorities and society;
- only regulatory functions that require law enforcement activity on the part of the management agency cannot be delegated;
- many activities can be carried out through partnerships with NGOs, universities, private companies, etc.
- Planning, execution, prevention and corrective control measures, education, and communications and public relations, are all necessary elements of well-structured integrated management initiatives.

NGOs are viewed as useful potential partners for carrying out activities within their specific areas of interest, since they often possess qualified human resources and specialized knowledge. By working with NGOs, the State is not abdicating its constitutionally appointed role, but, rather, enhancing the efficiency, efficacy and effectiveness of its activities.

NGOs dedicated to development activities could help explore new sustainable-development initiatives in various areas, through the conduct of economic, technical and environmental feasibility studies, entailing effective participation of society. Local NGOs, working in close contact with grass-roots communities, can play an effective role in the management of such initiatives.

The third sector could provide the basis for ensuring that support reaches small communities and dispersed rural populations, in support to governmental initiatives. In this way, formal governmental institutions can focus more closely upon core institutional elements, such as expediting administrative procedures and providing assistance for securing funding.

Such partnerships generate a win-win situation, whereby cost reductions and management efficiency gains can be achieved through the productive use of the initiatives generated, without causing undue damage to the ecosystem.

#### 3.1.6. Management pact and integration agreement

Shared management of the water resources necessarily implies the resolution of conflicts of interest among the various players. To this end, it is necessary to establish institutional environments suitable for conflict resolution and problem solving where negotiations can be carried out, and to respond to situations where possible gaps may exist in the legal framework. The creation of such environments entails a combination of various factors, among them:

- convergence of aims;
- understanding, on the part of all participants, of the issues and challenges involved;
- fostering of bonds of confidence through the exercise of ethical, transparent and democratic management, with a view to achieving equitable decision making;

Fruits of the São Francisco Valley

• building of a sense of social identity and of community, through shared responsibility and co-dependence, throughout the Basin.

The establishment of such environments of confidence and consensus could be achieved through a pact involving all significant social participants in the Basin. Such a pact would consist of a commitment to the principles, aims and guidelines for action foreseen in the legislation, with a view to putting them into effect.

No universal formula exists for designing institutions on the scale needed to carry out the management of water resources in a country the size of Brazil, where such an immense diversity of situations is to be found. This constitutes one of the greatest challenges for the São Francisco River Basin Committee.

One clear path to be followed is the construction of a pact, which will translate the commitment of making the principle of shared management an objective reality, in line with the terms of Law 9.433/97.

The National Water Agency (ANA), in the exercise of its technical and institutional role, with the aim of implementing integrated shared water-resources management strategies, has proposed that a Management Pact be celebrated through an Integration Agreement, between ANA, the States, and the Basin Committees.

This integration pact or agreement is based on the harmonization of criteria and procedures for the implementation and operationalization of the institutional and technical management instruments applicable to and in the Basin. It is a real alternative, and, perhaps, the only one within the present legal framework that could overcome the challenges which have been mentioned above, especially the question of overlapping jurisdictions over water bodies. Figure 13 illustrates the interaction of the various institutions which could participate in river basin management under an Integration Agreement.

The principal elements needed to address and overcome these challenges are understanding and cooperation. The issue of federal and state jurisdictional dominion over bodies of water must be resolved through examination of the legal possibilities and the establishing administrative cooperation agreements to enable joint approaches to the resolution of conflicts. Moreover, such agreements must encompass the establishment of mutually-acceptable norms, criteria and procedures, in order to guarantee the effective exercise of shared and delegated responsibilities.

It is important to underscore that the establishment of a management pact is an important step along the path toward the signing of an Integration Agreement. In practice, it is through such pacts that technical water-resources management can be deployed, since they make it possible to consolidate decentralized institutional water-resources management instruments that reflect ethical and democratic principles.

In order to establish such management pacts, institutions that participate in the Integrated Water Resources Management System, must be held accountable for actions carried out in their respective spheres, and must exercise due diligence and commitment in the pursuit of integration; i.e., they must enhance their skills in such areas as listening, dialoguing, accepting disparate viewpoints, cooperating and sharing views, in order to reach a state of mutual understanding and cooperation.

### 3.2. Coastal areas management and interfaces with the SAP

A number of actions are currently underway which, in view of their importance and affinity with the principles that underpin the SAP, require an assessment in terms of
their scope, performance and their interface with the SAP. Foremost among these are: the National Coastal Management Program (GERCO), and the Program for the Assessment of the Sustainable Potential of Living Resources in the Exclusive Economic Zone (REVIZEE).

The Global Environment Facility (GEF) selected international waters as one of the four areas in which it concentrates its support. The Global International Waters Assessments (GIWA) will provide the information necessary to prioritize the projects it supports.

GIWA is evaluating 66 sub-regions, which will enable it to establish strong cooperative links with all of its significant partners. Its activities will focus mainly upon establishing an exchange of information and coordination of programs for joint activities, designed to culminate in the establishment of a worldwide network for the evaluation of waters.

At the GIWA meeting, held in Rio de Janeiro from 3 to 5 October 2001, the five environmental aspects, listed below in descending order of priority, were identified as being of particular concern:

- i) shortages of fresh water;
- ii) pollution;
- iii) changes in habitats;
- iv) unsustainable exploitation of fish stocks and living resources; and
- v) global climate change.

The Brazilian coastal zone is 8,698 km long, of variable width, and contains a variety of contiguous ecosystems over an area of approximately 388 thousand km<sup>2</sup>. This area is home to almost a quarter of Brazil's population, living in 400 municipalities with an average population density of 87 people per km<sup>2</sup>, (i.e., five times greater than the national average which is 17 people per km<sup>2</sup>). There are 17 coastal states, though only two of them, Alagoas and Sergipe, are encompassed within the São Francisco River estuary.



Part of this area is situated in GIWA sub-region 39C (Figure 14) which encompasses the ocean waters of the eastern and southern coasts of Brazil and all of the inland waters draining into the ocean off this coast, within the boundaries of the South West Atlantic Large Marine Ecosystem, as defined by UNESCO.

Estuaries and coastal zones are regarded as strategically important for Brazil and are the subject of general action guidelines established under Law 9.433/97, which instituted the National Water Resources Policy and provided for the establishment of the National Water Resources Management System. Insert VI of Article 3 of the Law refers clearly to: "the integration of hydrographicbasin management with that of estuaries and coastal-zone systems."

The National Coastal Management Program (GERCO), instituted under Law 7.661/88, provides for the establishment of a National Coastal Management Plan (PNGC) designed to foster integrated, decentralized and participatory planning and management of socioeconomic activities of the Coastal Zone. The Plan seeks to ensure sustainable use, through appropriate control and protection measures, and through the preservation and restoration of natural resources and coastal ecosystems. The Program for the Evaluation of the Sustainable Potential of Live Resources in the Exclusive Economic Zone (RE-VIZEE) aims to increase sustainable potential catches of the living resources within the Exclusive Economic Zone (EEZ), and is being implemented according to the following stages:

(i) Determination of the distributions, seasonality, abundance and sustainable potential of living resources in the EEZ, using techniques for fish prospecting and the evaluation of stocks;

 (ii) Collection of extensive climatological, physical, chemical, geological and biological data for an understanding of the dynamics of the living resources in the EEZ;



Figure 14. Area within the scope of sub-region 39 and of the São Francisco River Basin sub area 39C.



View of the town of Penedo-AL

(iii) Analysis of the sustainable potential and prospects for exploitation, based on coordinated information on abundance and environmental characteristics.

The SAP established a strong link between the integrated management of land and sea environments in the Coastal Zone, through the construction and maintenance of transparent and participatory decision-making mechanisms, based on the best available information and technology and on convergent and compatible public policies at all administrative levels.

Implementation of the Program aims to reinforce the principle of decentralization, and to ensure commitment and cooperation on the part of the various levels of government, and between government and society as a whole, in the formulation of state and municipal policies, plans and programs.

At the estuary of the So Francisco River, the coastal strip under the jurisdiction of the PNGC is governed by coastal municipalities, whose territory stretches no more than 50 km from the shoreline. Within this area, the municipalities carry out activities and maintain facilities that have considerable impacts upon the Coastal Zone and that are highly significant for these coastal ecosystems.

The Land-Ocean Interactions in the Coastal Zone (LOICZ) are at the center of the International Geosphere-Biosphere Program (IGBP), which sponsors the Study on Global Climate Change carried out by UNEP with GEF support. The aim of this study is to enhance knowledge of the basic carbon, nitrogen, and phosphorus nutrient cycles; to improve knowledge on how bio-geochemical processes in the coastal zone affect material flows; and to describe the relationships between these flows and environmental changes, including human interventions. The program, however, does not encompass activities in the estuary of the São Francisco River, since its nearest activity is being carried out in the coastal lagoon system of Munda/Manguaba in the State of Alagoas. Consequently, the GEF São Francisco Project is the first GEF supported initiative to be carried out in Brazil, simultaneously conducting evaluations and studies in both the São Francisco River Basin and its estuary and coastal zone (Photo 1).

Studies carried out by the Federal Universities of Alagoas (UFAL) and Sergipe (UFSE) and by the Xingó Institute in the areas close to the estuary include:

- hydrodynamic-sedimentological research into the Lower São Francisco River and its coastal zone;
- determination of nutrient levels in the São Francisco River close to its estuary;
- restoration of the estuarine ichthyofauna of the Lower São Francisco River and of eroded river banks along the Lower São Francisco River, and mitigation of their effects on sedimentation dynamics in the river bed.

The State of Sergipe has prepared a State Coastal Management Plan. Alagoas also has a Coastal Management Plan but it is targeted toward the northern part of the State and does not include the São Francisco River estuary.

In both of these states, the coastal region is characterized by riparian and coastal plains comprised of seasonal floodplains (várzeas) and high sandy river terraces (tabuleiros) of the Barreiras group, with sandbars (restingas), and coastal dunes, lakes and channels. The várzeas are typically occupied by cyclical crops and pioneer vegetation. On the surrounding tabuleiros, the vegetation has been almost entirely replaced by cyclical crops, especially sugar cane and cattle pasturelands.

The dominant ecosystems in the region, aside from the São Francisco River delta, comprise dunes, sandbars, floodplains, and beach barriers (cordões litorâneos), lagoons, river islands, sandy river terraces, and mangrove swamps.



Source: Inpe – scene 214/67, year 2001.

Estuary of the São Francisco River

Among the most significant Conservation Units in this region are the Piaçabuçu Environmental Protection Area (APA), with an area of approximately 8,600 hectares, and the Praia do Peba Shoreline, an Area "Under Special Protection", which covers 2,778 hectares.

The Santa Isabel Biological Reserve, on the southern border of the municipality of Pacatuba, covers an area of 2,766 hectares. In addition to these federal conservation units, there are state-level environmental protection areas such as the Marituba do Peixe APA, located in the várzea da Marituba that covers an area of 10,900 hectares in the municipality of Penedo.

The Piaçabuçu APA preserves an important sample of the region's flora and wildlife that comprises species which are associated ecologically with open terrain, but also shelters species characteristic of the Atlantic Forest (Mata Atlântica), thus providing a mosaic of the fauna and flora encountered in the Brazilian coastal zone. The area is also an important refuge for various species of migratory and resident birds.

In terms of maritime species, Peba Beach in Alagoas is a site for the reproduction of turtles and also marks the southern limit of the manatee in Brazil. Both the environmental zoning of this APA, and its Environmental Management Plan, have been completed and are being implemented.

The Santa Isabel Biological Reserve in Sergipe preserves typical sand-dune and restinga vegetation ecosystems, and serves as a refuge for migratory birds. The Reserve is one of the most important nurseries for water turtles in Brazil.

However, little research has been done on the marine geomorphology of this area, or on the coastal dynamics of its interaction with the river. There are, in the region, mud banks extending up to the 50 m isobath, especially to the south of the So Francisco River estuary. The entire right bank of the estuary has been undergoing significant

## Box 14

## Availability of Water Resources Plans in the Sub-basins of the São Francisco River Basin

Water Resources Plans define the programs and projects to be carried out within hydrographic basins, based upon the formulation of alternatives that associate goals and objectives to be attained with the resources available. Investment programs that comprise such plans must provide for a management component (institutional development, an information system, licensing, enforcement and billing, surveys, research, and non-structural projects and measures for environmental protection and conservation); a water-resources engineering-works and services component (e.g., building of dams); and related components (i.e., sanitation, energy, irrigation, and navigation); and must contain a proposed institutional and economic/financial framework for their execution, operation and maintenance.

In order to develop the water-resources plan for the São Francisco River Basin that went into effect in 2004, the National Water Agency (ANA) and the São Francisco River Basin Committee (CBHSF), with support from the GEF-São Francisco Project, has developed an in-depth knowledge of the various basin plans currently in operation in the various sub-basins of the São Francisco, in order to identify investment programs that had been proposed when these plans were initially drafted in the 1995-1998 period.

The following water-resources plans currently under execution in the São Francisco River Basin are available from the National Water Agency - ANA:

#### **Minas Gerais**

- Basin of the Paracatu River
- Basin of the das Velhas River
- Basin of the Verde Grande River

#### Bahia

- Basin of the Corrente River
- Hydrographic basins of the Middle and Lower sections of the Rio Grande and of the tributaries on the left bank of Sobradinho Lake
- Basins on the right bank of the Lower-middle São Francisco River
- Basins of the Verde and Jacaré Rivers, on the right bank of Sobradinho Lake

#### Sergipe

- Hydrographic basins of the Curituba, Jacaré, Capivara, Campos Novos Rivers, and others
- Hydrographic basins of the Gararu, Salgado, Riacho Jacaré, Pilões, Bertume Rivers, and others

#### Alagoas/Pernambuco

- Basin of the Capiá River
- Basin of the Iraipu River
- Basin of the Ipanema River
- Basin of the Moxotó River

#### Pernambuco

- Basin of the Pajeú River and of the GI-3 group of river basins
- Basins of the Brigida and Terra Nova Rivers, and of the GI-4, GI-5 and GI-9 groups of river basins
- Basins of the Pontal and Garças Rivers, and of the GI-6, GI-7 and GI-8 groups of river basins.

erosion, owing to increased wave action from the sea, probably as a consequence of changes in the flow of the river resulting from reduced flows and sediment loads, and exacerbated by destruction of the mangroves.

One of the most important characteristics of this area is the wetland complexes of the floodplains (várzeas) which absorb excess of water during the rains and flooding events. Such flooding was more common prior to construction of the various hydroelectric plants, but flooding still periodically results in plentiful inflows of fish into the lagoons, where they provide a livelihood for traditional fishermen such as those living in the vicinity of the Marituba várzea.

It is the influence of the várzeas and other wetland areas (such as Brejo Grande and Marituba) that gives rise to the great diversity of the biological resources in the region, especially of the fish community, in the São Francisco



Typical sand dunes at the estuary of the São Francisco River

River estuary and its coastal zone. This biodiversity is under threat of being transformed into areas of intensive rice and sugar-cane plantation. The várzeas are natural breeding grounds and nurseries for a great variety of fish species, and are constantly renewed by spawning and influx of fingerlings from local streams or from the São Francisco River itself.

To the north, in the State of Alagoas, the sand dunes of the São Francisco Delta form the State's southern coast, and high sandy coastal terraces (tabuleiros) are the characteristic terrain at Pontal do Peba and Vrzea de Marituba (Photo 2). The towns located closest to the coastal zone on the northern bank of the São Francisco River are Feliz Deserto, Penedo and Piaçabuçu.

The principal economic activities in this region are: subsistence farming, intensive commercial sugar-cane and coconut production; traditional fishing; oil production; and handicrafts and tourism.

In the area of tourism development, a project called Costa Dourada has been proposed, which would entail allocating large areas of beach front to private developers.

In the State of Sergipe, to the south of the São Francisco River estuary, the coastline comprises a landscape of sandy coastal plain protected from the sea by sandbars (restingas) with sparse natural vegetation along the seashore, mangroves, and sand-clay coastal terraces (tabuleiros) that have been taken over by cattle pasture and sugarcane plantations. The towns in this region are Pirambu, Pacatuba, Ilha das Flores and Brejo Grande. The Santa Isabel Biological Reserve is located in the municipalities of Pirambu and Pacatuba.

The principal economic activities in the area are the production of oil and natural gas, and sodium and potassium chloride by Petrobrás, and fertilizers and cement by other companies. Agricultural products the region include sugarcane that supplies ethanol distilleries, coconut plantations and livestock raising.

Aerial view – São Francisco River

## **3.3. Current projects and planned investment**

## 3.3.1. Surveys carried out during the preparatory phase of the DAB

A variety of governmental institutions, at the federal, state and municipal spheres, and NGOs are currently engaged in projects and initiatives that have implications in terms of the management of water-resources in the São Francisco River Basin. The following is a listing of current and planned initiatives, some of which have been contemplated in the 2004-2007 Multi-Year Plan (PPA), that interface with actions foreseen in the SAP.

PROÁGUA – This program was designed to provide water for the semi-arid region and to strengthen the institutions responsible for implementation of the National Water Resources Management System, instituted by the Ministry of Environment (MMA) and the National Water Agency (ANA), with funding from the World Bank. The program aims to increase volumes of water pro-



Typical mangroves in the region of the São Francisco River estuary

vided, through effecting institutional improvements and executing priority projects, including the renovation of aqueducts, canals, and dams, the transposition of water between river basins, and exploitation of groundwater resources.

Plan for hydro-environmental revitalization of the São Francisco River Basin - A diagnosis was conducted by the Ministry of Regional Integration (MI) to assess the principal hydrological and environmental problems of the region, identified through available secondary information sources. The work is centered on the Lower São Francisco River Basin.

Program for Revitalization and Conservation of the São Francisco – Within this Program, the Ministry of the Environment (MMA): (i) seeks to promote quantitative and qualitative improvements in water supply throughout the Basin; (ii) promote improvements in socio-environmental and living conditions for riverine populations; and, (iii) promote equity through benefits resulting from the transposition of waters between river basins.

Coastal Management Program (GERCO) - This program, being implemented by the Ministry of Environment (MMA) and the Ministry of the Navy (MM), coastal states and NGOs, seeks to promote rational and sustainable use of natural resources in the coastal zone, with a view to improving the living standards of local populations, while at the same time promoting protection of local ecosystems. This program is a component of the National Coastal Management Plan (PNGC), instituted under Law 7.661 of 16 May 1988.

Our Rivers Program (Programa Nossos Rios): São Francisco - This program of the National Water Agency (ANA) provides the basis for the conservation and revitalization of the So Francisco River Basin project, instituted by Decree on 5 June 2001. There follows a listing of the principal projects and programs planned or being carried out by State level institutions and NGOs:

- Bahia: State Program for the Sustainable Development of Springs and Riverine Areas, the Living Headwaters Program (Programa Nascentes Vivas), and the Program for the Preservation and Restoration of the Salitre River Basin – SRH/BA.
- · Minas Gerais: (i) Technology Development for Decontamination of Areas Degraded by Gold Mining, with the Recovery of Mercury and Gold, a case study being carried out at Córrego Rico (Paracatu/MG) - CETEC, sponsored by CNPq/FNMA; (ii) Pilot Project for Water Use and Soil Conservation in the Entre Ribeiros Sub-basin – IGAM, which implements concepts used in other World Bank financed micro-basin projects carried out in Paraná and Santa Catarina; (iii) Monitoring of Water Quality in the São Francisco River Basin in the State of Minas Gerais - executed by IGAM, financed by ANA under a Technical Cooperation Agreement; (iv) Geo-environmental Study of the headwaters of the Rio das Velhas – Water and soil quality, executed and financed by IGAM, under a Technical Cooperation Agreement with UFMG/FUNDEP; (v) Revitalization of the Upper Rio das Velhas Sub-basin, executed by Minas Gerais State Secretariat of Environment - SEMAD, and financed by MMA, through a Technical Cooperation Agreement with IBAMA; and, (vi) Pilot Project for Preservation, Revitalization and Monitoring of the Bambu River Basin - FUNDAGRI and EAFB.
- Non-governmental and private organizations:

  (i) Recovery of areas contaminated by heavy metals:
  CMM, a private metallurgical company of the Votorantin Group, through an agreement with the Federal University of Lavras (UFLA) and with support from FAPEMIG (a research foundation), has developed a technology for the restoration of flora in areas with soils contaminated by heavy metals which it is applying in degraded areas in the industrial district of Três

Marias; and, (ii) Management and rational use of the Caatinga biome and impounding of water – NGO Caatinga is introducing changes in land use patterns.

This list shows that, though actions being carried out by the various agencies in the São Francisco River Basin often have objectives that overlap, the projects themselves tend to be extremely local in scope. Under the GEF São Francisco Project, a number of meetings were held to promote the involvement of the various participants, specialists, and of representatives of communities and of government, with a view to identifying problems and their causes, and sharing proposals for action and corrective measures to be implemented.

Based on the results of these meetings, seven significant critical problems were identified. The principal problem, or root cause, was diagnosed as a lack of institutional articulation. Other critical problems identified were: water use conflicts stemming from multiple uses; degradation of the aquatic ecosystem; widespread pollution from point and non-point sources; changes in land use and unsuitable land use patterns; uncontrolled tapping of groundwater without regard for surface- or ground- water availability; and the presence of barriers to shipping.

Institutional networking, acknowledged to be an essential element for implementation of laws and regulations, for deployment of concrete actions, and for coordinated integration of development projects throughout the Basin, was perceived to be lacking.

Poor networking, resulting from this lack of linkages, reflects weak institutional capabilities, especially in terms of the capacity to establish goals and define roles to be performed by the various bodies that are active in the Basin. This is exacerbated by the lack of the institutional skills necessary for the various bodies to exercise their functions in a coordinated, articulated and integrated manner. The result of this is overlapping activities and a dissipation of human and financial resources. The SAP's support for the recently established Basin Committee, as an instrument for promoting articulation among these various agencies and organizations that have a common interest in water management in the So Francisco River Basin, is regarded as the best response for overcoming these deficiencies.

### 3.3.2. Multi-year Plan of Action – PPA 2004-2007

#### **Overall structure of the PPA**

The Federal Multi-year Plan of Action (PPA) is submitted by the Executive Branch to the National Congress every four years. In 2003, the PPA for the 2004-2007 period was approved.

In view of the complexity of the PPA process, there follows a brief description of its structure, to elucidate procedures.

The PPA for 2004-2007, prepared by the federal administration, seeks to institute the following long-term strategies:

- social inclusion and better income distribution through strong GDP growth and more employment;
- environmentally sustainable growth, with a reduction of regional disparities, underpinned by a vibrant mass consumer market, investment and productivity gains;
- reduced vulnerability to external factors, by means of greater competitiveness, leading to sustainable growth; and
- strengthening of citizenship and democracy.

These strategic goals of the PPA are divided into five dimensions (social, economic, regional, environmental and democratic), under the following three mega-objectives:

 Mega-objective I, the social dimension: social inclusion and reduction of social inequalities;

- Mega-objective II, the economic, environmental and regional dimensions: environmentally-sustainable growth, job and income generation, and the reduction of regional disparities; and,
- Mega-objective III, the democratic dimension: promotion and expansion of citizenship and strengthening of democracy.

These three mega-objectives are laid out in 30 challenges, indicating development targets to be attained for fostering development. These challenges are addressed by 374 programs, broken down into some 4,300 actions.

The 30 challenges issued under the three mega-objectives are presented below. Ten of them relate to the first megaobjective, eleven to the second, and nine to the third. Challenges number 6, 17 and 19 contain programs and actions directly related to the SAP.

Challenges under mega-objective I:

1) Combating hunger with a view to its eradication, and promoting food and nutritional security, guaranteeing social participation and citizenship;

 Broadening the scope and enhancing income transfer targeted at poor families;

3) Promoting universal access to social security (encompassing health, social insurance and welfare) with quality and equity;

4) Raising schooling levels and the quality of education, by promoting universal access to schools;

5) Increasing supply and reducing prices of goods and services consumed by the population;

 Implementing urban reforms, and improving living conditions, access and mobility, with an emphasis on quality of life and the environment; 7) Reducing the vulnerability of children and adolescents to all forms of violence, by improving mechanisms for the defense of their rights;

8) Promoting reduction of racial inequalities;

9) Promoting reduction of gender inequalities;

10) Improving access to information and knowledge through new technologies, and digital inclusion mechanisms.

Challenges under mega-objective II:

11) Attaining macroeconomic stability, through resumption and maintenance of growth, better income distribution, and generation of jobs and employment;

12) Expanding domestic sources of financing, and broadening access to credit for investment, production and consumption;

13) Expanding the supply of jobs, promoting professional training and regulating the labor market, with an emphasis on reducing informal labor;

14) Executing effective land reform, rehabilitating existing settlements, strengthening and consolidating family agriculture, and promoting sustainable rural development;

15) Coordinating and promoting productive investment and increased productivity, with an emphasis on reducing vulnerability to external factors;

16) Expanding, strengthening and regionally deconcentrating scientific and the technological capabilities that underpin development, thereby democratizing access to science and technology; 17) Stimulating infrastructure investments in a coordinated and sustainable manner;

18) Reducing regional and intra-regional inequalities through national, macro-regional, sub-regional and local integration, stimulating the participation of society in local development;

19) Improving environmental quality and management by promoting conservation and sustainable use of natural resources, with an emphasis on promoting environmental education;

20) Expanding Brazil's participation in the international market, preserving national interests;

21) Stimulating and strengthening micro-, small- and medium-sized companies, by developing and fostering entrepreneurial skills.

Challenges under mega-objective III:

22) Strengthening citizenship, guaranteeing human rights, and respecting diversity in human relations;

23) Guaranteeing the physical integrity of indigenous peoples, and respecting their cultural identity and economic organization;

24) Valuing the diversity of national and regional cultures;

25) Guaranteeing public security through implementation of decentralized and integrated public policies;

26) Preserving the Nation's integrity and sovereignty;

27) Promoting national interests intensifying Brazil's commitment to a culture of worldwide peace, solidarity and human rights;



28) Implementing new forms of ethical, transparent, participatory, decentralized public management, with social controls and centered upon the citizen;

29) Combating corruption;

Boat on the São Francisco River

30) Democratizing the communications media, by enhancing the value of alternative media and diversity of expression.

The programs of the PPA are grouped into four broad categories according to their objectives:

- Direct Action Programs, aimed at attending to society's demands and needs;
- Public-Policy Management Programs, aimed at guiding government actions relating to formulation, coordination, supervision and evaluation of public policies;
- Programs of State Services, aimed at the production of goods and services where the State itself is the beneficiary, through institutions established for this purpose; and

 Administrative Support Programs, that encompass actions targeted at providing support to the administration and implementation of the other programs, essentially by covering personnel costs that cannot be allocated directly to public policies under individual direct action programs.

It should be stressed that the Direct Action Programs account for 90.3% of the total resources allocated under the PPA, amounting to R\$ 1,609.4 billion (US\$ 536.5 billion) over the four-year period of the PPA, with the three remaining programs receiving only 9.7% of this total.

The PPA's Direct Action Programs reflect, through the allocation of resources, commitments that the government has publicly assumed in relation to society. Of the three mega-objectives around which the PPA's implementation strategy is structured, mega-objective I (social inclusion and reduction of social inequalities), accounts for 63% of total planned expenditure for the four-year period encompassed by the Plan.

A flow chart, with a structural and sequential view of the PPA, is provided in Figure 15





A general description of the principal programs and actions under the SAP, taken from the PPA report, is presented below. The most significant aspects to be extracted from this information are the priorities established by means of interfaces between investments allocated under the PPA and actions to be carried out under the SAP.

General characteristics of the principal PPA programs that interface with the SAP.

Under Mega-Objective I (social inclusion and reduction of social inequalities), Challenge number 6, 'implementing urban reforms by improving living conditions, access and mobility, with an emphasis on quality of life and the environment', focuses on the environmental sanitation program that aims to provide financial support for the implementation, extension and improvement of the water-supply and sewerage systems, urban drainage networks, and collection and final disposal systems for urban solid waste.

The national goals for sanitation are to benefit 9 million families, increasing the percentage coverage rates for urban water supply from 92.4% to 93.5%, and increasing sewer service coverage from 50.9% to 57.9%. of the population. These investments are conditioned by studies, plans and projects targeted at institutional and operational development in the sanitation sector, human-resources training, and reform of regulatory frameworks, social controls and evaluation mechanisms, underpinned by environmental education and soil and land-use management.

Fruit in the São Francisco River Valley

As the principal environmental problems and threats to ecosystems demonstrate, there is a close relationship between environmental and social degradation. Clearly, if solid-waste disposal and sewage treatment are inadequate, the water quality of rivers will be compromised. It is for this reason that the PPA states that competent water-resources management needs to be ensured by progressive implementation of the new Water Law, and that intensive investments must be implemented to ensure adequate basic sanitation and solid-waste collection in large cities.

Among the 11 Challenges issued under Mega-Objective II (environmentally-sustainable growth, job and income generation, and the reduction of regional disparities), Challenge number 17, 'stimulating infrastructure investments in a coordinated and sustainable manner', merits special attention. One of the most significant challenges over the coming years will be to ensure that the basic requisites and infrastructure necessary to satisfy the demands of society and of the economy are met. The PPA aims to stimulate expansion and modernization of social and physical infrastructure, with a view to eliminating bottlenecks and fostering growth, improving competitiveness and thereby reducing the so-called 'Brazil-cost,' while, at the same time, fulfilling the government's commitment to improving social and regional income distribution, and preserving the quality of the environment.

The PPA aims to stimulate public-private partnerships and enhance the roles of regulatory agencies. It also attributes high priority to addressing problems stemming from adverse weather conditions, especially the droughts that afflict certain areas of Brazil.

Among the PPA's investment priorities for the waterresources sector that have a direct bearing upon the SAP, the following programs merit special mention:

 Integrated and Sustainable Development of Semi-arid Areas, "Conviver" – This program involves the integration of a series of irrigation projects in semi-arid areas, and includes human-resources training, development of and access to new technologies, health, sanitation, and educational components. Conviver also includes a portion of the Proágua program targeted toward semiarid areas, which encompasses medium-sized public works, and a social-integration component targeted toward local populations (sertanejos) in areas where shortages of water are a fact of daily life. The program will benefit about 3.7 million people and 200 communities through the provision of good quality water by December 2005.

- Proágua Infrastructure This project aims to increase the quantity of water available for human consumption and for farming through the execution of large-scale infra-structure works, such as construction of dams, reservoirs and aqueducts. Around 2,000 km of aqueducts are to be built and some 5 billion cubic meters of water are to be impounded to serve municipalities that currently lack reliable and safe water supplies. The program also aims to generate some 80,000 jobs.
- Irrigated Agriculture Efficiency This program is mainly directed at the Northeast and aims to reduce current levels of water consumption by irrigated agriculture by roughly 10%.
- Development of Irrigated Agriculture This Program's principal efforts are directed toward areas in which adverse climactic conditions make sustainable agriculture unfeasible. The aim for the four-year period is to incorporate 100,000 hectares into public irrigation projects, currently at different stages of implementation and operation. This will correspond to an 83% increase in the area currently under irrigation.
- Integration of hydrographic basins The aim of this project is to build connections between river basins in the northern portion of Northeastern Brazil in order to ensure perennial flows of at least 75 cubic m<sup>3</sup>/s in intermittent rivers in the region, using water transferred from the São Francisco River. Aside from ensuring perennial flows in these intermittent rivers, the program will offer protection to municipalities most susceptible to drought.

noto: Codevas

Challenge number 19, 'improving environmental quality and management by promoting conservation and sustainable use of natural resources, with an emphasis on promoting environmental education', seeks to support the introduction of measures for the protection of water resources, not only where they are under threat, in urban centers and degraded areas, but also through regulations on the use of water sources. Springs and other water bodies continue to be subject to intense pressures, not only from informal uses, settlement of headwater and recharge areas and the destruction of the riparian forest, but also from the discharge of domestic and industrial wastes. It is for this reason that the PPA contemplates the following programs:

 ProBacias – The aim of this program is to implement the National Water Resources Policy with a view to instituting decentralized and participatory management under the auspices of Basin Committees, and through promoting more effective integration and sharing of guidelines among local, regional, state and federal water authorities. These actions are designed to support Basin Committees in the performance of their duties of control and licensing, and in instituting water-use charges. Within the scope of the PPA, the principal aim is the initiation of integrated water resources management in six hydrographic basins.

• Conservation and Rational Water Use - This program seeks to ensure water quality and foster conservation and efficient use of water resources, in a complementary manner, through the financing of projects targeted at water reuse and increasing water availability, environmental monitoring of water quality, and stimulating demonstration projects in the field of rational water use. Almost 20% of the planet's biological resources are in Brazil. A portion of Brazil's vast biological heritage has already been lost and much of the remainder is under threat, thereby placing some of the principal Brazilian biomes in jeopardy. The PPA addresses these issues by stressing the need to consolidate existing conservation units and establish new sustainable-use and permanent-protection areas, especially in regions of the Cerrado, Caatinga and Atlantic Rainforest vegetation.



Plant nursery

Strategic guidelines for the management of the São Francisco River Basin and its coastal zone



## Strategic guidelines for the management of the São Francisco River Basin and its coastal zone

Canyon – Alagoas-Sergipe

## 4.1. Development policies and water use

The São Francisco River Basin and its coastal zone are not areas of great prosperity when compared to other regions of Brazil. Figure 16 shows its principal centers of development.

In view of the inequalities that exist within the Basin, and its level of development as compared to other more prosperous areas of the country, the pursuit of 'development with social inclusion' as the underlying policy for water resources management would appear a prudent approach, compatible with local aspirations.

While allowing this general principle to permeate policy approaches, it should not be forgotten that development implies the use of resources. It has, moreover, become evident that water-use policies could serve as a driving force to stimulate future economic development. Thus, water-resources management polices should be implemented in line with modern practices, and should seek to cause the least possible impact on the environment.

A basic premise for successful implementation of water-resources management policies is that policymakers should have a clear understanding of the true needs and potential of the São Francisco River Basin, in view of the diversity of water uses in the region, the conflicts that have emerged in relation to them, and problems of quality, quantity and spatial distribution.

Within such a context, determining the most appropriate uses for water resources in the Basin has become vitally important, and the SAP aims to contribute to defining needs and priorities, and ensuring that water-resources management serves as a tool for measuring development and assessing the success of policies adopted.

In order to determine the most appropriate forms of water use, establish policies and consolidate plans to engender appropriate forms of water use and promote sustainable development, it is essential that the São Francisco River Basin Committee be consolidated, and provided with adequate management instruments.

The development of water-use plans will require identification of investment needs, and sources of funding will have to be earmarked, so as to ensure execution of the most pressing priorities.

### **Development alternatives**

Formulation of planning scenarios for the future of the São Francisco River Basin and its coastal zone is a complex matter. The future scenarios must take into account not only historical trends, but also the initiatives of the federal, state and (to a lesser extent) municipal governments, especially with respect to economic and policy aspects. Only by means of clear signals from these authorities will it be possible to encourage private enterprise to effect the



Source: National Water Agency – ANA / GEF/UNEP/OAS Project

Figure 16. Most significant centers of development within the São Francisco River Basin

investments that are so sorely needed for the development of this area of Brazil.

The São Francisco River Basin has long been a major exporter of electric power, contributing to the development of Brazil's Northeast Region through the hydroelectric power plants operated by CHESF, and to parts of the Southeast Region through the power generated at the Três Marias Hydroelectic Plant in the upper reaches of the Basin. There are also a large number of other Small Hydroelectric Plants (SHPs). In 2003, in line with the policy of electrical interconnection, the hydroelectric plants of the São Francisco River Basin have been incorporated into the national electrical system.

For many years people have talked about transporting water between basins, from the Tocantins to the São Francisco, and from the São Francisco to basins in the semi-arid regions of the northern part of the Northeast. Such decisions pose distinct scenarios of greater or lesser vulnerability for the Basin and its coastal zone, caused not only by endogenous or regional factors but, at times, by deliberations at a national level.

A general assessment of Brazil's industrial sector, carried out by the Social Services to Industry (SESI), noted that a technological revolution in production processes is occurring not only in industry, but also in other sectors of the economy. These changes have altered competitive relationships on a planetary scale, with the following repercussions:

- reduced availability of raw materials and energy sources;
- · redefinition of labor and conditions of employment;
- changes in the productive structure;
- increased supply of new products and services;
- lower transport and communications costs;
- growing participation of companies in the management and dissemination of knowledge.

The integration of markets and internationalization of production have tended to limit the maneuvering space of Nation-States, to lessen their capacity to control and regulate foreign trade, and modified many other economic-policy variables.

These transformations in production systems have resulted in growing unemployment rates in many countries. Since, in modern societies, the right to the exercise citizenship is based upon formal labor relations, losing a job, besides cutting off access to income and, consequently, to consumption, thus implies poverty and loss of basic citizenship rights. The 'excluded', having become superfluous to the system upon becoming redundant, thus pose a threat to social cohesion.

Planning scenarios for the Basin range from optimistic forecasts of an era of prosperity with integrated development and systematic social-inclusion policies, to somber warnings of environmental degradation, stagnation and poverty brought on by deteriorating structural problems. Actions proposed, such as those under the SAP, that focus on the sustainable use of natural resources, public participation in decision-making and policies targeted at reducing social and economic exclusion, have sought to delineate a path that steers clear of the excesses of each of these two scenarios.

The world population is aging, and the populations of Brazil and the region of the São Francisco River Basin are no exception. On the one hand, life expectancy has increased; on the other, birth rates are declining. According to the World Health Organization (WHO), by 2025, Brazil will have the sixth most aged population in the world. With 15% of Brazil's general population considered to be elderly, the situation in the São Francisco River Basin will be even more accentuated, owing to the mass exodus of its youth in search of better opportunities for the future. Means will have to be found to reverse this migratory flow through measures that stimulate local economic development.



2<sup>nd</sup> Plenary meeting of the São Francisco River Basin Commitee

The Federal Government's Multi-Year Action Plan (PPA) for 2004-2007 addresses these issues through the following long-term strategies: social inclusion and distribution of income through vigorous GDP and employment growth; environmentally-sustainable growth to reduce regional disparities, stimulated by the expansion of the mass consumer market through investments and productivity gains; reduced vulnerability to external factors by expanding competitive activities which make such sustained growth achievable; and strengthening citizenship and democracy.

Investments in water-resources, sanitation and housing, provided for in the PPA, comprise a large portfolio of projects for the future.

In the light of a forecasted Gross Domestic Product (GDP) growth of between 1% and 1.5% during 2003 and 3.5% during 2004, the Government is predicting longer-term growth in GDP of about 4% in 2005, 4.5% in 2006, and 5% in 2007. Farming and livestock are expected to

experience substantial growth over the next four years. Cumulatively, production in the farming and livestock sector is expected to grow by about 18% during the 2004 - 2007 period, with special emphasis on increased production for export.

In regional terms, the growth forecast for the Northeast, where the São Francisco River Basin makes an important contribution, would result in an increase in its contribution to Brazil's GDP.

However, such ambitious forecasts may not materialize in a uniform manner throughout the Basin, and are likely to be more significant in the region of the Middle São Francisco River Basin. In Minas Gerais, for example, the Jaíba Project, which is one among the State's 27 priority projects, is undergoing expansion, while, in Bahia, the Government's Alcohol Producing Centers extend from the boundary of the Lower-middle São Francisco River Basin to the Iu-Iu sub-basin.

## Formation Process of the São Francisco River Basin Committee (CBHSF): lessons learned

Work on Activities 3.4. - Support for the Instituting of an Integrated Basin Committee for the São Francisco River Basin (CBHSF), and 3.5. - Support for the Strengthening of the CBHSF, began in 2001. Close contact was maintained and events were attended for determining the course of the formation process of CBHSF, especially during the period between June and October 2002. Highlights of this stage of the work included mobilization for formation of the Committee, and the choosing of elected representatives of such segments as water users, municipal public sector and organized civil society. In 2003, support was provided for the holding of meetings in various regions of the Basin, culminating with the Plenary of Penedo, attended by the Vice-President of the Republic and the Minister of Environment.

A detailed report on the process of the formation of the CBHSF, along with an account and evaluation of its methodological, normative and contextual aspects, was prepared by the National Water Agency (ANA), with GEF support, and is available on the ANA website.

For the formation of the São Francisco River Basin Committee, initially, a Provisional Board was set up, comprising 19 members, 9 of which represented governmental, and 10 represented non-governmental, bodies which, from October 2001 up until the Committee was inaugurated in November 2002, held 10 meetings. Within the scope of the Provisional Board, committees were established to attend to the election process and to the drafting of the Committee's house rules. Moreover, State Committees for Coordination of the Election Process were set up. It was decided that the Committee should have 60 members, of which 40% represent water users, 33% the Public Authorities, and 27% representing Civil Society; and that the composition by state should be as follows: 32% Minas Gerais, 20% Bahia, 13% Pernambuco, 10% Sergipe, 10% Alagoas and 3% the Federal District.

A mobilization program was drawn up and 39 Regional Meetings held, which were attended by 5,726 people from 6 states and the Federal District. The majority of the participants who attended these Regional Meetings were representatives of Civil Society (53%), the remainder being representatives of the Public Authorities (28%) and of Water Users (19%).

In preparation for the electoral process, 27 state plenary meetings were held and one special plenary meeting for indigenous peoples of the São Francisco River Basin. A total of 940 people attended these plenary meetings, of which 57% were representative of the Water Users, 30% of Civil Society and 13% of the Public Authorities.

It is important to underscore that throughout this process there was much debate on the problems, demands and proposals of local society throughout the São Francisco River Basin. The result was a great step forward in the building of a new participatory approach to water-resources management, involving state management agencies and institutions of Civil Society as full partners in this process. In all likelihood, the western part of the Middle São Francisco River Basin, both in Minas Gerais, in the Sub-basin of the Paracatu River, and in Bahia, in the Sub-basins of the Corrente and Grande Rivers, will continue to be dedicated to intensive farming, principally grain production. These areas will undoubtedly surpass the growth forecast of 4.2% p.a., predicted for the Northeast as a whole. Meanwhile, sustainable development in the Lower São Francisco River Basin will focus mainly on tourism and aquaculture, the latter including restoration of local fisheries where possible, since prospects for other economic alternatives in this region are very limited.

Even in a less adverse scenario, serious doubts persist as to how sustained growth in the Basin can be financed, and there is a preeminent need to attract private capital investment. Regardless of the scenario, it is clear that agribusiness will remain a major focus of activity and a driving force behind development in the area.

It is important to bear in mind that immense areas of land in the São Francisco River Basin have not as yet been utilized, and that, as in many areas currently being used, methods applied in their exploitation are not always the most sustainable or orthodox. This underscores the importance of understanding that sustainable development in the São Francisco River Basin needs to be based on the three-pronged model: "water – land – energy".

Water is the most critical limiting factor to long-term sustainability and, for this reason, it will be necessary to conduct a careful assessment of the role of water-resources management in the sustainable development of the Basin, as conceptualized in the São Francisco GEF Project.

Within this context, Strategic Environmental Assessments (SEAs) will be an important tool for implementing this policy, by minimizing the negative impacts and maximizing the benefits of the intended development. These Assessments address the environmental, economic and social impacts of Development Policies, Plans and Programs (PPP). Their use, therefore, is a more appropriate approach to the situation in the Basin and its coastal zone than are Environmental Impact Assessments (EIAs), which apply only to projects.

Water should be a central focus. Any Assessment should emphasize its key role throughout the entire hydrological cycle, taking into account all aspects of atmospheric, surface and ground waters. The use of the SEAs introduces technical, political and institutional dimensions that play an important role in promoting sustainable development, and, when the focus is placed upon the water component, introduces a water-use management policy dimension in place of the traditional geopolitical one. Such is the real contribution that SEAs can provide in the preparation of the Basin Management Plan, as required by Law 9.433/97.

Although the emphasis is on water, it should be remembered that integrated natural-resources management within a structure based on economic theory is a prerequisite for a sound environmental policy, and that integrated water-resources management is a component of such an overall approach. This is reflected in the legislation governing waters which provides general guidelines for implementation of the national water-use policy and emphasizes the integration of basin management into other aspects of environmental and land-use policy, as shown in Figure 17.



## 4.2. Strategies for consolidation of the São Francisco River Basin Committee (CBHSF)

## 4.2.1. Challenges

The major challenge facing the São Francisco River Basin Committee will be that of consolidating its position as the forum for determining a strategic program for the Basin with the aim of guaranteeing revitalization of the river and optimization of its multiple uses, in an efficient and democratic manner.

Consequently, the most urgent challenges facing the São Francisco River Basin Committee are issues of an operational nature, including determination of operational mechanisms to ensure its sustainability; to provide for its technical, financial and administrative support; to confirm its assignment of responsibilities; to provide a framework for its decision-making procedures; and to accommodate the structuring of its technical councils and regional advisory bodies.

Consolidating the Committee's position as the forum for deliberating water-resources policy for the Basin will depend upon its ability to overcome, among many other challenges, an overwhelming belief in the superiority of technical knowledge over empirical and grass-roots knowledge. This is the legacy of top-down decision making in a sector in which, until quite recently, all policy decisions tended to be handed down, unilaterally, in accordance with dominant interests, and without any discussion taking place outside the scope of State agencies.

In contrast, the SAP recommends that technical and scientific knowledge should be placed at the service of the Basin Committee so that, alongside the intrinsic knowledge of the Basin's population, it can be used as an instrument to support decision-making, in all issues relating to the Basin Plan. These issues should include the operation of reservoirs, determination of actions for revitalization of land and water resources, establishment of criteria for granting water-use licenses, identification of mechanisms for instituting water-use charges, administration of oversight of water uses and of the activities of users, operation of the information system, and conclusion of a host of other decisions within the scope of the Committee's remit.

To this end, strategies for the decentralized implementation of these management tools are urgently needed to enable the Committee, on the basis of technical information and with legal support, to address these issues and make decisions that will determine the destiny of the Basin.

Overcoming conflicts between local, regional and interstate interests in the management of the Basin's water resources will surely pose serious challenges to the Basin Committee. Such difficulties are already apparent, and stem from the diversity of state-level water-resources management systems, as well as the social, economic and cultural peculiarities of the various states that comprise the region, and will require negotiating skills and respectful approaches to building of a sustainable and effective system for integrated and participative natural resources management.

The rationale that underpins the concept of sharing basin management responsibilities among users, society and government is no less valid simply because of the greater complexity of a large hydrographic basin, as is the case in the São Francisco River Basin. However, overcoming resistance will require the honing of negotiating skills, a willingness to engage in dialogue, and respect for existing institutions, while seeking a consensus for joint strategies for action, targeted at producing benefits for the São Francisco River Basin as a whole.

Irrigation in the São Francisco Valley

Preparing a strategic decision-making agenda for the Basin will require broad-based participation by the various stakeholders, and will require vision and political decisiveness on the part of the agencies charged with managing water resources at the state and federal levels. These agencies, in particular, need to acknowledge the Basin Committee as an integral part of the decision-making system for management of the Basin.

However, in view of the size and complexity of the São Francisco River Basin and its coastal zone, there is a need to stimulate and strengthen intermediary channels of exchange between society and the Basin Committee, in line with the realities of each region, and to ensure that the views of bodies such as the tributary committees and the regional advisory councils are heard by the Basin Committee. The strengthening of such channels would assist in enabling the Committee's decision-making agenda, incorporating relevant issues of concern in the Basin, and ensuring that decisions made when the Committee is in session are preceded by ample discussion within the affected regions and sub-basins, thereby guaranteeing that the views of all of the various stakeholders are effectively represented.

## Review and adjustment of the legal framework to ensure sustainability of the São Francisco River Basin Committee

The experience of establishing the São Francisco River Basin Committee has highlighted the nature of the laws and standards that regulate the creation and proceedings of river basin committees in Brazil, especially with respect to the setting of water-use charges, the allocation of revenues accruing from collection of such charges, and the proceedings of Basin Agencies.

Despite the progress achieved since inauguration of the National Water Resources Policy, the National Water Resources Management System has not as yet been fully assimilated by agencies at the federal, state and municipal levels. The regulatory standards and legal underpinnings of the System are not yet in place to address the many competing demands likely to arise within the participative model selected for the management of water resources in Brazil.

Additional legal instruments required, for example, for disciplining relations between Basin Committees and their component sub-basin committees, and the establishment of management tools, especially water-use charges, will have strong implications in terms of state legislation, and as yet unpredictable repercussions on relations among the numerous institutions operating in the Basin.

It is through the review and adjustment of the legal framework, and an objective assessment of its weaknesses, that proposals for new laws and regulations can be drafted and submitted to the competent legislative spheres. Through the adoption of such proposals, active measures can be taken to address the need to provide the São Francisco River Basin Committee with water-resources management instruments, and to ensure its operation until such time as it becomes self-sustaining.

## Establishment and functions of the Technical Office

A temporary office is to be established to carry out the executive functions of the São Francisco River Basin Committee and to enable it to function until such time as the Basin Water Agency is established and mechanisms are instituted to levy water-use charges. The establishment of the Basin Water Agency is a complex task that can only be achieved after intense debate within the Committee.

The team in charge of the Technical Office will be responsible for executing the tasks required to make the São Francisco River Basin Committee operational, including: orchestrating contacts and negotiations between the National Water Agency (ANA), state institutions and stakeholders in the Basin, with the aim of forming a network of institutional partnerships; harmonizing the interests of the federal government and the states with the internal interests of stakeholders within the Basin; preparing drafts of cooperation agreements with states and institutions that are to participate in the implementation of such actions; and organizing and establishing the Technical Office, and providing for procurement of vehicles, furnishings and office equipment (i.e., telephone, fax, computers and printers, Internet, office supplies).

Establishment of the Technical Office will be the responsibility of the National Water Agency (ANA) and the São Francisco River Basin Committee. This office should serve as a management and operations unit and functioning as the executive arm of the São Francisco River Basin Committee.

Initially, the Technical Office could operate within the National Water Agency (ANA) for a minimum period of six months, with a view to expediting procedures for implementing integration agreements and formalizing political interfaces with other institutions and federal programs. After this period of consolidation and acquisition of initial operational experience, the Technical Office could be transferred to another agency within the Basin and, depending on the demand, could assist in fomenting the creation of support groups at the level of the regional advisory councils.

The Technical Office is to be responsible for coordinating all activities performed during the implementation period. To follow up and coordinate these activities, a monitoring process, with indicators defined for tracking the progress of activities underway, should be established. Such monitoring will enable corrections of course and the adoption of concrete measures to ensure implementation of actions throughout the Basin.

## **Regional Advisory Councils**

The legacy built up and handed over to the São Francisco River Basin Committee, of a responsible attitude in relation to the nearly 6,000 stakeholders and the 940 licensed participants in the electoral process resident within the Basin, has resulted in their positive participation in the regional advisory councils, as provided for in the Internal Regulations of the São Francisco River Basin Committee.

In addition to their function of keeping the Committee in touch with the different regional realities, these councils will have a decisive role in the establishment of waterresources management tools, since they will be able to assist the São Francisco River Basin Committee by providing local assessments of the relevance of the proposed measures.

The National Water Resources Policy foresees the presence of a water-resources management consultant, in each region of the Basin (i.e., the Upper, Middle, Lowermiddle, and Lower São Francisco River Basins).

### **Technical Councils**

Technical Councils are to be responsible for examining technical, scientific and institutional issues with a view to assisting the Basin Committee in its decision-making; preparing studies and analyzing proposals relating to their particular fields of expertise; issuing opinions when requested by the Chairman of the São Francisco River Basin Committee; preparing reports and submitting issues to the Plenary of the Basin Committee for decision; and inviting specialists to provide information on specific issues within their spheres of competence.

In addition to the Technical Council for Institutional and Legal Articulation, that has already been established, the formation of four additional Technical Councils has been proposed to address the following: Water Rights and Fees; Plans, Programs and Projects; Minorities; and Training, Information and Communication.

The Assembly of Indigenous Peoples has also submitted a demand for the creation of a Technical Council for Indig-

Box 16

# Participatory reservoir management: the experience of Pernambuco

In the semi-arid areas of the São Francisco River Basin, reservoirs (açudes) are commonly built to provide water supply for small communities, irrigation for subsistence farming and water to livestock. Activity 3.3. A. entailed two experiences of forming Water Users Councils for two such reservoirs in the State of Pernambuco.

These Water Users Councils (CONSUs) are civil society entities governed by private law, with authority over a limited area of influence near reservoirs built by the Public Authorities, for urban water supply, farming and livestock activities. They are organized as Boards, with seats for representatives of the public authorities and of various local organizations that have a stake in maintaining the operation and sharing of water resources of the reservoirs around which they are organized. In the Semi-Arid areas, this institutional arrangement is often preferred to the organization of a basin committee, owing to the intermittent flows of rivers in these areas.

While accompanying deployment of the Water Users Councils of Açude Jazigo and of the Perennial Utilization System for Riacho Pontal, it became apparent that such councils enable the exercise of participatory management, based upon concrete day-to-day problems experienced by these communities of water users. Among the lessons learned from this type of management system, the following stand out:

- The educational process, aimed at promoting cooperation and democratic management among water users, is more effective when its starting point is social mobilization targeted at resolution of concrete problems closely linked to community interests. Among these are the need to restore and preserve reservoirs and the urgency of defining criteria for ensuring availability of water in times of shortage.
- Shared efforts to improve the operation of reservoirs and overcome technical problems, and negotiations to fulfill demands and resolve disputes among the various types of water users, tend to strengthen associative practices and the cooperation necessary to deploy effective instruments for shared water management.
- Disputes over water use witnessed during the course of these experiences were often exacerbated by a lack of information as to the operational capacities of the reservoirs, and of the alternatives for rational utilization of water. Negotiated allocations of water, for various types of use and of user, are more effective when users have consistent information on the performance of reservoirs and of operational demands for their protection and maintenance, and when water-users councils show that they are fully committed to settling disputes, with a view to ensuring the best possible operation of reservoirs.
- It is necessary that water users establish a relationship of trust and partnership with the public water-resources management agency, so that they can receive reliable information and feel it is worthwhile to participate in council meetings at which they are represented. The formation of Water Users Councils for Açude Jazigo and for the Perennial Utilization System for Riacho Pontal, were a step forward in this regard.

enous Peoples, and this proposal, having been brought to the attention of the São Francisco River Basin Committee, is receiving due consideration within the context of actions for the establishment of the other advisory councils.

## 4.2.2. Strategies for creation of the São Francisco River Basin Water Agency

### **Preliminary considerations**

Modern water resources management consists of a set of guidelines that encompass a worldwide consensus of best practices. At various symposia, specialists in the field have concluded that the basic principles of modern water-resources management must include:

- decentralized and participative management through river basin committees;
- the financial commitment of users, through the principle that 'the polluter/user pays;' and
- the river basin as the basic unit for planning and action, through adoption of a Basin Plan.

It is also generally accepted by the majority of specialists that the executive body responsible for the operation of such a system should be a basin water agency. It is worth stating, as a basic premise, that the system rests upon a three-part foundation comprising the river basin committee; the basin water agency; and a suite of management tools.

In various experiences from around the world, it has been observed that attempts to institute such systems have gone awry as a consequence of failing to attend simultaneously to these three underlying aspects. In other words, it can be safely stated that the principal causes of failure have been:

 establishment of river basin committees with poorly structured river basin water agencies and insufficient financial resources;

- preparation of Basin Plans without an executive committee to validate them, and, more especially, without provision of sufficient financial resources for their implementation;
- establishment of river basin water agencies without clearly providing them with appropriate management tools, or leaving them with unresolved conflicts among institutions.

Experience has shown that it is necessary to invest in technical studies in order to better understand a river basin's physical, biotic and economic characteristics so as to sustain the administrative and regulatory system. Conditions necessary for a sustainable system depend upon:

- the likelihood that emergent or repressed conflicts over the use of the water in the river basin can be resolved, including conflicts both of a quantitative and qualitative nature that enhance the political need to establish the system;
- the real prospect of financial self-sustainability, through the institution of water-use charges; and,
- institutional credibility for the formation of partnerships with users, so that the merits of the new waterresources management model have value to the partners in order to overcome natural resistance to change.

## Legal responsibilities of the Basin Water Agency

The basin water agency is the executive arm of the river basin committee, and carries out or puts into effect the committee's decisions. It is, however, important to remember that the water agency does not actually execute works, but, rather, transfers revenues accruing from water-use charges collected from those who use or pollute the waters of the basin, so as to enable the users, themselves, to resolve problems involving water or the natural environment. The principal functions of the water agency are:

- to act as the secretariat during meetings of the river basin committee;
- to expedite decisions of the river basin committee, analyze requests for funding and effect transfers of resources to users;
- to carry out technical studies in support of water-resources management efforts and effect improvements in water-related and environmental conditions in the river basin; and
- to draw up the basin plan and submit it to the basin committee for deliberation.

Under Brazilian law, river basin agencies are responsible for:

1. maintaining an updated balance of the availability of water resources within their areas of operation;

2. maintaining a register of water resources users;

3. charging fees for the use of water resources, through delegated authority;

4. analyzing and issuing official opinions on projects and works to be financed through funds generated through water-use charges;

 monitoring the financial management of the revenues collected through water-use charges;

6. managing water-resources information systems within their areas of operation;

7. entering into agreements, providing services and financing contracts for the discharge of their duties;

 drawing up budget proposals and submitting them for the approval of the respective river basin committee or committees;

View of the first hydroelectric plant on the São Francisco River

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 providing the resources necessary for the execution of water-resources management studies within of their areas of operation;

10. drawing up a water-resources plan for approval by the respective river basin committee;

11. proposing to the respective river basin committee or committees:

- a classification system for bodies of water by categories of use, to be submitted to the respective National or State Water Resources Councils, according to their jurisdictions;
- the amounts to be charged for the use of water resources; and,
- a plan for the investment of the revenues collected through water-use charges.

## Creating conditions for the future establishment of a Basin Water Agency under the São Francisco River Basin Committee

The establishment and operationalization of a Basin Water Agency to serve as the executive arm of the São Francisco River Basin Committee will entail assertive efforts and careful planning. The range of responsibilities and duties that fall within the remit of the Basin Water Agency, and which are to serve as elements to sustain the functioning of the São Francisco River Basin Committee, can only be addressed if a set of prerequisites are met. It is for this reason that it is so important that, prior to the institution of the Basin Water Agency, the Technical Office be established with the capabilities needed to provide operational and executive support for the São Francisco River Basin Committee, in the interim period prior to the founding of the Basin Water Agency. The diverse hurdles that must be overcome in this mission to establish mechanisms for water-resources management in the interim period, until a system of water-use charges has been instituted under the auspices of a Basin Water Agency, will place the Basin Committee in a position where, undoubtedly, it will need to seek support from institutions such as the National Water Agency (ANA) and the state water-resources management bodies.

The investment required, in this case, encompasses financial support for the goals identified by the São Francisco River Basin Committee, including the resources needed to establish the Technical Office and for equipment and supplies, as well as an allocation to be used in the preparation of a preliminary register of water users in the Basin, and resources to cover the expenses of technical missions to the Basin, training for the staff of the Technical Office, and training for members of the São Francisco River Basin Committee.

### Budget of the Basin Water Agency

Brazil's new water-resources legislation foresees a policy based on the principle of shared financial responsibility. It is intended that the entire system should be financially self-sustaining, through the institution of water-use charges. Consequently, anyone who uses, consumes or pollutes water shall be called upon to make a financial contribution. Such charges should conform to the following guidelines:

- the system should not receive State subsidies;
- charges shall be invested in the river basin where they are collected;
- charges shall be proportional to the cost incurred by users subject to the effects of the polluting action(s);
- charges should stimulate and discipline rational water use, in keeping with regional peculiarities and conditions;
- parameters for establishing charges should relate to problems existing in the River Basin and to actions under the Basin Plan.

#### Implementation of the Basin Water Agency

Instituting charges for the use of water figures as one of the most important points in the implementation of the Basin Water Agency. It constitutes the principal management tool of the Agency, and, clearly and objectively, enables operationalization of the Basin Water Agency model. On the other hand, water-use charges should not be viewed as an isolated management tool, or one capable of resolving all of the issues relating to water-resources planning and management. The concession of water-use rights, environmental licensing, and implementation of Basin Plans approved by the Basin Committees are also essential management tools. Moreover, aside from these, the stimulus provided by investments in public works and services that address local and regional interests constitute efficient means of improving the quality and availability of water resources.

Available information concerning the principal variables in studies of the economic feasibility of a Basin Water Agency, i.e., data on the availability of surface and ground waters, the register of water users, and quantitative and qualitative data on their abstraction and discharges, should be sufficient to carry out a complete study.

To ensure the viability of the Basin Water Agency, it is necessary therefore:

- initially, to normalize the status of the principal water users in the River Basin, through the issuing of wateruse licenses; and
- to implement a system of water-use charges during 2005, since 2004 will be dedicated to developing priority projects and the institutional components for the implementation of the Basin Water Agency, and holding consultations with users, as it is believed that the



Photo: Alain Dhomé

Boats on the São Francisco River
system of water-use charges should be implemented gradually.

In order to ensure the feasibility of a comprehensive investment program to be carried out by the Basin Water Agency, it is extremely important that partnerships be established with the state and municipal governments, and especially with the operators of sanitation concessions.

Likewise, there is a pressing need to engage water users in an ongoing effort, based upon transparent and participatory initiatives to be conducted by the River Basin Committee, with a view to promoting awareness and a sense of environmental responsibility, involving those responsible for the largest abstractions of water and/or the greatest discharges of pollutants.

Consequently, prior to applying these management procedures and implementing water-use charges as a means of ensuring the viability of the Basin Water Agency, it is important that certain aspects of the process be addressed:

• Technical and legal prerequisites: this group encompasses actions without which charges cannot be implemented, such as the registration of users (at least the major ones) and approval of a specific enabling law, providing criteria for establishing water-use charges based on flow rates, intake and consumption, volumes discharged and other conditions relevant to the body of water and to the river basin;

- Articulation and negotiation with federal and state authorities: even when the prerequisites above have been met, it will be necessary to define unified procedures and charges be established for the use of water, regardless of whether it is in the federal or state domain;
- Sustainability and effectiveness: charges for water use will only gain effective support from society and from users if they comply with the following principles:
  - acceptance of the importance of charges as an instrument for the rational use of water resources, to be promoted through public awareness campaigns, and participatory, decentralized planning;
  - identification of economic impacts on productive activities and consequent consideration of these impacts when setting criteria and rates to be charged;
  - assurance that the revenues will be utilized to benefit communities in the river basins from which they are collected.





Box 17

## **Community-Government partnerships for restoration of riparian forests**

In the municipality of Luz, in the State of Minas Gerais, in the Upper São Francisco region, within the scope of Activity 2.2.A. of the GEF São Francisco Project, community mobilization and training activities were carried out with the aim of producing saplings of native tree species to be used in the restoration of riparian forests and environmental conservation. The success of this community—government partnership is likely to serve as a model for other areas.

Degradation of riparian forests in the São Francisco River Basin has reached a point where many species have almost become extinct, making it necessary to gather seeds in small forested areas or from other reserves.

Schools and rural communities, among which there has been growing awareness of the economic losses associated with environmental degradation, have joined forces with NGOs, local government, unions, farming cooperatives and churches, to reforest riparian areas.

Listings were produced of farmers interested in participating in the project and, with participation of farmers organizations and the government's rural extension company EMATER, a campaign was launched to collect seeds of native species.

Mobilization also attracted participation of town dwellers, through environmental-awareness building, training courses, meetings, field visits, fairs and workshops that addressed environmental issues and provided knowledge and propagated values for the exercise of citizenship.

Roughly 200,000 saplings of native species and fruit trees, and also some exotic species, were produced. These saplings were distributed to farmers who assumed a commitment to plant and tend to them in the proximity of watercourses on their properties. Furthermore, a collective action initiative was launched in which 600 municipal high-school students participated in the planting of saplings, after having received orientation during field visits.

This methodology for combating deforestation could easily be replicated in the 500 municipalities of the São Francisco Basin, thereby presenting a low-cost solution through the restoration of riparian forests. If it succeeds in fulfilling these criteria, the Basin Water Agency will be financially independent and fully equipped to provide executive support to the São Francisco River Basin Committee, and to discharge its duties in relation to major water-users, public entities and society in general.

#### Strategic Plan for the Basin Water Agency

The strategic plan entails a results-oriented consolidation of all institutional, legal and operational elements, with a view to fostering regional development through:

- General Simulation of Revenues and Expenses: This activity, to be carried out in conjunction with the São Francisco River Basin Committee, involves detailing all expenditures and revenues deriving from the establishment of a system that levies charges on water users and polluters.
- Management Studies of a Basin Water Agency: These should encompass an assessment of the technical, institutional and legal requirements for the implementation of a Water Agency, using models that take both state and federal scenarios into account.
- Cost Estimations: This activity should determine the costs of preparing the register of water users, expanding the system of water-use permits, establishing an information system, an institutional design for the Water Agency, effecting any necessary inter-institutional agreements, and creating and interim management structure during the period of establishment of the Agency.

# 4.3. Guidelines for implementation of management instruments

Figure 18 provides a graphic representation of interrelationships among the management instruments to be applied to water resources management, in accordance with the provisions of Law 9.433/97. In the interests of clarity, the management instruments established under the National Water Resources Policy have been arranged in following categories: technical instruments, economic instruments, and strategic or policy instruments.

#### 4.3.1. Principal technical instruments

#### Water Resources Basin Plans

Basin Plans are master plans targeted at providing the foundations and guidance necessary for implementation of the National Water Resources Policy, and for managing water resources.

As a management tool, they comprise a flexible framework that permits continual updating through linkages established between the Basin Water Agencies and sectoral and regional planners, with defined indicators to expedite ongoing assessment of results. At the level of each river basin, the plans are to be drawn up by the Agencies under the general supervision of the respective River Basin Committees. In cases where the Basin Water Agencies have not yet been established, responsibility for the preparation of such plans will be assigned to competent water-resources management bodies with jurisdiction over the waters, under supervision of their respective Basin Committees.

The Basin Plans set the priorities for water use in the Basin, and allocate the necessary funding. This implies that such plans are, in effect, a broad political agreement among all stakeholders, since the setting of water-use priorities will determine the form that water-use rights will take and the charges to be levied for the use of the waters. The preparation of the Basin Plans must, necessarily, be a participatory process.

Considering the need to harmonize the drafting of the Basin Plans with the plans to be drawn up for their respective sub-basins, each with its management bodies or river basin committees, the National Water Resources Council approved Resolution 17 on May 29, 2001, which provided, under the terms of Law 9.433/97, supplementary guidelines for the preparation of water resources plans.

On May 24, 2002, Resolution 22 of the National Water Resources Council determined how groundwater studies should be integrated into the water resources planning process.

#### Classification of bodies of water

The classification of bodies of water is one of the essential instruments for water-resources management and environmental planning provided under the National Water Resources Policy.

Classification provides for the "establishment of the quality level (class) to be achieved or maintained within a segment of a body of water over time." This definition is set forth in Resolution 20/86 of the National Environment Council (CONAMA), dated June 18, 1986. The Resolution provides classifications for bodies of fresh water, brackish water and salt water in Brazil, based on their principal uses.

National Water Resources Council Resolution 12, of July 19, 2000, established the procedures for determining the classification of bodies of water, in accordance with precepts laid down in the Water Law. The aim of these classifications is to guarantee water quality compatible with the most stringent water-use requirements, and to reduce pollution-control costs through constant preventive actions.

As was intended by Law 9.433/97, more than being a mere category or designation, the classification of bodies of water constitutes a powerful planning instrument. Water-quality goals set out in the Basin Plan should strive to improve the water-quality rating of the river; i.e., to attain a better classification within a period set by the Committee. Future water-quality targets to be achieved for a given body of water should be decided through a pact established by society, taking into account the water-use priorities. Discussion and establishment of such pacts should be pursued within the appropriate forum specified by the Water Law; i.e., the Basin Committee. The final decision as to the classification to be achieved must be ratified by the State or the National Water Resources Council, depending upon which sphere of government has dominion over the water body in question, in accordance with guidelines established under CONAMA Resolution 20/86.

#### Licenses

The granting of licenses to use water resources is an administrative procedure whereby the licensee is authorized to use the water subject to terms and conditions expressed in the license. Unlike a simple authorization, licenses serve as an indispensable management instrument, since they enable managers to exercise quantitative and qualitative control over various types of water use. Although licenses are granted by public authorities, licensing requirements are conditioned by guidelines established under the Basin Plans approved by the respective Basin Committees. National Water Resources Council Resolution 16, of May 8, 2001, established general criteria for the licensing of the use of water resources.

Forms of water-use subject to licensing include: diversion or uptake of water from a given body of water for final consumption, including public water supply and water used in productive processes; tapping of groundwater for final consumption or as a component of productive processes; discharges into a body of water of liquid effluents or gaseous wastes, whether treated or otherwise, for dilution, transport or final disposal; use of hydroelectric generating potential; and, any other uses that alter rates of flow, or the quantity or quality of the water within a given body of water. The following forms of water use are not subject to permits: the use of water resources to fulfill the needs of rural settlements with small populations; diversions, abstractions and discharges regarded as insignificant; and, the impoundment of volumes of water regarded as insignificant.

Licenses to use water-resources from rivers within the domain of the Federal government are issued by the National Water Agency (ANA), whereas licenses for the use of water from rivers under State domain are issued by the competent State bodies or entities.

National Water Resources Council Resolution 7, of June 21, 2000, provided for the creation of a Technical Council for Integration Procedures, Licensing and Regulation, with authority to propose:

- guidelines for integrating procedures among the institutions responsible for issuing water licenses and regulatory decisions that affect the use of water resources;
- joint actions among institutions, targeted at optimizing procedures for related issues;
- guidelines and joint actions for the resolution of conflicts arising from multiple uses of water resources; and
- compensatory and mitigating actions.

#### Information Systems

The term information systems refers to a system for collecting, handling, storing and retrieving information on water resources and on factors influencing water resources management.

Law 9.984, of July 17, 2000, which provided for the creation of the National Water Agency (ANA), assigned ANA the task of "organizing, implementing and managing the National Water Resources Information System" (Article 4, sub-item XIV). National Water Resources Council Resolution 13, of September 25, 2000, issued



Aerial view of the Xingó dam

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regulations relating to the implementation of the National Water Resources Information System. The National Water Resources Information System (SNIRH) is essentially a decision-making support instrument for participants in the National Water Resources Management System. In order to provide a basic structure and standardized formats, a central coordination unit is required. By law, free access to information is guaranteed to society as a whole.

#### 4.3.2. Economic instruments

#### Water use charges

Charges for water use constitute one of the management tools employed to induce water users to adopt more rational patterns of consumption. There is a need to establish a balance between availability and demand and, consequently, to promote harmony among competing demands for water while, at the same time, redistributing the social costs, lessening potentially damaging discharges of effluents, and providing funding for engineering works, programs and interventions in the water-resources sector.

Water-use charges have been sanctioned by Brazilian legislation since the promulgation of Decree Law 24.643, known as the Water Code. One of the provisions of the Water Code states that: "public use of water may be free or paid, in accordance with the laws and regulations of the sphere of administration to which they pertain" (Article 36, § 2).

The law also demonstrated concern for water quality, through the statement that "no one may lawfully defile or contaminate waters that they do not consume, to the detriment of third parties" (Article 109). Article 110 of the Law provided for what is now known as the "polluter-pays principle," when it stated that the "work required to make water wholesome shall be performed at the expense of offenders who, in addition to criminal liability, if any, shall also be responsable for losses and damages caused, and be liable to fines imposed under administrative regulations." Despite the relevance of these legal precepts, they have never been adequately implemented.

In January 1997, Law 9.433/97, known as the Water Law, instituted water use charges as one of the management instruments for implementation of the National Water Resources Policy. The Water Law also established mechanisms whereby charges will be applied, the area (river basin) in which they shall be applied, assigned responsibility for determining the rates, system of application and timeframe for instituting charges (by the Basin Committees), and established the agency responsibility for executing actions using revenues collected (i.e., the Basin Water Agency).

It determined that water-use charges should be levied on those forms of use that require licenses (Article 20), and that the rates charged shall be commensurate with:

- the volume of water withdrawn and resulting alterations in flow rates, in cases of diversions, abstractions, and tapping of groundwater;
- the volume discharged and resulting flow rate variations, in cases of sewage and other liquid or gaseous discharges, and the physical, chemical, biological and toxic characteristics of the effluent (Article 21).

It further determined that revenues resulting from charges collected shall be spent, in accordance with local priorities, in the river basin wherein they were generated.

Basin Committees are charged with establishing mechanisms for applying water-use charges and proposing the rates to be charged. The rates are to be submitted to the Box 18

## Hydroelectric power potential and multiple water use in the São Francisco River Basin

The São Francisco River Basin is endowed with a potential 26,300 MW of hydroelectric generating power, of which 10,300 MW has already been harnessed. Hydroelectricity from the São Francisco River Basin is the principal source of power for the entire Northeast region of Brazil.

The table below provides information on the power plants located on the main stem of the São Francisco River. Other smaller-scale power plants, located in sub-basins of the São Francisco River, include 6 operated by CEMIG, with total installed capacity of 30.14 MW.

#### Principal Hydroelectric Plants on the São Francisco River

Power plant	Oper- ated by	Distance from the mouth of the São Francisco River (km)	Catch- ment area (km²)	Usable volume (km³)	Installed capacity (MW)
Três Marias	Cemig	2,220	50,560	15.278	396
Sobradinho	Chesf	800	498,425	28.669	1,050
Itaperica	Chesf	310	587,000	3.548	1,500
Moxotó	Chesf	270	599,200	0.226	400
Paulo	Chesf	270	599,200	0.090	1,423
Afonso 1/3					
Paulo	Chesf	270	599,200	0.030	2,460
Afonso 4					
Xingó	Chesf	210	608,700	0.005	3,000

It is thus worth stressing that the reservoirs of hydroelectric plants on the São Francisco River, aside from producing electric power, have other important roles relating to the multiple use of water resources, namely: irrigation, water supply for human consumption, regularization of flows and flood control, navigation, fisheries, tourism and leisure. The reservoirs of the Três Marias and Sobradinho hydroelectric plants are of particular importance in regulating flows in the river bed and preventing flooding.

Although the minimum natural flow at the Três Marias dam amounts to less than 60 m<sup>3</sup>/s, the reservoir makes it possible to maintain a minimum flow of 500 m<sup>3</sup>/s throughout the year, thus making it feasible to conduct year-round navigat-ion on the stretch of the São Francisco River between Pirapora and Juazeiro. The same applies to the Sobradinho reservoir, where though the natural minimum flow was no more than 620 m<sup>3</sup>/s, it has been possible to maintain a minimum flow of over 1,000 m<sup>3</sup>/s, even during the power crisis in 2001.

With respect to flood control, each year an Annual Flood Prevention Plan is drafted by the National Operator of the electricity System (ONS), detailing the volumes to be discharged into the main stream of the São Francisco River, with a view to avoiding flooding that may occur in the period between November and April, and presenting maximum discharge volumes to be complied with downstream of each of the hydroelectric plants. appropriate State or National Water Resources Council, for ratification, based on the jurisdiction over the body of water in question.

Law 9.984/2000, that provided for the creation of the National Water Agency (ANA), assigned ANA responsibilities for:

- implementing, jointly with the Basin Committees, charges on the use of water resources within the federal domain;
- collecting, distributing and investing revenues accruing from the water-use charges collected within the federal domain.

National Water Resources Council Resolution 21, of March 14, 2002, established the Permanent Technical Council for Water-Use Charges, whose principal duties are:

- to propose general criteria for applying charges;
- to propose and analyze supplementary guidelines for the implementation and collection of water-use charges;
- to propose guidelines and joint actions for the integration and optimization of procedures among the institutions responsible for collecting water-use charges;
- to analyze mechanisms for collecting water-use charges and the rates to be charged for use of water resources, in accordance with suggestions made by the Basin Committees.

#### 4.3.3. Strategic and policy instruments

#### Enforcement

Enforcement does not figure under the provisions of Article 5 of Law 9.433/97 as a separate element among the instruments prescribed in the National Water Resources Policy. Nonetheless, unquestionably, the role of enforcement is intrinsic to the application of each of those instruments. Essentially, enforcement represents the exercise of public authority and control, thereby constituting an important facet of the application of public policies.

Enforcement can be defined as the control and monitoring of the use of water resources, with the aim of guaranteeing availability of water for multiple uses. It serves to deter inappropriate patterns of use and to impose sanctions on those who commit abuses or offenses against water-resources regulations, thereby ensuring that users of water resources observe the legislation in force, while at the same time informing them of the legal requirements that they must fulfill in order to be in compliance. Users can normalize their status by filling out a declaration specifying the type of water use that they aim to pursue, and by obtaining a license from the appropriate federal or state authority entitling them to use the specified water resource.

Preventive enforcement is based on the Basin Plans. decisions of Basin Committees, and licensing. With the aim of guiding users toward compliance with laws and water-use regulations, preventive measures should be carried out on a system-wide basis, beginning with enforcement campaigns in priority river basins. Actions for the enforcement of policies and combating of offenses against water-resources regulations often result from responses to complaints or situations revealed during enforcement campaigns, and thus tend to involve "one-on-one" contact with users, initially with the aim of instructing them on how to enter into compliance with regulations and, in cases of conflicts over water use, seeking to reach a consensus, possibly through the application of the regulatory instruments foreseen in National Water Agency (ANA) Resolution 082/02. Modern technologies, such as remote sensoring, are indispensable tools for the conduct and monitoring of enforcement activities.

The implementation of instruments prescribed under the National Water Resources Policy seeks to ensure rational and integrated patterns of water-resources utilization.



#### Box 19

### **Volunteer Water Agents**

Volunteer Water Agents are members of the local community, who may be teachers or public-school students, that monitor water quality, with a view to promoting a sustainable environment from the ecological, economic and social standpoints.

The work of these Volunteers generates data and information for measuring the ISA\_Water index, used in Activity 1.4 – Development of a Water-Quality Monitoring System in the Lower-middle São Francisco Basin.

This indicator is a precise broad-spectrum tool for measuring geographic variables, in the light of ecological, economic and social profiles, for the evaluation of bodies of water, thereby minimizing the need to conduct individual tests on each one of them. It measures environmental degradation resulting from human activity and its impact upon the natural-resources base, with a view to promoting environmental protection and conservation measures.

The basic instrument used by Volunteer Water Agents is an "Ecokit", that comprises flasks and bottles of reagents and all the material necessary to conduct physical and chemical analyses, thereby making it possible to assess such aspects of water quality as: temperature, pH, dissolved oxygen, BOD, total hardness, turbidity, and iron, phosphate, chlorate, chlorine and ammonia content.

This methodology, aside from being a low-cost approach that is easily disseminated throughout the region, also enables the spread of educational and scientific knowledge, thereby having a positive effect in terms of grass roots environmental education. It is, furthermore, a means of harnessing public participation and of providing training in the basic concepts inherent to shared water-resources management. The enforcement of laws and regulations governing the multiple uses of water resources thus comprises an essential component of this policy.

#### 4.4. The São Francisco River Basin Plan and the role of the SAP

With the founding of the São Francisco River Basin Committee at the end of 2002, one of the Committee's priorities has been the preparation of a water-resources basin plan for the São Francisco River Basin (hereinafter referred to as the São Francisco River Basin Plan), to underpin its water-resources policy-management framework. This is a long-term task, with planning horizons stretching over the entire period required for structuring and implementing its programs and projects.

Actions foreseen under the São Francisco River Basin Plan will seek to establish the integrated management of the São Francisco River Basin, on an permanent basis, in accordance with general guidelines provided under the National Water Resources Policy (PNRH), and Law 9.433, of January 8, 1997.

National Water Resources Council Resolution 17, of May 29, 2001, determined that water-resources plans shall be based upon diagnostic and prognostic analyses, alternatives for harmonization, goals, strategies, programs and projects, and encompass both surface and ground water resources. The Resolution further recommended that the following topics be considered when establishing goals, strategies, programs and projects:

- identification of priority actions, possible executing or participating bodies and entities, cost assessments, funding sources and establishment of timeframes for execution;
- proposals for adjusting and/or structuring the system for water-resources management in the Basin;

• a program for implementing the management instruments provided under Law 9.433/97, encompassing the following aspects: (a) limits and criteria for granting water rights; (b) guidelines and criteria for setting rates for water-use charges; (c) proposals for the classification of bodies of water; (d) methods for implementing the Basin information system; and (e) environmental education initiatives in keeping with the national environmental-education policy, established by Law 9.795, of April 27, 1999.

The programs that are to comprise the São Francisco River Basin Plan must cover a broad and diversified range of issues, requiring careful structuring, which, from now onward, will constitute one of the principal focuses pursued by the São Francisco River Basin Committee.

Although they contain some similar elements, the SAP and the Basin Plan have quite distinct objectives, content and execution schedules. The SAP is a document containing a set of strategic actions designed to address priority concerns, and is designed to comprise a second stage of support from the Global Environment Facility to the National Water Agency (ANA). As a consequence of the studies carried out, the activities and analyses of causal chains, the identification of proposed courses of action to be pursued is targeted at correcting or mitigating these critical problems. Its scope, however, encompasses integrated management actions applied throughout the entire São Francisco River Basin. Moreover, in order to be eligible for GEF funding, such actions must be in compliance with the GEF's criteria.

The São Francisco River Basin Plan, in its full final version, will be a much more comprehensive document. Indeed, water-resources basin plans need to be conceived as continuous and dynamic processes, subject to periodic review, and focused on long-term horizons, expressed through scenario analyses that examine future conditions for the development of their respective river basins. The drafting of such plans will involve a complex participative process under coordination of the River Basin Committee.

Under the terms of Article 38 of Law 9.433/97, it is the responsibility of the Basin Committees, within their areas of authority, to promote debate on issues relating to water resources, and to provide coordination for actions to be carried out by the entities involved. It is also within the remit of the Basin Committee to approve the waterresources plan for the Basin and to monitor its execution. A period of roughly 15 months is anticipated to be required for drafting the plan, not including the time needed for successive reviews and amendments, prior to its approval by the Basin Committee, providing the various stakeholders and communities with ample opportunity to present their views.

It is worth noting that, according to item III of the São Francisco River Basin Committee's Declaration of Principles and Mission Statement, "the Committee, in the exercise of its administrative and management authority, shall prioritize approval of a Basin Plan, that shall comprise a statement of the principal guidelines and bases for deployment of other instruments provided for under the National Water Resources Policy; namely: licensing of the right to use water resources, water-use charges, and the classification of bodies of water; and shall seek, by means of the other instruments foreseen, to accomplish the effective revitalization and management of quality and quantity of water resources and their multiple uses."

Further, according to Item IV of this Declaration of Principles and Mission Statement, "based upon the Basin Plan, the Committee shall approve a strategic and operational program for revitalizing the River Basin by elucidating concepts relating to water-resources management and defining technically-justified measures to promote the preservation, conservation and restoration of the river basin, with a view to favoring biodiversity, and environmental, economic and social sustainability, and ensuring adequate quantities and quality of water supplies, for the fulfillment of human needs, while at the same time providing effective instruments for environmental education of communities, endowing them with critical and deliberative autonomy, while increasing their awareness of the interdependence of the natural, socio-economic and cultural environments."

At the Plenary Meeting of the São Francisco River Basin Committee, held in Penedo, it was decided that preparation of the Basin Plan should be entrusted to a high-level Technical Work Group, comprising members of the National Water Agency (ANA) and representatives of the agencies that manage water resources in the states that comprise the São Francisco River Basin. This Technical Work Group was charged with the task of presenting, within six months, a first draft of the Basin Plan for discussion, deliberation and approval by the Committee. The process of preparing the Basin Plan will be overseen and assessed by the Committee's Council on Technical Plans and Projects, and by its Regional Advisory Councils.

At the same Plenary Meeting of the São Francisco River Basin Committee, a preliminary draft of the structure of components and actions required for completing the Basin Plan was submitted for debate and comment, with a view to stimulating involvement of participants in activities targeted towards the revitalization of the River Basin.

Components of an investment program, to be pursued under the Basin Plan, could be grouped into two major categories: (i) management, relating mainly to actions of a 'non-structural' nature; and (ii) services and works, relating to actions of a 'structural' nature, comprising the more direct corrective interventions to be effected in the River Basin.

The management component is characterized by actions that, in general, require relatively minor investments but entail major institutional articulation and integration efforts by multi-disciplinary teams. Many of the actions under this component relate to the performance of studies, analyses and surveys, or to actions that provide support for development. The services and works component, on the other hand, is characterized by actions entailing direct interventions in the River Basin, and that involve engineering projects, public works, services of a corrective nature, and actions specifically targeted at promoting development.

The contribution of the SAP, within the scope of the Basin Plan, is more closely related to lines of action under the management component, in view of the eligibility criteria emanating from the GEF itself, which is its financial agent. In view of this, and with a view to providing greater clarity for the purposes of the preliminary draft of the Basin Plan, it is suggested that the management component be covered by actions encompassed by the SAP, whereas actions under the services and works component be left for subsequent definition. Under such an arrangement, aspects relating to services and works in an investment program to be executed under the Basin Plan, could encompass the following:

#### Services and Works Component - Water Resources:

- normalization of flows, multiple use and flood control;
- improved navigability within the Basin;

- control of erosion and siltation/deposition;
- provision of technical and financial assistance to municipalities for sustainable management of urban and rural lands;
- development and implementation of actions for the preservation and restoration of the ichthyofauna and biodiversity.

#### Services and Works Component - Environmental Sanitation

- projects and works for universalized water supply;
- projects and works to improve levels of collection and treatment of urban sewage and industrial effluents;
- projects and works to improve levels of collection and final disposal of urban solid wastes;
- · environmental restoration of areas degraded by mining.

Clearly, other actions also could be included, but the listing above is considered sufficiently broad to stimulate initial discussions within the São Francisco River Basin Committee and to guide the compilation of supporting material to expedite the process.

Figure 19 provides an illustration of the organization of the components and actions to be included in the preliminary draft of the Basin Plan, and their interfaces with the SAP.



Strategic actions and selected activities



## Strategic actions and selected activities

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View of the town of Penedo-AL



### 5.1. Guidelines for the Selection of Priority Areas and Actions

In the development of the GEF São Francisco Project, two types of actions were prioritized: actions that seek to minimize the principal negative aspects diagnosed; and actions that aim to establish a sound technical and management base for carrying out the work and for decision-making, with intense public involvement on the part of Basin institutions.

With respect to actions of the first type, the size, heterogeneity and complexity of the São Francisco River Basin means that it is impossible to treat the full scope of all of the problems facing the Basin at the same time. For this reason, the strategy adopted was to select areas for intervention and priority actions under the SAP through the development of integrated activities that could not only lead to rapid and favorable outcomes in resolving the problems identified in specific locations where the direct interventions were carried out, but could also constitute easily replicated or adapted models for adoption in other areas. It was considered that the scope of actions selected should, whenever possible, include measures to address all of the problems identified and seek to deal with them as a whole, on a sound basis, thereby avoiding thinly-spread or limited actions. To this end, it is also necessary to focus on more restricted and representative areas for action, and, while these problems did not occur in the same way in the different physiographic regions of the Basin, various approaches could be adopted in tackling them. In general, the priority actions took the following guidelines into account:

- a sound and consistent technical basis, explicitly related to the critical problems of the Basin;
- a coordinated approach, addressing the greatest possible number of problems in partnership with the institutions potentially involved in their resolution;
- an ability to produce measurable benefits, to be evaluated throughout the entire course of project implementation;
- community participation, particularly of organized civil society;
- a potential to be fully or partly replicable in the Basin or in similar areas, such as in the semi-arid Northeast, or even in other countries around the world;
- a contribution to the well-being of the local community and to sustainable development;
- being environmentally and socially acceptable in other words, risks of negative impacts for the environment or for local communities should be minimized;
- the opportunity to develop the capabilities and potential of the communities and institutions involved; and
- institutional sustainability in technical and financial terms, thereby guaranteeing continuity beyond the period in which they receive GEF resources.

The selection of areas for implementing priority actions was carried out with a view to: achieving direct benefits (i.e., solving one or more critical problem); being representative and having potential for replication; and, to the extent possible, potentially constituting a 'regional project' in which a set of activities with a specific objective could be relied upon to provide support and assistance for other activities.

With respect to actions of the second type, those having a technical basis were selected after taking into account the specific needs identified during the execution of the Diagnostic Analysis of the Basin (DAB) and/or those originating from points raised during the public debates of the São Francisco River Basin Committee (CBHSF).

#### 5.2. Structure and Basic Components

The strategic actions foreseen in the SAP aim to make a lasting contribution to the integrated management of the São Francisco River Basin and its coastal zone, in accordance with the general guidelines of the National Water Resources Policy (PNRH) as expressed in Law 9.433 of 8 January 1997, and in consonance with the aims and objectives of the GEF São Francisco Project, which was the basis for developing the SAP. Brazil's National Water Resources Policy stipulates that water resources management should be systematic, and that it should: take into account the quantity and quality of water; be appropriate to the context of physical, biotic, demographic, economic, social and cultural diversity; be integrated with environmental management and articulated with land-use management; and, finally, be integrated with the management of estuary systems and coastal areas of the corresponding hydrographic basins.

The GEF São Francisco Project emphasized the importance of public participation, by users and other stakeholders, as a means of involving society in decision-making, with a view to ensuring the sustainable use of water resources. From this standpoint, it should be noted that the Basin Committees, prescribed under Law 9.433 of 8 January 1997, as components of the National Water Resources System (SNRH), constitute model institutions for enlisting public participation from society as a whole. This should be taken into account when conceptualizing actions intended to support and promote public participation and social mobilization to ensure these actions are effective and efficient.

The structure of the SAP and of its basic components, in order to fulfill the goals set under the National Water Resources Policy and the GEF São Francisco Project, focused on the promotion of technical-institutional strengthening and participation of society as a whole. This could be consolidated through the implementation of a participative and stable water-resources management system, to which the SAP contributed. This system is the Integrated Water Resources Management System for the São Francisco Basin and its coastal zone, hereinafter referred to as Integrated Basin Management System (SIG-RHI). The SAP's contribution comprised the development and adaptation of the regulatory framework and its technical and institutional instruments. This framework and these instruments aided in developing a management database, implementing the institutional instruments required under the Integrated Basin Management System, and reinforcing institutional links, along with fulfilling the socio-institutional role of providing environmental training and education for its members and other parties involved. However, in order for the Integrated Basin Management System to be in a position to be utilized successfully, it is indispensable that the institutional links with appropriate water-resources and environmental authorities at the federal, state and municipal levels be in place. The establishment of such links is another area that received support under the SAP.

It should be remembered that the São Francisco River Basin and its coastal zone includes practically every type of water use. Therefore, the SAP initiatives also ought to

Landscape – semi-arid region

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seek to promote the multiple and rational use of water resources in order to ensure sustainable development in the Basin and its coastal zone. At the same time, steps should be taken to ensure progress toward universal access to water supplies, sewage collection and treatment, and final disposal of solid waste with a view to fulfilling socialinclusion goals enunciated under the Multi-year Plan of Action (PPA) for 2004-2007. In addition, the critical decision making instruments to be deployed in the event of emergencies, with a view to protecting and defending local communities and users in emergencies, should be adopted in consonance with the aims of the National Water Resources Policy, and the provisions of Law 9.433/97. Likewise, the SAP initiatives should contribute to the sustainable development in the Basin and coastal area, from the physical standpoint, through preventative measures, environmental protection and the restoration of degraded areas, with the consequent conservation of water resources and quality, and of soil and biodiversity.

Another pressing issue is the potential for sustainable use of groundwater resources, found particularly in the Middle and Lower-middle São Francisco River Basin, through an assessment of their volume, quality and knowledge available with respect to their potential for exploitation. It is essential to bear in mind that, since the main goal of the SAP is the implementation of strategic actions for integrated management of the River and its coastal zone, the basic thrust of such actions should be to seek consensus and provide instruments for the systematic formulation of the Basin Plan, under the terms of Law 9.433/97. Such a Basin Plan must be approved by the São Francisco River Basin Committee (CBHSF).

Figure 20 provides a graphic representation of interactions between the Basin Plan and the SAP. In practice, since the SAP comprises a series of interlinked measures, supported by studies, it will provide a significant contribution for expediting the preparation of an initial draft of the Basin Plan and for the allocation of available financial resources, to serve as baseline for the work of the São Francisco River Basin Committee in its early years, until systematic procedures for drafting and periodically reviewing such Plans are established. To prepare the São Francisco River Basin Committee for this role of formulating the Basin Plan, it will be necessary to conduct studies, identify the actors involved and establish their responsibilities, as well as to determine how such studies will be prepared, how often the plans will be reviewed, the systematic procedures for their approval, provision of oversight by the public, and other associated issues.

With these goals in mind, the SAP introduced a participative planning system, utilizing lessons learned during the SAP drafting process, so as to foster comprehensive public participation in determining the allocation of investment resources for projects that affect the Basin and its coastal zone.



Coconuts – São Francisco River Valley



#### Figure 20. Interaction between the Basin Plan and the SAP



Grapes in the São Francisco Valley

It is also necessary that actions proposed be linked to investments foreseen under the federal and state Multi-year Plans of Action (PPAs) for the São Francisco Basin and its coastal zone, since these will be regarded as the Brazilian counterpart to any future funding provided by the GEF and, as such, must be guaranteed by the corresponding budgeted resources allocated within these government plans.

Among the lessons learned during the drafting of the Diagnostic Analysis of the Basin (DAB) which led to the identification of problems of the São Francisco River Basin and its coastal zone, the following appear to have permeated all other issues and thus constitute important factors to be taken into account:

- the mere act of organizing (or reorganizing) resourceutilization patterns in the São Francisco River Basin and its coastal zone may have led to more sustainable development in the area;
- the causal chain of problem analysis has shown the need for public participation in the search for solutions to problems, so as to avoid the same problems from being repeated over time;
- the best approaches to facilitating and improving such public participation are mobilization and environmental education; and, finally,
- consolidation of an integrated water-resources management system can guarantee public participation, discipline types of water use through the application of suitable management instruments, and foster better planning, allocation mechanisms, inspection procedures and application of water use charges.

In the light of the latter conclusion, which consolidates the previous three, it can be concluded that issues relating to the strengthening of institutions and networking, public participation, and environmental training and education can be grouped into a single component that deals with the implementation of such management measures. Likewise, issues related to sustained development, pollution prevention, environmental protection and environmental restoration may be grouped under a second component.

It was within such parameters that the SAP was prepared. Its structure comprises these two major components for the Basin and its coastal zone, namely: contributions to the introduction of an Integrated Basin Management System and its array of management instruments; and to the sustainable use of water resources and the restoration of environmental quality, as shown in Figure 21. In order to achieve these aims, these Components must incorporate eight Strategic Actions, selected in strict compliance with the criteria described as follows:

#### 5.2.1. Component I - Implementation of the Integrated Basin Management System for the São Francisco River Basin and its Coastal Zone

Strategic Action I.1. Strengthening of institutional links among federal programs, and among federal, state, and municipal authorities, Basin Committees and other participants in the management of water-resources and environmental systems, with a view to promoting collaboration and improvements in the regulatory framework by setting criteria and formulating strategies for the issuing of water-use licenses, monitoring of different types of water use, managing conflicts and establishing water-use charges.



Figure 21. Structure of the SAP

Micro-spray irrigation

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Strategic Action I.2. Implementation of institutional instruments for the Integrated Basin Management System, training and public participation, to ensure the representation of users and stakeholders in the Basin Committees, providing them with training and skills, instituting the Basin Water Agency and state water-resources management systems, and introducing an effective participatory planning system.

Strategic Action I.3. Development of technical instruments for the Integrated Basin Management System, identifying and promoting activities to equip the System with all the necessary technical instruments required for the exercise of its activities, including development of its database and information system, accrediting and monitoring of users, and inputting of field data.

Strategic Action I.4. Social Mobilization and Environmental Education, through pursuit of an action plan involving restoration of historical documentation pertaining to the actions of agencies operating within the São Francisco River Basin and of the coastal area.

#### 5.2.2. Component II - Sustainable use of water resources and environmental restoration of the São Francisco River Basin and its Coastal Zone

Strategic Action II.1. Promotion of multiple uses of water, encompassing development and rational use of water for irrigation, human consumption, livestock, navigation, hydroelectric power generation, fisheries and aquaculture; such approaches should include interventions during the feasibility study and design phases of hydraulic engineering works to ensure economic efficiency and low environmental impact, particularly when located near the coastal zone.

Strategic Action II.2. Conservation of water, soil and biodiversity, dealing with ichthyofauna, restoration of shoreland vegetation and conservation of the remaining forests; control of erosion and recovery of degraded areas; point and non-point pollution control; and the establishment of a conservation unit.

Strategic Action II.3. Access to environmental sanitation and measures to be taken in the event of floods or droughts, essentially providing access to environmental sanitation for poor communities and identifying and drafting emergency management measures for the entire São Francisco River Basin and its coastal zone in the event of extreme weather conditions, such as floods or prolonged drought.

Strategic Action II.4. Sustainable use and protection of groundwater sources, with the aim of developing hydro-geological maps of the aquifers underlying the São Francisco River Basin and establishing guidelines for the sustainable exploitation of its two, known principal aquifers.

# 5.3. Analysis of selected strategic actions

Based on the eight Strategic Actions, workshops were convened in each of the four physiographic areas of the São Francisco River Basin to discuss the proposed actions with stakeholders and interact with the São Francisco River Basin Committee Work Group (GT-CBHSF). These meetings enabled participants to identify 14 principal activities, within the scope of the SAP's basic macro-actions, encompassing the range of issues to be addressed in the integrated management of the Basin and its coastal zone.

It is worth noting that, within the scope of the GEF São Francisco Project, a series of meetings and seminars were held during 2001 and 2002 with the aim of deepening understanding of experiences and identifying problems and their causes, to assist in the formulation of actions to be developed. As a result, these workshops identified various relevant and critical problems in the São Francisco River Basin and its coastal zone and it was on the basis of an analysis of this information that the SAP proposals were formulated. The proposals consist of a (short-term) four-year strategic action program to address conflicts and foster revitalization of the São Francisco River Basin and its coastal zone.

In order to assess the Strategic Actions selected, enumerate their benefits and identify their beneficiaries, a more detailed examination of the content of the proposals underlying the principal activities is needed. It must be born in mind that the SAP, in effect, is a program comprising components of an institutional nature, based on "non-structural" actions and measures; i.e., it does not involve execution of large-scale engineering works or interventions that significantly affect the flow of the river or directly alter physical conditions in its hydrographic basin.

Activities and their beneficiaries are frequently dispersed throughout the São Francisco River Basin and are often not in touch with each other. Similarly, the various proponents, whose roles often overlap, often work independently and autonomously. In view of these circumstances, benefits can be achieved through overall efficiency gains and greater rationality in the conduct of actions. In like manner, however, the expected benefits, as well as impacts upon the beneficiaries of the actions, cannot always be quantified or expressed in a simple and comprehensive way.

This difficulty notwithstanding, an attempt was made to analyze strategic actions and to enumerate their benefits and beneficiaries, by component of the SAP, as is shown in Figures 22 and 23.

Strategic Actions in Component I - Implementation of the Integrated Water Resource Management System for the Basin and its Coastal Zone.

#### 5.3.1. Strengthening of institutional relationships (I.1)

This Strategic Action is divided in two main activities:

I.1.1 Links between programs run by federal bodies, among water-resource and environmental management systems; federal, state and municipal governments, and other stakeholders in the system

This activity may be described as promoting articulation among the SAP activities and the actions of government and of stakeholders involved in the São Francisco River Basin and its coastal zone, with a view to promoting a convergence of efforts and multiplication of results.

The principal expected benefit stems from a greater degree of overall efficiency to be attained in the conduct of all activities carried out in the Basin, as a consequence of improved articulation among programs and projects run by the various bodies and stakeholders.

These benefits can be achieved through the implementation of a communications system to provide inputs for water-resources managers, thereby strengthening links and interaction between the SAP project initiatives and actions being carried out under other government programs in the Basin. Such a convergence of efforts should lead to synergy and multiplication of the individual results, through mediation of conflicts among programs and proposals for the Basin, in a transparent manner.

This need stems from the fact that, during the preparation of the Diagnostic Analysis for the Basin (DAB), it was acknowledged that institutional articulation is an essential element for the application of laws, regulations and procedures, and for the pursuit of integrated development projects.



Figure 22. SAP – Actions for Component I

Efforts aimed at promoting links between central government, states and municipalities ensure a more rational application of financial, human and material resources, and thus reduce waste due to overlap or repetition.

To this end, there is a need for a swifter and more flexible flow of communications and information among institutions in the Basin, and also within each institution, at their various decision-making levels, through to the end-users of water resources. Conflicting or dubious guidelines emanating from numerous overlapping agencies should be eliminated, in favor of greater integration and networking among institutions.

Implementation of such an initiative would lead to greater interaction among the various bodies actively involved in the Basin, thereby fostering the setting of clearer objectives and establishing of more appropriate roles, enabling these bodies to exercise their functions in a coordinated, articulated and integrated manner.

The direct beneficiaries of this activity will be federal, state, and municipal institutions, and the Basin Committee, that intend to pursue programs within the São Francisco River Basin and its coastal zone. This activity will enable them to carry out their duties more efficiently and economically by avoiding overlapping and unnecessary expenses. This activity is designed to complement the Multi-year Action Plan (PPA).

As an activity targeted at promoting integration and joint actions among federal, state and municipal programs, the expected actions and outcomes include:

- integration agreement between the states and the federal government to standardize management instruments
- events to promote integration and articulation, involving those responsible for planned and ongoing initiatives, in discussions with participation from local and regional planners and parties responsible for preparing

estimates, with scrutiny of the various components of the work to be carried out by each institution and of the results of their work, with an emphasis on promoting convergence among the various proposals;

- preparation of an 'annual agenda of intentions', encompassing the plans and targets of each institution for subsequent periods, and the drafting of a framework for identifying potential conflicts and points of convergence;
- setting of criteria and procedures to harmonize and match budgets and timelines for action among the various federal and state government institutions.

#### I.1.2. Support for the setting of licensing criteria, water-use charges, management of conflicts, and definition of monitoring strategies.

This activity will support research designed to improve the regulatory framework in the São Francisco River Basin and its coastal zone.

The activity has an important contribution to make in the setting of criteria, to be adopted by São Francisco River Basin Committee in its Basin Plan, that will aid in harmonizing the implementation of licensing instruments, monitoring users, and settling disputes stemming from jurisdictional issues related to water bodies at the various governmental levels, thereby helping to avoid further litigation and disputes arising from unequal treatment of similar cases.

It is important to stress that water-use licenses do not transfer ownership of water, since such ownership is inalienable. What is being authorized is simply the right to use water. The regulatory frameworks for hydrographic basins or sub-basins, identified under this activity, comprise strategic instruments intended to orient implementation of this water-resources management instrument.

It will be necessary to create mechanisms for harmonizing strategies and the deployment of monitoring and inspecBox 20

### Irrigated Farming in the São Francisco River Basin: qualitative aspects

Climatic conditions in the São Francisco River Basin are ideal for agriculture, however, owing to irregular and low rainfall patterns in some areas, irrigation is required to ensure successful farming.

In the São Francisco River Basin, 3 million ha. of land could potentially be irrigated, of which, 342,712 ha. are currently producing irrigated crops. Of the average flow of 2,850 m<sup>3</sup>/s, some 203 m<sup>3</sup>/s are diverted for various uses. Irrigation takes the largest portion (68%), corresponding to 138 m<sup>3</sup>/s. Of the water-use licenses issued in Minas Gerais, 76% are for irrigation, whereas in Bahia this proportion reaches 94%. Though not very common, disputes over water use have been reported in such areas as the Verde Grande sub-basin. At Entre Ribeiros, in the Paracatu sub-basin, it has been estimated that 85% of the average seven-day flow, with a 10-year replenishment period, is removed for irrigation.

Despite such disputes, the potential for the growth of irrigated farming, to fulfill the social and economic development needs of the São Francisco River Basin, is considerable. This is particularly apparent in the area of Juazeiro-Petrolina, in the west of Bahia, the north of Minas Gerais, and Paracatu, where irrigated agriculture has undergone the greatest expansion. It is thus necessary to promote more efficient water use, water-resources management, and planning for the expansion of irrigated areas.

In order to increase the efficiency of water use in irrigated farming, it is necessary to secure more information on the performance of current irrigation systems. An evaluation of methods used in 55 irrigation systems located in the north of Minas Gerais, the region of Bom Jesus da Lapa, the west of Bahia, the region of Irecê, and in the Juazeiro-Petrolina area, showed that, generally speaking, the irrigation systems used are fairly uniform in terms of water distribution, thus indicating that the projects are adequately sized. On the other hand, an assessment of the management of irrigation systems revealed that such management was often lacking, and that inadequate methods were often used.

With overhead irrigation systems, irrigation efficiency averaged 71%, which is below the acceptable level. This was due to high evaporation and spray-drift losses (11%) and deep percolation (18%). With drip irrigation, an irrigation efficiency of 79% was achieved, with losses amounting to of 21%, chiefly through deep percolation. Deep percolation losses derive from inadequate irrigation management, i.e., excessive water applications, amounting to 40% in the case of drip irrigation, and 23% using overhead systems.

The adoption of proper irrigation management practices could result in water savings of as much as 64% for drip-irrigation systems where excessive amounts are being applied, while the potential savings with overhead irrigation systems could amount to 43%.

tion policies for water-resources use among the states that share the Basin and federal authorities. To this end, the definition of an organizational model with monitoring and inspection instruments that take into account the procedures currently employed by the National Water Agency (ANA), and state water-resources management bodies involved in the São Francisco River Basin, will also be necessary.

The aim of this approach is to optimize strategies and methodologies and ensure compatible implementation of regulations, including water-use charges, with a view to avoiding court challenges and confusion on the part of water users.

Simulations should be conducted to serve as inputs for the deliberations of the São Francisco River Basin Committee on issues relating to the definition of mechanisms, criteria, and rates to be charged for the use of water resources according to the various types of use (farming, sanitation, industry, livestock, etc.), and the setting of criteria and limits for categories of use classed as insignificant.

The activity also should encompass economic surveys to assess the impact of the cost of water on the final prices of products in, among others, the industrial, mining, sanitation, irrigation and power sectors within the São Francisco River Basin. These activities would be documented in reports to serve as decision-making inputs for the São Francisco River Basin Committee and state management bodies.

One of the benefits of the activity is that it facilitates implementation of an equitable system of charges for water-resources users, in the various categories of use, by taking into account the real costs incurred.

The expected outcomes of this activity are:

• Studies for the establishment of licensing criteria, including preparation of a joint resolution, to be signed by the National Water Agency (ANA) and waterresource management bodies and committees, establishing licensing criteria for the Basin or sub-basins, to guide their actions when disputes arise and orient institutional interventions in accordance with planning targets; drafting of a water-use licensing manual to guide the actions of the National Water Agency (ANA), states and Federal District, in consonance with general guidelines set forth under the regulatory framework; drafting of a report on the compatibility of criteria for water-use licensing; preparation of a manual for enhancing methodologies used in developing regulatory frameworks; and instituting of an integrated licensing system under the National Water Agency (ANA), states and Federal District.

- Studies for the establishment of conflict management strategies, including creation of a dispute management strategy for water-resource management use in order to ensure compatibility of uses in the São Francisco River Basin, in partnership with the state bodies involved and the Regional Advisory Councils of the São Francisco Basin Committee; establishing initiatives to address the legal framework, including both formal and informal structures; mapping of existing and potential conflicts; identification of critical issues and the systematization of data; and description of enforcement and inspection procedures for water-resource use.
- Studies for the setting of criteria for charges on the use of water resources, including preparation of inputs for the deliberations of the São Francisco Basin Committee, setting the parameters for the definition of limits as to what are to be regarded as insignificant levels of use and the range of rates to be charged for the use of water resources, as well as criteria for their applicability in the various regions of the Basin, according to types of users, seasonal variations, type of source, etc.

# 5.3.2. Implementation of institutional instruments, training programs and public participation mechanisms (I.2)

This Strategic Action is comprised of two principal activities:

I.2.1. Support for the São Francisco River Basin Committee, through implementation of the Basin Water Agency, the establishment of an inter-institutional research network for state water-resource management systems, and provision of training for members of the Integrated Basin Management System

During the Diagnostic Analysis, it became clear that the dominance of site-specific and isolated actions on the part of the various bodies at the different spheres of government, without adequate integration and planning, have at times led to conflicting efforts. In this context, the São Francisco River Basin Committee that, with strong support from the GEF project, has now been founded and installed, though still in need of further strengthening, takes on added importance.

This activity will follow up on the establishment of the Basin Committee by supporting the implementation of the Basin Water Agency, as the executive body that will guarantee successful and effective functioning of the Committee, and by providing support for state water-resources management systems.

This support should be provided through training activities targeted at members of the Integrated Water-Resources Management System, thorough courses, seminars, workshops, internships and trainee programs, with the aim of providing technological training and improving standards. Such initiatives will help encourage participation of users and stakeholders in public events relating to water-resource issues.

In order to expand the scientific-knowledge base in the region, this activity should provide support for the establishment of an inter-institutional research network on the São Francisco River Basin and coastal area.

Such a network should seek to develop mechanisms to ensure compatibility among policies, and provide support

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to state governments, generally by means of Cooperation Agreements designed to support the establishment of their respective State Water-Resources Management Systems.

Cooperation Agreements could be drafted with a specific work program to address the needs of each state, with a view to strengthening and/or restructuring state water-resources bodies. These Agreements could introduce technical and institutional management instruments; support the adoption of technical standards and guidelines; and the preparation of specific studies and projects. The activity should also support reservoir users associations around the impoundments that are often the only sources of water available in many parts of the semi-arid region.

Experiences that focus upon providing support for civil-society organizations, that represent the interests of water-resource users in the various sub-basins that comprise the São Francisco River Basin, have proved potentially effective. Mobilization of these stakeholders, with their extensive local knowledge, can help change values and behaviors and have been shown to be of crucial importance in instituting participative water management of source-specific waters. To date, water-resources planning documents and technical studies have tended to be written with a high level of abstraction that most users have difficulty understanding.

The São Francisco River Basin Committee and, by extension, all its members, will be the principal beneficiaries of this activity. Not only will its members be better prepared for the exercise of their duties, but also the problem of its status as a deliberative body without executive powers will be resolved when the Basin Water Agency, with its technical team empowered to carry out the studies and projects necessary for ensuring successful outcomes for the work of the Committee, is finally instituted. Until such time as the Basin Water Agency is established and water-use charges are instituted, the São Francisco River Basin Committee has no means of stimulating public participation on the part of its members. Furthermore, the very accentuated regional, social and economic disparities, and the enormous distances that separate members of the Committee, are major obstacles to public participation which, unless adequate responses are found, could lead to the Committee losing significance.

Expected outputs of this activity are:

• Support for instituting of the Basin Agency

Actions to strengthen the Basin Water Agency, taking into account the specificities of its component sub-basins, and the diversity of regional situations; providing support, initially for the Technical Bureau, and, subsequently, for the structuring and founding of the Basin Water Agency.

- Support for state water-resources management systems Training
- Support for reservoir users associations (açudes)

Actions include the holding of events to disseminate knowledge and promote training programs, and providing technical training for public and private entities operating reservoirs and their related facilities.

• Support for an inter-institutional research network

Actions include drawing up a register of higher-education and research institutions, setting selection criteria for the various institutions registered, and creating a research network based upon the institutions selected. These actions could also include creation of a virtual library, issuance of discussion lists on subjects of common interest to a specific audience, and establishment of fora for the conduct of debates on specific themes.

• Training for members of the Integrated Basin Management System

Actions to support the training of staff and officials include: organization of courses on water-resources

management, organization of workshops, seminars and debates on related subjects, and provision of opportunities for trainees.

# I.2.2. Support for the implementation of a planning system based on models providing for interaction between sectoral policies

One of the first activities to be launched by the São Francisco River Basin Committee will be the formulation, by the National Water Agency (ANA), of a Basin Plan for the São Francisco River Basin and its coastal zone, in compliance with legislation in force. Establishing procedures for implementing a planning system in the Basin should be based upon providing for interaction between sectoral investment policies and the quantitative and qualitative water management in the São Francisco River Basin and its coastal zone. Periodic evaluations of development scenarios and proposals for measures targeted at the development, should be undertaken as an additional element of this process aimed at the conservation, preservation and sustainable utilization of water resources.

With a view to expediting discussions to this end within the São Francisco River Basin Committee, the Diagnostic Analysis of the Basin (DAB) provides an initial overview of the situation in the Basin, and the SAP provides a preview of the investments required to resolve the main problems identified. An analysis of these preliminary investment proposals and the subsequent preparation of the more detailed Basin Plan, to be discussed within the scope of the São Francisco Basin Committee, should result in a final version of the investment program for the Basin that will support solicitation of funds, over and above those available to the bodies charged with the execution of the Plan. It is crucially important, therefore, that activities in support of the Basin planning system, as proposed in the SAP, be in place to motivate the continuity of the studies leading to the preparation of the principal management instrument of the system: the Plan for the São Francisco River Basin and its Coastal Zone, and its accompanying investment program and consultations.

The Basin Plan will indicate actions to be pursued, and financial resources that must be secured, to address the problems that need to be overcome in revitalizing the São Francisco River Basin and its coastal zone.

The beneficiaries of this activity will be all stakeholders in the system who, after systematic planning has been introduced, will have the opportunity to exert a lasting influence on determination of investment priorities in the São Francisco River Basin and its coastal zone.

The expected outcomes are:

- preparation of integration agreements between the different governmental bodies, taking into account their roles and expected contributions to the functioning of the planning system;
- determination of strategies for a transition from the current situation, through the preparation of the Basin Plan under the direction of the National Water Agency (ANA) and the Basin Committee, to the establishment of the Basin Water Agency, with a review of the longterm investment goals presented in subsequent state and federal Multi-year Plans of Action (PPAs), and their corresponding annual budgets;
- preparation of suggested Bylaws of the Basin Water Agency, governing aspects relevant to its role in the planning area;





- preparation of a flow chart, illustrating the linkages between sectoral plans and the Basin Plan, with a view to consolidating institutional coordination;
- establishment of a planning horizon, stipulating execution schedules, periodic reviews and work methodologies, including the use of Strategic Environmental Evaluations applicable to policies, plans, programs and works in the São Francisco River Basin.

# 5.3.3. Development of technical instruments for the Integrated Basin Management System (I.3)

It is recommended that the two principal activities be adopted:

I.3.1. Support for the regularization of water-resource use, for monitoring and users, for implementation of an information system for the São Francisco River Basin and its coastal zone, and for the establishment of a database for the Integrated Basin Management System

Among other objectives, the aim of this Activity is to operationalize the register of water-users in the Basin in order to regulate water-resource supply and demand, and prepare users for the eventual implementation of charging mechanisms, thereby aiding in the elaboration of water-resources management guidelines and licensing procedures, particularly in areas of real or potential conflict.

The benefits of such action are clear, given that control over the use of the Basin's water is an indispensable instrument for managing demand, resolving any conflicts arising from water use, and, consequently, for integrating water-resources management throughout the Basin.

Upon implementation, information on water users will be included in a database, via the National Register of Water Resource Users (CNURH) that contains data on all Basin users (irrespective of whether the rivers are in the federal or state domain), as the initial action designed to ensure control over water supply and demand.

Thus the conditions will be laid down for regularizing user licenses, a fundamental step in the introduction of water-use charges, and for aiding the formulation of directives for water-resources management and licensing procedures, particularly in areas of real or potential conflict arising from uncontrolled water use.

There will also be a series of workshops and seminars to gather input for defining licensing criteria. A user support service will be implemented through the adoption of an "0800" toll-free phone number, staffed by trained individuals from the water-resources management body responsible for licensing and billing. This training will be extended to certain outside bodies, such as those assisting with the user registration and regularization processes.

The principal beneficiaries are the final users who, by means of this service, will have their water use duly licensed and regularized. The federal, state and municipal water-resource management bodies will also benefit, since the database will receive inputs that are not currently available, thereby endowing the system with greater consistency.

This activity will also provide input for an important instrument envisaged herein, i.e., the monitoring of water use and of water users. This is targeted at classifying the various types of water use in the São Francisco River Basin. Bulk water measuring devices, campaigns to measure flows, and rapid analyses of sediment and water will also be implemented in order to arrive at a true picture of demand for water resources in the Basin, given that there are frequent discrepancies between licensed and real flow volumes.

The principal beneficiaries of such monitoring will be the federal and state water resource management bodies,



#### Box 21

# Recommendations for the rational utilization of irrigation wate<u>r in Irecê</u>

On the Irecê plateau, in the Verde/Jacaré sub-basin, data provided by the Superintendency of Irrigation of the Secretariat of Agriculture of the State of Bahia – SEAGRI, indicates that there are over 6,000 ha. of irrigated land and that groundwater is being drawn from 10,000 tube wells.

A study carried out under Activity 1.5. - the Impact of Agriculture on Groundwater Resources in the Rio Verde/Jacaré Sub-basin, by the Federal University of Bahia – UFBA and the Superintendency of Water Resources – SRH/BA, shows that there is intense irrigation using central pivots and localized irrigation, of low efficiency in terms of water use, and that irrigation is carried out at times of day when greatest evaporation takes place.

This is a semi-arid region, where annual rainfall amounts to some 730 mm. In some areas, it was found that, from 1981 to 2002, water tables had fallen by as much as 13 meters.

With a view to optimizing and rationalizing water use, and improving the efficiency of irrigation, the GEF São Francisco team recommended that farmers carry out their irrigation at night, when there is less loss to the atmosphere. Significant gains were achieved, as of December 2003, and water consumption was reduced by around 20%.

whose activities will be enhanced by adoption of instruments capable of assessing the real (monitored) situation and any discrepancies between it and the planned distribution, in light of major projects currently being planned and negotiated. In this way, monitoring can contribute to ensuring guaranteed water supplies for local communities, and identifying potential conflicts between the transportation, energy, and irrigation sectors. A register of water-resources users, broken down by user type, will be a by-product of this activity.

With this information, water use will be regularized on the basis of user demand as reflected in the declared water-use by registered users. Thus, it will be possible to calculate actual volumes with a greater degree of accuracy, thereby assisting in the decision-making process with respect to new undertakings. It will also be possible to predict and map potential conflicts, and to anticipate measures for resolving them, rather than simply waiting for them to come to a head, usually as a consequence of whistle blowing.

Monitoring by type of user ultimately aims to correct the huge water losses from reservoirs due to evaporation, especially in the semi-arid region; the use of inadequate irrigation techniques; and the lack of periodic maintenance on most dams, canals, etc. Moreover, indirectly, users will also benefit since monitoring and integrated management will lead to more rational water use.

As a result, many of the Basin's recurrent problems, such as the presence of unregistered weirs installed by major users that jeopardize low-income communities downstream or in their immediate vicinity, will tend to be resolved. The same is true of major conflicts (though these have tended not to be explicit) involving conflicting demands from the expansion of irrigated farming versus hydroelectric power-generation.
These activities will prove invaluable for two related activities; namely, creation of the Integrated Basin Management System, and development of hydrologic, hydraulic and water-quality simulation models. They will also provide inputs for the decision-making process.

The principal beneficiaries, once again, will be the federal and state water-resources management bodies, that will be provided with modern simulation instruments for assessing the Basin's water balance, and the operation of reservoirs and hydraulic facilities, thereby making it possible to conduct analyses of innumerable potential scenarios.

This activity also encompasses the development of the Integrated Basin Management System database, including the rehabilitation and modernization of the hydrometric network, the monitoring of water and ecosystem quality, and conclusion of land-use mapping activities.

It is worth pointing out that the hydrometric network was initially planned and implemented principally with the aim of providing support for electricity-sector planning and operations, rather than for the purposes of managing multiple forms of water use.

In general, it appears that the data is most scarce in areas where intensive irrigation is being carried out, since such activities tend to be concentrated in sub-basins with little hydroelectric potential. This has led to the granting of some licenses without adequate technical assessments of water availability and risks, thereby contributing to aggravation of conflicts, as has been the case in the Verde Grande River sub-basin.

Moreover, several of the sub-projects developed during the SAP formulation phase highlighted both this deficiency of data and a lack of awareness that surface- and ground- water are all part of a single system. Implementation of this action will correct these deficiencies. Once again, the main beneficiaries will be the federal and state water resource management bodies.



#### Box 22

# Freight on inland waterways of the São Francisco River Basin

Waterways are an adequate form of transport for bulk cargoes that do not require high speeds. This theme was examined under Activity 1.1.C. – Evaluation of the Potential Contribution of the Lower São Francisco Waterway to Enhancing Competitiveness of Agriculture in the São Francisco River Basin.

Appropriate goods for transport on the waterway are those with a low value-added component that can be transported in bulk over large distances. Grain and agricultural supplies are typical of the goods that could be transported by water.

Cargoes under consideration for transport on the São Francisco waterway, include: soybeans, corn (maize), soy meal, gypsum, and tomato paste. Fertilizers used for farming in the São Francisco River Basin, produced in Camaçari in the State of Bahia, are also among the products that could be transported on the waterway.

Within the area of influence of the waterway, Pernambuco produces tomato paste and gypsum, and consumes corn (maize) and soya meal. Bahia, produces corn (maize) soybeans, soy meal and soy oil, and both produces and consumes tomato paste. Minas Gerais produces corn (maize) and is, at the same time, a consumer of gypsum and tomato paste. Goiás and the Federal District also produce corn (maize).

The main seaports that export products from the São Francisco River Basin are: Aratu, Salvador and Ilhéus in Bahia, Suape in Pernambuco, and the Vitória port complex in Espírito Santo.

Multi-modal transport systems that include stretches on which goods are transported by barge for distribution in the area of influence of the São Francisco Waterway could, potentially, generate savings amounting to US\$ 45.5 million, in relation to the use of road transport alone. Furthermore, the use of river transport would result in considerable savings of fuel and thus much lower emissions of  $CO_2$  into the atmosphere. Expected outputs include:

• Support for the regularization of water-resource use

Evaluation of the current status of knowledge regarding water demand in the Basin (available registers) and the sizing/planning of campaigns to ensure complete user registers, including: satellite imaging of irrigated areas; drafting of a manual defining a registration campaign methodology (based upon user declarations and/or census-based); standardizing registration procedures and data for licensing and billing purposes, in conjunction with other management bodies in the Basin; identifying partners, from both governmental and private entities, for mounting regularization campaigns; creating a user registration system (customization of software, database and hardware); and drafting a personnel training program for user support.

- Monitoring of water uses and users Identification of water users in the Basin, quantifying water demand and availability to assist with decision making and the implementation of new undertakings; compiling a register of laboratories equipped to perform tests; analyzing the quality of river water; and disseminating the resulting information.
- Support of the information system on water resources in the São Francisco River Basin and its coastal zone

Consolidation and operationalization of a geo-referenced database, making information on water resources available using, inter alia, the Internet.

• Development of the Integrated Basin Management System database

This activity comprises two sub-components:

- Land Use Mapping of the Upper and Middle São Francisco River Basins, completing the map of land use and settlement patterns in the entire São Francisco River Basin, in ArcView® format; and,
- Rehabilitating and upgrading of the hydrometric and water-quality monitoring networks, resizing a joint network for the collection of hydrometeorologic and

water-quality data in line with specifications for manned and automated measuring stations within an optimized operational framework, and documenting changes in the data acquisition source program, written in Delphi, to adapt it for electronic-data reception and to enable it to perform data-consistency analyses using an Oracle database. The resulting program will be part of the National Water Resource Information System, run by the National Water Agency (ANA), and interface with the ANA Geographical Information System (GIS). This subcomponent will also support the implementation of a piezometric monitoring network, designed to provide more detailed knowledge on groundwater resources in the Verde Grande River Sub-basin (in Minas Gerais and Bahia) and expand the existing network in the Verde/Jacaré River Sub-basin.

### I.3.2. Development of hydrologic, hydraulic and water-quality simulation models and of a decision-making support system

This activity entails the development of a support system for decision-making, including development of simulation models for quantitative and qualitative analysis of the Basin's hydrologic condition and hydraulic structures (dams, canals, catchments, pumping facilities, diversions, etc.).

The following technical instruments are involved in the development of this system:

- network flow models for water allocation, corresponding to the multiple categories of water use in the São Francisco River Sub-basins; a water quality analysis model; and a non-linear model for calculating alternatives to maintain a steady power output from hydroelectric power plants to the national grid system;
- a database containing quantitative and qualitative details on industrial, rural, irrigation, livestock and human water demands;

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- a dialog module for facilitating electronic communications between databases, the model base and users;
- sectoral demand models for the industrial, rural, irrigation, livestock and human water supply sectors;
- decision-making support systems for sub-basins and for the Basin as a whole.

Given that these instruments will aid the resolution of conflicts and promote integrated management within the Basin, the benefits lie in improved quality of decisionmaking. The development and deployment of these models will be of paramount importance for implementing licensing procedures and negotiated water allocations in the sub-basins. They thus constitute the principal technical instruments for analyzing water supply and demand in the Basin, and will, therefore, be of inestimable use to the Basin Committee and the Basin Water Agency.

The following instruments should be drafted:

- Technical specifications, comprising the following simulation-model modules: (i) Database Module, (ii) Model Module, and (iii) Dialog Module;
- Manuals, including (i) User Manual; (ii) Model Reference Manual, with numeric solutions and frameworks
- A computer program for the Decision-making Support System (DSS).

## 5.3.4. Public Involvement and Environmental Education (I.4)

This Strategic Action is comprised of one principal activity:

I.4.1. Promotion of social mobilization and environmental education, including the drafting of a plan that respects regional differences, and the restoration of historical documents Social mobilization occurs only when a group of individuals seeks to achieve common objectives. This, in turn, depends upon an awareness of the importance and publicspiritedness of the objectives. In order to mobilize public support for integrated and sustainable water-resource management, therefore, planned and coordinated public involvement must be promoted.

This promotion should be based on a Social Mobilization and Environmental Education Plan that covers the entire São Francisco River Basin and its coastal zone, while respecting regional differences.



View of the mouth of the São Francisco River

The benefits of social involvement are of paramount importance, though difficult to measure, as they become apparent only in the longer term. Indeed, without the support of society, sustainable development cannot be achieved.

The envisaged outputs of this activity are:

 An Environmental Educational Plan for the São Francisco River Basin and its coastal zone;

- Courses, field days, and seminars, and the drafting of primers;
- Educational events, including convening a public water and environment week.

Component II Strategic Actions – Sustainable Use of Water Resources and Environmental Restoration of the São Francisco River Basin and its Coastal Zone

This Strategic Action is comprised of three main activities, as shown in Figure 23:



Figure 23. SAP – Actions for Component II Actions

Fruit in the São Francisco Valley

### 5.3.5. Promoting multiple forms of water use (II.1)

Three main activities are foreseen under this strategic action:

# II.1.1. Support for rational water use in irrigation

This activity aims to promote the economic, social and environmental sustainability of irrigation systems, by reducing water and energy losses, seeking to achieve maximum crop yields per unit of area based upon optimizing water use, and allowing the integration of irrigation technology and water-management instruments. To this end, it will be necessary to study replacement of existing irrigation methods, adoption of more water-efficient crops, and use of improved piping and distribution efficiency in irrigation districts.

Such studies will lead to the drafting a pilot scheme for rationalizing water use, equipment and crop selection, assisting farmers and institutions that operate and maintain irrigation and drainage systems to make the best possible use of more efficient irrigation methods. They will also provide inputs for a study of project costs designed to increase the efficiency of water transport, distribution and application, through the introduction of automation and permanent controls over water use based on tried and tested software.

The products envisaged are:

- A model and software for calculating water and irrigationflow needs, making use of regional and local data;
- Organizing and disseminating a database on soils, climate, crops and irrigation-management, and detailing parameters for orienting licensing procedures;

• Convening of courses and disseminating information by means of workshops, seminars and technical publications.

II.1.2. Follow-up of hydro-environmental and operational studies on multipurpose dams, including the generation of artificial floods, with the aim of providing support for shipping and resolving problems in the Coastal Zone

This activity will monitor progress on inventory, economic-feasibility and environmental studies on all dams under consideration, and assessments of their impacts on the Basin and its coastal zone, always from the standpoint of multiple water uses. The dams in question are those being considered by CHESF, CEMIG, CODEVASF and others, for specific or multiple uses, on the das Velhas, Paracatu, Urucuia, Jequitaí and São Francisco rivers.

These investigations may lead to further studies aimed at establishing operational rules for these dams in order to optimize their multi-purpose uses, thereby conferring massive benefits on the system as a whole.

A better understanding of flow regulation, carried out in conjunction with the shipping, irrigation, power-generation and water-resource management sectors, will help optimize the investments needed to ensure shipping on the river and some of its leading tributaries, thereby integrating the region's various municipalities and states, by determining the cost of services required to keep the waterway navigable.

In addition to enhancing decision-making by providing information to aid in understanding the problems afflicting water-resource users in the Basin and its coastal zone, the activity could also provide partial sponsorship for studies designed to restore navigation in the region of the Middle São Francisco River.

The activity envisages morphologic and bathymetric surveys of the river bed and implementation of mathematical and hydrodynamic models in the estuarine region, with a view to initiating studies and control over erosion and silting in the Lower São Francisco River Basin, possibly through the use of monitored artificial flooding. The work and studies will be undertaken by federal and state bodies.

The products to be prepared to support the multi-purpose operation of dams and the occasional generation of artificial floods are:

- Compendia of the dam studies for decision-making purposes;
- Reports on the technical, economic and environmental feasibility of instigating artificial floods downstream from the Xingó dam, considering aspects relating to their impact on the riparian population and the interconnected power system;
- Compendia of strategies for restoring shipping on the river.

With respect to shipping, assistance will be provided to the State of Bahia for re-instituting shipping services on the stretches deemed most viable, extending the study already completed on the stretch between Juazeiro and Ibotirama, to Pirapora in Minas Gerais.

# II.1.3. Assisting in the rehabilitation of the ichthyofauna and fostering the development of fisheries and aquaculture

The main aims of this activity are to restore fish stocks with native species, when feasible, and introduce highly efficient aquaculture systems which will serve as instruments for economic and social development, as well as environmental conservation. Jobs and income will be created through the introduction of fish conservation, processing and distribution technologies (including byproducts), thereby diversifying the rural economy and social structure.

Intermediate steps in this process involve fostering the rehabilitation of fish populations by monitored restocking with native species, managing the addition of nutrients to the river, and the drafting of a fisheries-management plan. The principal direct beneficiaries are fishermen of the region of the Lower São Francisco River Basin.

The outputs envisaged are:

- A database, continually updated, containing details on, inter alia, aquaculturists/fish-farmers, reservoirs [açudes], dams, water sources [aguadas] and suppliers of basic aquaculture inputs;
- Short courses in fish-breeding for fish-farmers and extension workers;
- Manuals for extension workers covering such issues as fish breeding systems and processing techniques;
- Facilities for the production and distribution of fry, and the setting up of experimental facilities to investigate the reproduction of native fish species, larval fish rearing and fry rearing;
- Training schemes for fish-breeding in net tanks and in irrigation channels, using improved technologies.

### 5.3.6. Water, soil and biodiversity conservation (II.2)

This Strategic Action is comprised of two main activities:

II.2.1. Support for restoring and preserving remaining vegetation, control of erosion, restoration of degraded areas and measures to control specific point and non-point pollution The aim of this activity is to promote measures to assist bodies that work with the restoring and/or preserving of the Basin's representative ecosystems, including the Atlantic Forest. The activity will provide support to the efforts of federal, state and municipal government actions to restore native vegetation around headwaters, in aquifer recharge areas, around springs and along river banks.

To this end, it will be necessary to draw up a detailed profile of all activities with potential impacts on soil loss in the Basin, apply semi-quantitative mathematical models within a GIS environment, and assess the most appropriate conservation practices always respecting local socio-economic and environmental characteristics.

Microbasins can be rehabilitated by installing small stone weirs to contain sediment, and utilizing underground dams to store water and form areas of cultivatable land. Local roads can be improved by creating detention and infiltration basins, or rerouting stormwater in such a way as to avoid erosion and sediment runoff into watercourses.

These actions aim to assist with the preparation of a pilot project for integrated water-and-soil conservation, to enhance the status of 'Water Producers' in the sub-basins of the São Francisco River.

They also envisage the identification of critical points in the São Francisco River Basin where there is a potential risk of environmental accidents, related to point and nonpoint pollution originating in rural and urban areas, from mining, domestic sewage, dam breaks, agrochemicals and/or nutrients. These actions will be identified through preparation of terms of reference and appropriate pilot projects.

The envisaged outputs are:

 Mapping of critical areas of deforestation and soil-loss in the Basin, on an appropriate scale;

#### Box 23

### Over US\$ 1 billion invested in irrigation works in the São Francisco River Basin

Up until 2003, total investments in irrigation in the region of the São Francisco Basin encompassed by CODEVASF were of the order of US\$ 1.112 billion. A major portion of this investment has been provided by international agencies. The table below presents figures on the investment for each of the projects currently underway.

Investments in Irrigation Projetcs in	the São Francisco River Basin
irrigation project	Investments US\$
Barreiras	112,122,941
Bebedouro	5,834,827
Betume	23,731,793
Boacica	47,984,058
Ceraíma	5,511,955
Cotinguiba/Pindoba	21,800,633
Curaçá	25,653,499
Estreito	31,066,218
Formoso A	169,675,849
Formoso H	59,180,601
Gorutuba	30,963,550
Itiúba	13,216,073
Jaíba	274,888,310
Lagoa Grande	1,654,946
Mandacaru	2,276,888
Maniçoba	25,045,949
Mirorós	28,009,529
Nilo Coelho	182,445,765
Nupeba	3,093,308
Piloto Formoso	2,618,795
Pirapora	4,479,618
Propriá	11,773,809
Riacho Grande	1,615,138
São Desidério/Barreiras Sul	8,630,831
Tourão	19,541,451
Total	1,112,816,348

Source: CODEVASF, Brasilia, june 2003

With a view to contributing to reducing the role of the State in economic activities, CODEVASF has begun to transfer responsibility for the management of irrigation projects to the farmers that work on them. This transfer of responsibilities has been taking place through Contracts for the Delegation of Management in irrigated areas, signed by water users associations.

- an evaluation of land use, land management and remedial practices capable of stemming erosion, along with their socio-economic and environmental effectiveness;
- a workshop on legislation and erosion controls, including replanting and sustainable management of riparian vegetation and protection of areas of permanent preservation, involving organizations and stakeholders from the most critically affected regions;
- primers on replanting and sustainable management of riparian vegetation and management of permanent preservation areas;
- a pilot project on sustainable agricultural and urban stormwater management practices and undertaking socio-economic and environmental monitoring of the feasibility and replicability of the projects;
- an evaluation of critical areas of the Basin subject to nitrate- and phosphate-induced eutrophication;
- the identification of critical point and non-point sources of pollution, by agrochemicals and industrial and mining effluent, and assessing their impact on human health and environment.

### II.2.2. Support to the creation of a conservation unit at the mouth of the São Francisco River and in its Coastal Zone

This activity will support the creation of a conservation unit characteristic of the region's bio-ecological system, while, at the same time, permitting identification and delineation of areas requiring permanent environmental protection, and determination of the level of protection needed. It will also permit assessment of water-exchange mechanisms, tidal-prisms and seawater intrusion volume ratios, estuarine sedimentation and sediment transport mechanisms, and nutrient concentrations and cycling in estuarine mangrove swamps, and identification of the distribution and yield of phytoplankton, zooplankton and mangrove species.

This activity will lead to a better understanding of how to reconcile development with the sustainable use of biodiversity, thereby mitigating the effects of the environmental changes taking place in the São Francisco River Basin and its coastal zone. The focus of these actions will



Irrigation in the São Francisco Valley

São Francisco River – Barra - BA

be support for the creation of set of conservation units, with the aim of controlling land use, exploitation of natural resources, and ongoing environmental degradation in these critical areas. An ecological corridor should be created to link these conservation units. The direct beneficiaries are the population of the Lower São Francisco River Basin and its coastal zone.

The envisaged outputs are:

- studies for a delineated Conservation Unit and ecological corridor;
- workshops for presentation of interim results and a seminar for the dissemination of the final results, as well as a proposal for the implementation of a Conservation Unit at the mouth of the São Francisco River;
- a Management Plan for the Conservation Unit at the mouth the São Francisco River and in the coastal zone, including empirical estimates of sediment and nutrient loads and cycles;
- a proposal for the creation of an ecological corridor from the mouth of the São Francisco River to the Xingó Dam.

### 5.3.7. Access to environmental sanitation and measures to be taken in the event of floods or droughts (II.3)

This Strategic Activity is comprised of one main activity:

### II.3.1. Help provide access to environmental sanitation for poor communities and the adoption of preventive measures against floods and droughts

This activity will stimulate access to environmental sanitation in municipalities in the São Francisco River Basin with less than 5,000 population, providing substantial economic, environmental and social benefits for the greater part of the population of the Basin. In order to protect the riverside population, and that of other areas of the São Francisco River Basin and its coastal zone, this activity is also designed to provide flood and drought prevention, monitoring and impact-assessment programs for communities in the Basin, in view of the seriousness of such natural disasters.

The envisaged outputs are:

- a seminar, attended by representatives of government and of organized civil society, to establish criteria for the proposed actions and identify priority areas for their implementation;
- a diagnostic analysis, including economic evaluations and conceptual studies, on water-supply, sewage and solid-waste collection and disposal systems in the São Francisco River Basin;
- improvements in environmental sanitation systems in priority municipalities;
- Action Plans for drought and flood relief, entailing a series of workshops and seminars, and the participation of the various stakeholders to be involved in their development and execution.



Irrigation channel - Jaiba Project - BA

### 5.3.8. Sustainable use and protection of groundwater (II.4)

This strategic action envisages one principal activity:

### II.4.1. Dissemination of knowledge on the management, utilization and protection of aquifers in the Basin, and establishment of guidelines for sustainable exploitation of the Bambuí and Urucuia aquifers

This activity aims to improve the knowledge base concerning on the aquifers in the Basin, including the isolated sedimentary aquifers in the Lower-middle São Francisco River Basin. It will also result in preparation of guidelines for the integrated management, utilization and protection of groundwater resources of the Bambuí and Urucuia aquifers.

Such knowledge will enable an evaluation of the contribution of groundwater to the São Francisco River's total flow through determination of groundwater interfaces with the surface water system.

This will be achieved through analysis of geological, geostructural, geomorphologic and hydrogeologic data; quantification of the available groundwater reserves; and, in the case of the two principal aquifers, an evaluation of their water catchment, production and supply potential, and vulnerability to contamination of the quality of their water.

A deeper knowledge of these two aquifers will help to potentially increase water availability in the Upper and Middle São Francisco River Basins, ensuring coverage for local populations, even in a scenario characterized by higher volumes of use than are currently envisaged.

The envisaged outputs are:

- A diagnostic analysis of the current state of knowledge on the lithological and structural framework of the Basin's existing aquifers, and on the storage, circulation, extraction, quality and utilization of their water;
- Delineated pilot areas, including the physical and geometric characterization of the aquifers, their hydraulic and hydrodynamic features, water uses and exploitation characteristics, and water-quality;
- A comprehensive evaluation and consolidation of knowledge and the establishment of guidelines for the sustainable use and protection of groundwater, especially from the Bambuí and Urucuia aquifers.



# 5.4. Physiographic regions encompassed by the actions

The selection criteria utilized for the determination of areas where strategic actions will be carried out made it possible to establish a highly homogeneous distribution and comprehensive coverage of the São Francisco River Basin and its coastal zone (see Table 9).

Component I is applicable to the entire Basin and its coastal zone, since it deals with matters related to the Integrated Basin Management System, at the federal level, and at that of each of the states. Component II, on the other hand, contains actions targeted at more specific areas, albeit still with ample coverage throughout each of the major divisions in the Basin and at the coastal zone.

Thus, the only actions under Component II that apply to a single physiographic region include those targeted at the Lower São Francisco River Basin and its coastal zone, in view of the specific nature of the problems that need to be resolved.

Likewise, and for the same reason, actions targeted at groundwater resources do not apply only to the Lower São Francisco River Basin, nor do actions aimed at regularization of flows apply solely to the Upper São Francisco River Basin.

It is important to note that activity I.3.1, which updates land-use mapping in the Middle São Francisco River Basin in a manner compatible with the other surveys already completed in the other three major sub-basins, should be considered as being of relevance to the entire Basin.

		Physiographic Region								
Component	Strategic Actions	Principal Activities	Upper	Middle	Lower-mi- ddle	Lower & Coastal Zone				
	I.1. Strengthening of institu- tional links	I.1.1. Articulation between federal programs and between water-resource and environmental systems, federal, state and municipal governments and other stakeholders								
		I.1.2. Support for the establishment of licensing criteria, water use charges, conflict management and monitoring strategies								
nt System	I.2. Implementation of Integ- rated Basin Management System institutional instru-	I.2.1. Support for the Basin Committee, through institution of the Basin Water Agency, an inter-institutional research network and state water-resource management systems,								
Managemer	participation mechanisms	Integrated Basin Management System I.2.2. Support for the implementation of a planning system with modeling that allows interaction between sectoral								
. Implementation of the Integrated Basin I	I.3. Creation of Integrated Basin Management System technical instruments	policies I.3.1. Regularization of water-resource use, monitoring and user data, the implementation of an information system for the São Francisco River Basin and its coastal zone, and development of the Integrated Basin Management System database I.3.2. Creation of hydrologic, hydraulic and water-quality simu- lation models and of a system to support decision making								
	I.4. Social Mobilization and Environmental Education	I.4.1. Promotion of public participation and environmental education, including the drafting of a plan that respects regional characteristics and involves restoration of histori- cal documents								
tal Restoration of	II.1. Promotion of multiple water use	II.1.1. Fostering rational water use in irrigation II.1.2. Continuation of hydro-environmental and operation- al studies on multipurpose dams, including the generation of artificial floods aimed at providing support for shipping and resolving problems in the coastal zone								
ources and Environmenta its Coastal Zone	II.2. Water, soil and biodiver-	II.1.3. Assisting the rehabilitation of ichthyofauna and fostering the development of fisheries and aquaculture II.2.1. Support for reforestation and the preservation of								
	sity conservation	remaining vegetation, control of erosion, restoration of de- graded areas and application of measures to control point and non-point pollution sources								
ater Resc 8asin and	II 3 Access to environmental	II.2.2. Assist the creation of a conservation unit at the mouth of the São Francisco and of its coastal zone								
ole Use of Wa cisco River B	sanitation and measures to be adopted in case of floods and drought	sanitation in poor communities and the adoption of preven- tive measures against floods and drought								
II. Sustainab the São Franc	II.4. Protection and sustain- able use of groundwater	II.4.1. Development of knowledge on the management, use and protection of aquifers in the Basin and establishment of guidelines for the sustainable exploitation of the Bambuí and Urucuia aquifers								

Table 9	Physiographic	regions encon	nnassed hv	stratenic a	actions under	the SAP
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Implementation of the SAP



# Implementation of the SAP

Caril

Grapes – Petrolina - PE



### 6.1. Investments Required and Implementation Schedule

The purpose of the strategic actions planned under the Strategic Action Program (SAP) is to foster environmentally sustainable development within the São Francisco River Basin and its coastal zone. In order to implement such actions, Brazilian Federal Government investment programs, and those of the States, municipalities and local entities that share the Basin, should be taken into consideration.

Significant investments have been made and/or are scheduled to be made in this part of Brazil, as described in Section 3.3.1. Some of these projects are financed by national agencies such as CHESF, CEMIG, CODEVASF, etc., and others by possible co-financiers, such as the multinational agencies.

One such case is the US\$ 330 million World Bank loan for the massive PROAGUA project in Northeast Brazil, some US\$ 5 million of which has already been invested in the Basin.

As set forth in Section 6.3.1 below, projects compatible with the SAP, totaling US\$ 199.1 million over four years, were identified. Of these, the National Water Agency (ANA) selected three Programs, encompassing five Activities with allocations under the Multi-year Action Plan (PPA), for urgent implementation. These Programs total US\$ 29.5 million, and the associated, proposed Activities represent the core investment scenario for the Basin.

The investment scenario also includes implementation of other actions needed to usher in sustainable development concomitantly with these core São Francisco River Basin Programs. These are the activities, identified in the SAP, which are crucial for achieving the global environmental benefits resulting from the mitigation of transboundary environmental problems that also affect coastal waters in the Southwest Atlantic Large Marine Ecosystem.

The costs of these actions include costs related to sustainable development projects within the Basin and its coastal zone, over and above those identified in the routine environmental impact assessments and mitigation measures required to comply with federal and state environmental laws and regulations in Brazil. These incremental implementation costs of the eight strategic actions encompassed within the SAP amount to US\$ 9 million, split into US\$ 4.3 million under Component I, and US\$ 4.7 million under Component II, in accordance with the allocation for each strategic action, as presented in Table 10. This amount is in addition to the above-mentioned Brazilian investment of some US\$ 29.5 million over the same four-year period, as shown in section 6.3.1 of this report. This raises the investment allocated to similar activities in the Basin to US\$ 38.5 million over four years, as shown in Table 10.



Landscape – Jaíba - BA

Table 10. SAP Investments by Component and Strategic Action		
Components / Strategic Actions	Incremental Cost—GEF US\$	Total Cost US\$
I — Implementation of the Integrated Water Resources Management System	4 200 000	4 570 000
for the Basin and its coastal zone (SIGRHI)	4,500,000	4,370,000
I.1. Strengthening institutional networking	200,000	250,000
I.2. Introducing Integrated Basin Management System institutional instruments,	1 500 000	1 570 000
public participation and capacity-building mechanisms	1,500,000	1,570,000
I.3. Developing the Integrated Basin Management System technical instruments	2,200,000	2,275,000
1.4. Involving society and environmental education	400,000	475,000
${ m II}-{ m Sustainable}$ use of water resources and environmental rehabilitation of	4 700 000	22 020 000
the Basin and its coastal zone	4,700,000	55,950,000
II.1. Promoting multiple water uses	2,200,000	7,430,000
II.2. Conserving water, soil and biodiversity	700,000	13,700,000
II.3. Providing access to environmental sanitation and measures to be taken in	1 150 000	11 150 000
the event of floods or droughts	1,150,000	11,150,000
II.4. Implementing programs for the sustainable use and protection of ground-	650.000	1 650 000
water	000,000	1,000,000
Total (I + II) US\$	9,000,000	38,500,000

The implementation period for all actions planned under the SAP is approximately four years, although the individual activities do not all begin or end at the same time. They have their own schedules, depending upon their component actions, as shown in Table 11 (Disbursements) and Table 12 (Dates).

Table 11. Annual disbursement schedule for financial resources							
Components	Ann	ual Expenditures Di	stribution (US\$ x 1,	000)			
	Year 1	Year 2	Year 3	Year 4	Total		
Component I	670	2,325	1,155	150	4,300		
Component II	430	2,160	1,650	460	4,700		
Overall Total	1,100	4,485	2,805	610	9,000		
%	12.2%	49.8%	31.2%	6.8%	100%		



Photo: Alain Dhomé

Serra da Canastra-MG

Table 12. Implementation schedule, and monitoring and evaluation schedule of SAP implementation														
Charles de Maliana	Martin Alabertation	Year												
Strategic Actions	Main Activities		Year 1				ar 2		Ye	ar 3	3	١	<b>f</b> ear	r 4
I. Implementation of the Int	egrated Basin Management System (SIGRHI)							_						
I.1. Strengthening institu-	I.1.1. Networking among programs managed by federal agen- cies and among entities responsible for water-resources and environment systems: the federal, state, and municipal govern- ments and other stakeholders in the Basin.													
	I.1.2. Establishing licensing criteria, water use charges, protocols for managing disputes and definition of monitoring strategies.													
I.2. Introduction of Integ- rated Basin Management System institutional instru- ments, public participa- tion and capacity-building mechanisms	<ul> <li>I.2.1. Supporting the Basin Committee through the institution of the Basin Water Agency, establishing an inter-institutional research network and state water resource management systems, training and capacity-building for the members of the Integrated Basin Management System.</li> <li>I.2.2. Implementing a planning system with modeling that allows for interaction among sectoral policies.</li> </ul>													
I.3. Development of Integ- rated Basin Management System technical instru- ments	<ul> <li>I.3.1. Regularizing and monitoring water-resources uses and users, implementing an information system for the São Francisco River Basin and its coastal zone, and developing the Integrated Basin Management System database.</li> <li>I.3.2. Developing hydrologic, hydraulic and water quality simulation models, and a decision-making support system.</li> </ul>													
I.4. Social mobilization and environmental education	I.4.1. Fostering social mobilization, public involvement and environmental education, including the preparation of a Plan that takes regional characteristics into account and includes the restoration of historical documents.													
II. Sustainable Use of Water	Resources and Environment Rehabilitation in the Basin													
II.1. Promotion of multiple water usage	<ul> <li>II.1.1. Fostering policies for rational use of irrigation water.</li> <li>II.1.2. Overseeing hydro-environmental studies for multiple use dams and their operations in order to provide support for shipping and mitigation of problems in the coastal zone, including the generation of artificial floods.</li> <li>II.1.3. Supporting the recovery of the ichthyofauna and the development of fisheries and aquaculture.</li> </ul>													
II.2. Conservation of water, soil and biodiversity	II.2.1. Supporting reforestation and preservation of remain- ing vegetation, erosion control, recovery of degraded areas and measures for point and non-point pollution control. II.2.2. Establishing a conservation unit at the mouth of the São Francisco River, in its coastal zone.													
II.3. Access to environmen- tal sanitation and measures for dealing with floods and droughts	II.3.1. Providing access to environmental sanitation in poor communities, and preventive flooding and drought control measures													
II.4. Sustainable use and protection of groundwater	II.4.1. Fostering adequate knowledge for the management, use and protection of aquifers in the Basin, and establishing guidelines for the sustainable utilization of the Bambuí and Urucuia aquifers.													



The investments in each of the seven principal activities that comprise the Strategic Actions under Component I

are shown in Table 13. These investments will ensure the outcomes described in Chapter 5 for each of these activities.

Table 13. Investments by Principal Activity of Component I					
Strategic Actions	Principal Activities	Cost US\$			
	I.1.1. Networking among programs managed by federal agencies and among				
I. 1. Stuppethoning institutional	entities responsible for water-resources and environment systems, the federal	100,000			
notworking	government, the states, municipalities and other stakeholders in the system.				
networking	I.1.2. Establishing licensing criteria, water use charges, and protocols for the	100 000			
	management of disputes and monitoring strategies.	100,000			
I.2. Introduction of Intograted	I.2.1 Supporting the Basin Committee through instituting the Basin Water				
Pasin Management System	Agency, establishing an inter-institutional research network and state water	1 100 000			
institutional instruments, public	resource management systems, and training and capacity-building programs for	1,100,000			
	the members of the Integrated Basin Management System.				
participation and capacity-building	I.2.2 Implementing a planning system with modeling that allows for interaction				
mechanisms	among sectoral policies.	400,000			
	I.3.1. Regularizing and monitoring water-resources uses and users, implement-				
I.3. Development of the Integrated	ing an information system for the São Francisco River Basin and its coastal	2,000,000			
Basin Management System techni-	zone, and developing the Integrated Basin Management System database.				
cal instruments	I.3.2. Developing hydrologic, hydraulic and water quality simulation models, and	200.000			
	the decision-making support system.	200,000			
I. 4. Social mobilization and onvi	I.4.1. Fostering social mobilization, public involvement and environmental edu-				
1.4. Social mobilization and envi-	cation, including the preparation of a Plan that takes regional characteristics	400,000			
	into account and includes the restoration of historical documents.				
Sub-Total – Component I	US\$	4,300,000			



Irrigation in the São Francisco Valley

Likewise, investments in the seven principal activities of Component II, designed to ensure the outcomes described in Chapter 5, are presented in Table 14.

Strategic Actions	Principal Activities	Cost US\$
	II.1.1. Fostering the rational use of irrigation water.	900,000
	II.1.2. Overseeing hydro-environmental studies for multiple use dams	
	and their operation in order to provide support for shipping and mitiga-	000 000
II.1. Promotion of multiple water usage	tion of problems in the coastal zone, including the generation of artificial	900,000
	floods.	
	II.1.3. Supporting the recovery of ichthyofauna and the development of	400.000
	fisheries and aquaculture.	400,000
II.2. Conservation of water, soil and biodiversity	II.2.1. Supporting reforestation and preservation of remaining vegeta-	
	tion, erosion control, recovery of degraded areas and measures for point	500,000
	and non-point source pollution control.	
	II.2.2. Establishing a conservation unit at the mouth of the São Fran-	200.000
	cisco River, in its coastal zone.	200,000
II.3. Access to environmental sanitation and measures for dealing with floods and droughts	II.3.1. Providing access to environmental sanitation in poor communities and preventive measures for flooding and drought control.	1,150,000
	II.4.1. Fostering adequate knowledge for the management, use and	
II.4. Sustainable use and protection of	protection of aguifers in the Basin, and establishing guidelines for the	650,000
groundwater	sustainable utilization of the Bambuí and Urucuia aquifers.	230,000
Sub total Component II	US\$	4,700,000

# **6.2. Potential Institutional Partners in the Implementation of the SAP**

The numbers of stakeholders and the intense public participation involved in the preparation of the GEF São Francisco Project were undoubtedly of great importance in enabling the project to reflect consensus on the various concerns and needs of stakeholders throughout the Basin.

This project management process thus constitutes a highly successful experience that can serve as a model for its continuation. The partnerships for implementing the SAP actions will remain the same as those involved in its formulation, with only a few slight variations in emphasis. When identifying partners, the need to harmonize very diverse interests and public policies must be taken into consideration. There is also a need to incorporate the technical and managerial skills of entities that have data and information available, or the technical capacity to obtain them.

Tables 15 and 16, respectively, list the institutions selected as potential partners for implementing Components I and II of the SAP, to ensure continuity of participation in the process with the decentralization and integration of the actions to be implemented for integrated management of the São Francisco River Basin. Note that this is a preliminary list that should not be regarded as exclusive, and which should be updated as the SAP is implemented.

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Table 15. Potential Institutional Partners for Implementation of Component I of the SAP							
Component I: Implementation of the Integrated Basin Management System (SIGRHI)							
Action	Activity	Institutional Partners					
I.1. Strengthening institutional networking	I.1.1 Networking among programs managed by federal agencies and among entities responsible for water-resources and environment systems: the federal, state, and municipal governments and other stakeholders in the system.	Ministry of Environment; Ministry of Planning and Budget; State and Municipal Secretariats of Water-Resources, Envi- ronment and Planning; CBHSF.					
	charges, and protocols for managing disputes and monitoring strategies.	State water resource management entities; CBHSF.					
I.2. Introduction of Integrated Basin Management System institutional instruments, public participation and capacity-	I.2.1 Supporting the Basin Committee through instituting of the Basin Water Agency, establish- ing an inter-institutional research network and state water resource management systems, and training and capacity-building for the members of the Integrated Basin Management System.	Ministry of Environment; CBHSF; State water resource management entities; Research Support Entities; Municipal Administrations; NGOs.					
building mechanisms	I.2.2. Implementing a planning system with modeling that allows for interaction among sectoral policies.	State water resource management entities; Federal Enti- ties (IBAMA, CODEVASF, MI, MC, MS, MT, MPO, MME, ANEEL); CBHSF; CHESF; CEMIG.					
I.3. Development of Integrated Basin Management System	I.3.1. Regularizing and monitoring of water- resources usage and users, implementing an information system for the São Francisco River Basin and its coastal zone, and developing the Integrated Basin Management System database.	Ministry of Transport; State environment and water resource management entities; IBAMA; State environment police; CHESF; CEMIG; CODEVASF; ANEEL; CBHSF.					
	I.3.2. Developing hydrologic, hydraulic and water quality simulation models, and the decision-making support system	State environment and water-resource management entities; CHESF; CEMIG; CODEVASF; ANEEL; CBHSF.					
I.4. Social mobilization and environmental education	I.4.1. Fostering social mobilization, public in- volvement and environmental education, includ- ing the preparation of a Plan that takes regional characteristics into account and includes the restoration of historical documents.	CBHSF; State Secretariats of Education and Environment; Municipal Administrations; CBHSF; NGOs.					

### Table 16. Potential Institutional Partners for Implementation of Component II of the SAP

Component II — Implementation of Integrated Water Resources Management and Environmental Restoration in the Basin and its Coastal Zone

Action	Activity	Institutional Partners
	II.1.1. Fostering rational use of irrigation water.	EMBRAPA; EMATER; Fundação Rural (DF); MBC; Pirecciani Acord; EPAMIG; UNIMONTES; Associação de Irrigantes; Irrigation Districts; CODEVASF; CTHidro; FINEP; CBHSF.
II.1. Promotion of mul- tiple water usage	II.1.2. Overseeing hydro-environmental studies for multiple use dams and their operation in order to provide support for shipping and mitigation of prob- lems in the coastal zone, including the generation of artificial floods.	Ministry of Transport/AHSFRA; CBHSF; CHESF; CEMIG; NOS; ANEEL; State Water Resource Secretariats; Bahia State/SEPLANTEC; Municipal Administrations; NGOs; SENAF; FRANAVE.
	II.1.3. Supporting the recovery of ichthyofauna and the development of fisheries and aquaculture.	CODEVASF; CERAQUA (SF); INFOPESCA; COHIDRO (SE); Betume Irrigation District (DIB); Cotinguiba/Pindoba Irrigation District (DICOP); Propriá Irrigation District (DIPP); EMBRAPA; EMDAGRO; Fry Nurseries (public and private); Faculdade Pio X Col- lege; UFS; UFAL; IBAMA; Fishermen's, and Fish-Farmer Institutions; Instituto Xingó / CHESF; Municipal Administrations; State Secretariats of Agriculture (SE/AL), SEBRAE (SE/AL); CBHSF.
II.2. Conservation of	II.2.1. Supporting reforestation and preservation of remaining vegetation, erosion control, recovery of degraded areas and measures for point and non-point pollution control	RURALMINAS; EMATER (MG); CODEVASF; Municipal Administrations; State Secretariats of Environ- ment and Agriculture; Farmer representatives; CBHSF; NGOs.
water, soil and biodiversity	II.2.2. Establishing a conservation unit at the mouth of the São Francisco River, in its coastal zone.	Sergipe and Alagoas State Secretariats of Environment; Sergipe Federal University; UFAL; Bahia Federal University; SOS Velho Chico; CBHSF.
II.3. Access to environ- mental sanitation and measures for dealing with floods and droughts	II.3.1. Providing access to environmental sanitation in poor communities and preventive measures for flood-ing and drought control.	Ministry of the Environment/ Secretariat of Environmental Quality; Ministry of Health /FUNASA; CBHSF.
II.4. Sustainable use and protection of groundwater	II.4.1. Fostering adequate knowledge for the manage- ment, use and protection of aquifers in the Basin, and establishing guidelines for the sustainable utilization of the Bambuí and Urucuia aquifers.	State and Federal Universities; Research Institutions; Technical Schools; PETROBRAS; State water resource management entities; CBHSF.

## 6.3. Governmental Investments in the São Francisco River Basin

### 6.3.1. Federal and State Multi-year Action Plans (PPAs)

The scope of activities covered by the SAP is huge, and the number of Government actions and programs that may potentially relate to actions under the SAP is also extensive, involving various ministries, state entities, and local government offices, which could offer significant synergy with the SAP.

A detailed analysis of the cross-linkages among the federal Multi-year Action Plan (PPA) that affect the São Francisco River Basin is provided in Annex 4, showing that programs and actions that relate or converge with the SAP activities on the theme of integrated development of the Basin. The level of investment associated with these programs amounts to some R\$ 63.9 billion (about US\$ 21.3 billion) over four years.

A more detailed examination of the federal PPA indicates that about 154 federal programs or actions directly interface with proposed SAP actions. These amount to a total of around R\$ 9,166,824,860 (US\$ 3.06 billion) over four years. Some of this funding is earmarked for more general and comprehensive programs and actions, to be undertaken throughout Brazil. Though at least a part of this funding will be targeted toward the São Francisco River Basin, on the basis of currently available data, specific allocations for the Basin can not be determined. Of these 154 programs and actions, 67 can be categorized as clearly applicable to the São Francisco River Basin. These 67 programs and actions total R\$ 2,866,218,563 (US\$ 955.4 million) over four years. However, of this funding, a major portion is earmarked for implementation or management transfers of irrigation projects (R\$ 333,040,734 or about US\$ 111 million), and for studies, projects and engineering works associated with integrating the São Francisco River with other river basins in Northeast Brazil (R\$ 1,928,000,000 or US\$ 642.7 million). There are 23 actions that are more directly related to the revitalization of the Basin and water supply, totaling R\$ 605.2 million (US\$ 201.7 million) over a four-year period.

Brazilian projects that most directly interface with the goals of the SAP (Table 17) were selected from among this set of 23 programs, by the National Water Agency (ANA). These 23 programs total R\$ 88.5 million (US\$ 29.5 million), representing an average of R\$ 22.1 million per year (US\$ 7.37 million per year) to be disbursed under the 2004-2007 Multi-year Action Plan.

In parallel, CHESF expects to be making major investments in the São Francisco River Basin over the four-year period. Indeed, its plans to make use of hydroelectric potential at Sobradinho-Itaparica, alone, amount to some R\$ 3 billion (US\$ 1 billion).

It must, however, be stressed that this proposal is not specifically addressed in the federal Multi-year Action Plan (PPA) and that, in accordance with Brazilian law, concessions for the installation and operation of hydroelectric power plants must be awarded through auction, with the participation of the private sector.

Table 17. Selected PPA Programs with links to the SAP					
PPA Program 2004- 2007	Action	In Charge	Value 2004-2007		
1305. Revitalization of	<b>3429.</b> Revitalization and rehabilitation of the	MI	R\$ 289.5 million		
river basins in vulnerable	São Francisco River		US\$ 96.5 million		
situations and subject to	101P. Rehabilitation and preservation of the	N 1 N 1 A	R\$ 10.3 million		
	São Francisco River Basin	MMA	US\$ 3.4 million		
environmental degrada-	5472. Rehabilitation of soils and control of	CODEVASE	R\$ 70.0 million		
tion	erosion in the São Francisco River Basin	CODEVASE	US\$ 23.3 million		
0229. São Francisco	5859. Restoration of the shipping channel on	MT	R\$ 25.0 million		
Corridor	the São Francisco River Waterway		US\$ 8.3 million		
1304. Water conserva-	3042. Integrated Management of onshore		D¢ 0.9 million*		
tion, rational use and	activities in the São Francisco River Basin	MMA/ANA			
quality	(in partnership with GEF)		03\$ 0.27 minion		

 $^{\ast}$  Includes only GEF São Francisco Project coordination spending.

Aerial view of the Xingó Reservoir



Photo: Alain Dhomé

Other proposals, put forth by CHESF, amounting to R\$ 12.0 million (about US\$ 4 million), merit mention:

- Implementation of a real-time geo-referenced water resources-system between Morpará and the São Francisco River mouth;
- Restoration of riparian areas degraded by urban settlement or alterations in the flow of the São Francisco River;
- iii. Survey of water uses and registration of water users between Morpará and the river mouth;
- iv. Expansion and adaptation of sewage treatment systems in towns relocated after displacement by the creation of proposed new reservoirs;
- v. Feasibility studies on generation of artificial floods designed to restore morphological and environmental conditions within the main river-bed;
- vi. Reforestation of degraded areas and restoration of riparian forests; and
- vii. Restoration of ichthyofauna in the Lower-middle and Lower São Francisco River, including expansion of the capacity of the Fisheries Station at Paulo Afonso for producing fry of native-species for repopulating the river and reservoirs.

In the area of research and development, during 2004, CHESF is obliged by law to disburse some R\$ 40.0 million (about US\$ 13.3 million), of which half is to be invested directly by the company, and the other half credited to the Ministry of Science and Technology's National Science and Technology Development Fund (FDNCT/ MCT). A significant proportion of these funds may be allocated to project in the São Francisco River Basin.

The states that share the São Francisco River Basin also organize a series of programs. Although no definitive version of the state-level PPAs for the 2004-2007 period

#### Table 18. Investments foreseen in the São Francisco River Basin, by state, 2004-2007 State PPAs \*

STATE	R\$	US\$ (approximate)
Alagoas	477,758,000	159,252,667
Bahia	213,538,000	71,179,333
Federal District	264,074,000	88,024,667
Minas Gerais	563,231,000	187,743,667
Pernambuco	9,070,000	3,023,333
Sergipe	219,668,000	73,222,667
Goiás	(**)	(**)
Total	1,747,339,000	582,446,333

(\*) = In most cases, these sums include Federal transfers of funds. (\*\*) = No sizable investments planned for the Basin.

has yet been published or approved by their respective Legislative Assemblies, a summary of available information from states whose jurisdictions include lands within the São Francisco River Basin is presented in Table 18.

In terms of the amounts proposed in the state PPAs, it should be noted that a significant portion of these funds stems from federal transfers and, consequently, is already accounted for under the federal government programs noted above.

However, the data supplied by most of the states do not stipulate the sources of this funding, which makes it difficult to correctly estimate the allocation of state-funded investments planned for the Basin. Moreover, substantial proportions of the investments are earmarked for waterresources infrastructure that may not necessarily directly relate to the revitalization of the Basin or, consequently, be convergent with the actions set forth in the SAP. Notwithstanding, Table 18 indicates that sizable investments are planned for the Basin.

More detailed information on the state programs and projects is summarized, in the form of tables, in Annex 4.

### a) PPA 2004-2007 - State of Minas Gerais

Information provided by the Minas Gerais State Planning and Management Information System presents a range of actions with interfaces with implementation of the SAP in the São Francisco River Basin. Its principal component, Code 0172, is: Revitalization and sustainable development program for the São Francisco River Basin, targeted at ensuring the sustainability of anthropogenic activities in the Basin, listing high-priority actions designed to restore, conserve and preserve the environment, as well as enhance the quality and quantity of water supplies, and upgrade quality of life in the region.

Actions under this program, that have an interface with the SAP, are listed in Table 19, and total R\$ 58,386,661 (US\$ 19.5 million) for 2004, and R\$ 563,231,000 (US\$ 187.7 million) for the 2004-2007 period.



Irrigation in the São Francisco Valley

Table 19. PPA 2004-2007 for Minas Gerais			
Actions planned under the Revitalization and Sustainable Development	R\$	US\$ (approximate)	
Program of the Sau Francisco River Basin (0172)			
(P261) Technical and economic feasibility studies for implementation of			
a waterway in the São Francisco River Basin and its tributaries, in Minas	30,000,000	10,000,000	
Gerais.			
(P338) Environmental education.	4,000,000	1,333,333	
(P345) Generation, dissemination and transfer of knowledge and technology.	21,247,000	7,082,333	
(P449) Implementation of engineering works.	210,000,000	70,000,000	
(P577) Management of biodiversity and expansion of forestry in the São	7 000 000		
Francisco River Basin.	7,000,000	2,333,333	
(P632) Land management.	10,250,000	3,416,667	
(P659) Water quality management and monitoring of water pollution.	63,360,000	21,120,000	
(P661) Water resource management.	30,030,000	10,010,000	
(P718) Integrated sub-basin management.	40,000,000	13,333,333	
(P904) Control of sales and use of pesticides.	3,900,000	1,300,000	
(P910) Building of biodigesters.	3,000,000	1,000,000	
(P932) Treatment of urban effluents.	48,000,000	16,000,000	
(P941) Handling solid and liquid wastes produced by farming and livestock.	8,100,000	2,700,000	
(P445) Restoration of vegetation cover.	50,000,000	16,666,667	
(P664) Support for the establishment of Basin Committees and Basin Agen-	00 444 000	0.403.222	
cies.	28,444,000	9,481,333	
(P672) Expansion of the forestry base in the São Francisco River Basin.	4,500,000	1,500,000	
(P733) Consulting services for the River Basin Technical Councils.	1,400,000	466,667	
Total	563 231 000	187 743 667	

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### b) PPA 2004-2007 for Alagoas

The principal programs for the State of Alagoas are listed

in Table 20, and amount to R\$ 477,758,000 (about US\$ 159.2 million) for the 2004-2007 period.

Table 20. PPA 2004-2007 for Alagoas		
Planned Actions (Implementing Agency)	R\$	US\$ (approximate)
Strengthening of the São Francisco River Basin Committee (SEMAR- HN).	120,000	40,000
Environmental prevention, protection and restoration (SEMARHN/IMA).	90,000	30,000
Environmental education and capacity-building (SEMARHN).	161,000	53.667
Sertão canal (SEINFRA).	312,037,000	104,012,333
Small water-conservation projects in the semi-arid area and Sertão drylands (SEMARHN).	1,750,000	583,333
Drawing up of soil, water and vegetation management and conservation plans (SEMARHN).	1,000	333
Training of technical staff for combating desertification (SEMARHN).	26,000	8,667
Installation of sewage collection systems - São Francisco River Basin (SEINFRA).	163,573,000	54,524,333
Total	477,758,000	159,252,667



Fruits in the São Francisco Valley



Bridge linking Juazeiro - BA and Petrolina - PE

### c) PPA 2004-2007 for Pernambuco

The principal programs for Pernambuco are listed in Table 21, and amount to R\$ 2,830,000 (US\$ 0,94 million)

for 2004 and R $9,070,000 \ (about US <math display="inline"> 3.0 \ million)$  for the 2004-2007 period.

Table 21. PPA 2004-2007 for Pernambuco			
Planned Actions (Implementing Agency)	R\$	US\$	
Review/update Water-Resource Master Plans for tributary river basins of the São	2 400 000	800.000	
Francisco River.	2,400,000	800,000	
Prepare an integrated water resource usage plan for tributary river basins of the	1 200 000	422.222	
São Francisco River (PARH, São Francisco).	1,300,000	433,333	
Integrated hydro-meteorological network project for tributary river basins of the	000 000	200.000	
São Francisco River.	900,000	500,000	
Support for the establishment of the Pontal, Garças, Brígida and Terra Nova			
River Basin Committees, restructuring of the Moxotó and Pajeú River Basin	1,970,000	656,667	
Committees, and establishing Water Users Associations.			
Hydro-geological studies of the Araripe, Jatobá, Cedro, Mirandiba and Tupanaci	2,500,000	022.222	
sedimentary basins.		666,660	
Total	9,070,000	3,023,333	

### d) PPA 2004-2007 for Bahia

The principal water resources development programs for the State of Bahia are related to expanding the water supply systems and building of water mains to service the semi-arid region. These projects and actions comprise investments of some R\$ 73,198,000 (about US\$ 24.4 million) for 2004 and R\$ 213,538,000 (about US\$ 71.2 million) for the 2004-2007 period, as shown in Table 22 below.

Table 22. PPA 2004-2007 for Bahia			
Planned Actions (Implementing Agency)	R\$	US\$ (approximate)	
Program 204: 'Sanitation is Life': expansion and upgrading of the quality of service;			
Project 3919: Expansion of water supplies to the semi-arid region;	114,700,000	38,233,333	
Proágua/Activity 1529: Expansion of water supply systems in the Northeast.			
Idem, Activity 1758: Building water mains.	50,000,000	16,666,667	
Idem, Activity 1844: Development of institutional programs.	800,000	266,667	
Program 223: `Look to nature';	19 600 000	6 5 2 2 2 2 2 2	
Project 3505: Water resources management (PGRH).	19,000,000	ودو,ووو,٥	
Program 218: `Fruits of the Earth';			
Project 3917: Water Resources Management Infrastructure (PGRH)	1,400,000	466,667	
PGRH/Activity 2109: Dam operations in the Northeast.			
Program 222: 'Reviving our Waters' and 'Renaissance of Earth';			
Project 3363: Replanting riparian forests;	235,000	78,333	
Activity 1655: Technical Assistance for farmers on planting riparian forests.			
Idem, Activity 2178: Replanting riparian forests (SFC).	1,321,000	440,333	
Idem, Project 3629: Environmental sanitation of river basins;	2 ( 70, 000	1 22/ 222	
Activity 2552: Recovery of degraded areas in river basin in the Northeast.	5,679,000	1,220,333	
Idem, Activity 2552: Restoring degraded areas in river basins.	3,681,000	1,227,000	
Idem, Project 3646: Sustainable, integrated development of lands around the			
Sobradinho Lake;	2.8/ 0.000	052 222	
Activity 1871: Preparation of a study and project for the lands surrounding	2,860,000	932,225	
Sobradinho Lake.			
Idem, Activity 2093: Environmental monitoring around the Sobradinho Lake.	4,840,000	1,613,333	
Idem, Activity 2472: Community development for environmental and health	4 230 000	1 410 000	
education.	4,290,000	1,410,000	
Idem, Project 3743: Revitalization of the São Francisco River Basin;			
Activity 1829: Development of educational activities through	286,000	95,333	
community mobilization.			
Idem, Activity 2171: Drawing up an agreement on the restoration of riparian	286.000	95 333	
forests (SFC).		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Idem, Activity 2178: Restoration of riparian forests (SFC).	2,010,000	670,000	
Idem, Project 3896: Combating desertification;			
Activity 1873: Drawing up a plan for preventing and combating desertification	660,000	220,000	
in the Northeast region (SPA).			
Idem, Activity 3896: Preparation of a plan for preventing and combating de-	440,000	146,667	
sertification in the Lower-middle São Francisco River region (SPA).	,	,	
Program 226: Environmental awareness;			
Project 3654: Environmental education;	1.830.000	610.000	
Activity 2171: Agreement on capacity-building for extension agents in the São	_/~~~/~~~	010/000	
Francisco River Basin.			
Program 234: Public administration models;			
Project 3656: Institutional strengthening for entities within the State			
Environment and Water Resources System;	680,000	226,667	
Activity 1565: Support for the Water Resources and Environment Councils with			
a view to strengthening these bodies.			
Total	213,538,000	71,179,333	

### e) PPA 2004-2007 for Sergipe

Similar to Bahia State, the principal water resource programs in the State of Sergipe relate to water supplies, and building water mains and irrigation projects in the semi-arid region. Together, these programs amount to R\$ 219,668,000 (about US\$ 73.2 million) for the 2004-2007 period, as listed in Table 23.

Table 23. PPA 2004-2007 for Sergipe		
Planned Actions	R\$	US\$ (approximate)
Integrated solid waste systems for the Districts in the Costa dos Coqueirais Complex	11,928,000	3,976,000
Urbanization of the Salomé Lagoon, Cedro de São João	1,325,000	441,667
Jacaré-Curituba Project	22,000,000	7,333,333
Xingó Canal	90,000,000	30,000,000
Supplementary studies of water availability in river basins in Sergipe	6,000*	2,000
Support for organization of bulk water users in the river basins of the State	6,000*	2,000
Revitalization of river basins	100,000*	33,333
Support for River Basin Committees	6,000*	2,000
'Our Rivers Program': São Francisco	200,000	66,667
Preparation of a Master Plan for the São Francisco River Basin, Sergipe Section	40,000	13,333
Supplementary social and economic feasibility studies for upgrading, auto- mating and extending the integrated water mains systems at Alto Sertão and Sertaneja	50,000	16,667
Preparation of the State water infrastructure rehabilitation plan	6,000*	2,000
State water resource management capacity-building plan	50,000*	16,667
Implementation of the State water resources information system	50,000*	16,667
Decentralized action in support of water resources management by citizens	50,000*	16,667
Implementation of the water-quality and hydro-meteorological network in Sergipe	84,000*	28,000
Updating and supplementing the Sergipe State Cartographic Base at a scale of 1:100,000	84,000*	28,000
Preparation of the Digital Atlas on Water Resources	9,000*	3,000
Upgrading, automating and expanding integrated water mains systems at Alto Sertão and Sertaneja	75,000,000	25,000,000
Preparation of Ecological and Economic Zoning for Sergipe	30,000*	10,000
Recovery of degraded areas and riparian forests in the Jacaré and Cadoz River sub-basins	632,000	210,667
Expanding integrated water mains systems at Alto Sertão and Sertaneja	8,637,000	2,879,000
Replacing the water mains system of the São Francisco River	7,621,000	2,540,333
Purchase of equipment for operating system automation	656,000*	218,667
Boring and establishing wells	123,000*	41,000
Establishing irrigation perimeters	500,000*	166,667
Maintaining irrigation perimeters	475,000*	158,333
Total	219,668,000	73,222,667

(\*) sums estimated for investment in the São Francisco River Basin.

### f) PPA 2004-2007 for the Federal District

listed in Table 24. These programs amount to some R\$ 264,074,000 (about US\$ 88 million) for the 2004-2007 period.

The principal PPA programs for the Federal District are

Table 24. PPA 2004-2007 for the Federal District		
Planned Actions	R\$	US\$ (approximate)
Water Resource Management	265,000	88,333
City 21 Program	50,000	16,667
Establishment of the District Water Agency	375,000	125,000
Restoration of degraded areas	246,750,000	82,250,000
District Environmental Protection Plan	8,625,000	2,875,000
Federal District Ecotourism Project	30,000	10,000
Procurement of equipment for strengthening water resource and environmental licensing, oversight and inspections	100,000	33,333
Strengthening of the Water Resource Management Policy	6,625,000	2,208,333
Strengthening and restructuring of the water resource and environmental licensing, oversight and inspection systems	100,000	33,333
Implementation of the water source protection program	150,000	50,000
Implementation of the River Basin Restoration and Stewardship Program	50,000	16,667
Reforestation with native plants	7,000	2,333
Modernization of the hydro-meteorological network in the Federal District	255,000	85,000
Mapping of ecosystems	7,000	2,333
Environmental Information System	525,000	175,000
Maintenance of the Water Resources and Environmental Information System, and the geo- referenced database	60,000	20,000
Ecological and economic zoning	100,000	33,333
Total	264,074,000	88,024,667

Aerial view – São Francisco River

#### g) PPA 2004-2007 for Goiás

There are no significant investments planned in Goiás State for the areas included in the São Francisco River Basin.

### 6.3.2. Investment Requirements within the Context of the Basin Plan

Certain test scenarios were prepared and, for items rated as crucial for the drafting of a Basin Plan, information relating to preliminary estimates was assessed with a view to providing a relatively detailed overview of current concerns in the Basin that must be addressed by new or planned investments.

Studies carried out to underpin the preliminary investment schedules provide a relatively clear overview of some of the most important sections to be included in the Basin Plan. In the light of these preliminary elements it is believed that the São Francisco River Basin Committee (CBHSF), with fairly minor efforts, will successfully complete the Basin Planning process, thereby obtaining the necessary information and data management capabilities needed to keep the work on schedule.

When the Technical Work Group (established by CBHSF Plenary Decision No. 3 of October 3, 2003), began its activities, it was felt that this information could contribute greatly to speeding up the proceedings, by providing significant input and assisting in assigning roles in accordance with the SAP and the Basin Plan, thereby paving the way for discussions and analyses of proposals.

### Description of the principal actions in the preliminary draft of the Basin Plan

Some of the principal actions proposed under the Water Resources Works and Services Component are described briefly below, with cost estimates of the more important items.

It should be underscored that the main purpose of this section, in the context of the SAP, is to provide a preview of current water resources development and management proposals in the Basin, without concern for ranking sectoral priorities, the most pressing needs, or the availability of funding.

### Water Resources Works and Services Component

**Regularization of flow-rates, multiple use and flood control:** There are numerous studies for engineering works to regularize flow-rates and provide flood control along the São Francisco River and its tributaries.

The study, entitled "Technical consulting and support services for meeting the needs of CODEVASF in terms of preliminary water supply systems for multiple uses in the São Francisco River Basin and the semi-arid region of Northeast Brazil," assigns high priority to the building of ten reservoirs, at a total cost of US\$ 666.67 million, that would result in an increase of the flow at Sobradinho by some 46.7 m<sup>3</sup>/s. These reservoirs, to be located on tributaries of the São Francisco River in Minas Gerais State, would permit an increase of the order of 216 m<sup>3</sup>/s of water to meet demands for irrigation. However, as the title of the study shows, research is still at a preliminary phase and such measures must be subject to further reflection and review during the drafting of the Basin Plan.
This activity also includes the implementation of irrigation projects. Countless studies have been carried out, including those by PLIRHINE and PLANVASF. More recently, the technical studies commissioned by CODEVASF have targeted the need for preliminary studies on primary water supply systems for multiple uses in the São Francisco River Basin and the Semi-Arid Region of Northeast Brazil.

According to the CODEVASF study, the irrigated area in the Basin today covers some 342,712 hectares. Studies and projects already envisaged extend this area to some 800,000 hectares. Abstractions of water to serve this larger irrigated area could have impacts upon the availability of water for electric power generation and navigation activities.

In order to meet increased demands for water due to the expansion of the irrigated area, the CODEVASF study proposes the building of ten reservoirs on tributaries of the São Francisco River and six on the main river, in addition to using water from the spillways of the Furnas hydroelectric plant, and the diversion of water from the Rio Grande Basin to the São Francisco River Basin.

The current irrigation projects in the Basin can be classed as both public and private. Public projects are limited to areas under the technical and administrative responsibility of government entities; whereas private projects are those implemented by private enterprise, at times supported by public loans and subsidies.

In this field, it is important to concentrate efforts on completing public projects that are already underway. However, future irrigation projects should include measures to minimize water consumption through replacing outdated irrigation techniques with other, more modern and efficient alternatives.

Current studies need to be subjected to critical analysis and, from the multiple-use standpoint, those that are most likely to foster regional development should be



Photo: Alain Dhome

Barges on the São Francisco River

selected and moved toward completion. Such analyses should also weigh the positive and negative impacts of building a dam, and assess its cumulative effects on the river system as a whole.

**Upgrading navigability in the Basin:** The São Francisco River and its main tributaries have been proposed as the focus for a new, multi-modal transport corridor for fostering economic development of the region.

To this end, it will be necessary to maintain water levels within the river, as the study conducted by FUNDESPA on the stretch between Ibotirama and Juazeiro has demonstrated. The top priority measures include:

- Rock removal at 51 locations where rock formations impede flows along a 40 km reach of the São Francisco River between Sobradinho and Juazeiro/Petrolina, in order to ensure a minimum draught of 1.5 m and an active channel width of 100 m, at an estimated cost of US\$ 2.4 million;
- Procurement, equipping, deployment, and operation of a hydrographic vessel for the periodic production of digitized shipping charts for the stretch between Ibotirama and Picão Arcado, at an estimated cost of US\$ 200,000;
- Establishment of a test site for work on stabilizing embankments and regulating the course of the river on the stretch upstream from the Sobradinho Reservoir, at an estimated cost of US\$ 6 million;
- Enhancement of shipping operations utilizing the fleet currently available on the waterway;
- Chartering the fleet owned by the Companhia de Navegação do São Francisco (FRANAVE), with a view to effecting investments needed for its modernization.

It is estimated that it would take five years to implement these measures. The sums needed to implement the first two measures (rock clearance and procurement of a vessel) are estimated at R\$ 25.9 million (about US\$ 8.6 million), while the other measures still need to be submitted to more detailed cost analysis.

**Erosion and siltation control:** The proposed erosion and siltation control measures for the Upper São Francisco region are targeted at identifying the critical areas within the Basin where the loss of soil contributes to erosion and sedimentation problems in the Basin. Through simulations, based on mathematical models and field questionnaires, the most appropriate conservation practices for mitigating current erosion can be identified, taking local, social and economic conditions into account.

Similarly, mining areas where erosion control is needed should be identified, and appropriate methods for controlling soil loss, and the estimated costs of mitigating these problems, should be developed. For projects that have already been prepared, this activity can channel the funding required to underwrite the implementation of appropriate measures.

Another approach to this action that could be adopted, in parallel, entails competitive funding. The concept of competitive funding implies that there are no fixed rules for allocating funds among the various proposals and projects, and no pre-defined percentages are earmarked for each of them. Rather, funding would be approved on an annual basis, depending on the progress of the project and guidelines/performance standards approved annually by the Program Coordinators. Disbursements would be effected by order of presentation of eligible projects; i.e., those that best meet the pre-defined eligibility criteria.

For the preliminary Basin Plan, (Table 25) an estimated budget of US\$ 700,000 was set for projects, and US\$ 20 million was allocated for erosion and siltation control works and services. Among the most relevant projects is the preparation of an Erosion Prevention and Sediment Containment Program for the Upper Velhas and Paraopeba River Basins, estimated to cost about US\$ 450,000.

Aerial view of the São Francisco River

Development and implementation of measures for the protection and restoration of ichthyofauna and biodiversity: The São Francisco River Basin once teemed with fish, both in its upper and lower courses, and provided its residents with food while attracting many sports fishermen. However, as the impacts of alterations triggered by human occupation have expanded, fish stocks have declined and biodiversity has dwindled, resulting in the virtual elimination of traditional fisheries as a livelihood.

One of the core properties of Nature, biodiversity, ensures the balance and stability of ecosystems while, at the same time, provides a potential source of economic benefit. It is the basis of agriculture, livestock raising, fisheries and forestry, and underpins the strategic biotechnology industry. It is the driving force behind the natural processes that ensure the bounty of ecosystems and the myriad species that provide support for other life forms, thereby modifying the biosphere and making it suitable and safe for life.

Quite apart from its intrinsic value, biological diversity has ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values. In view of its overwhelming importance, biodiversity must be preserved, in face of the following threats:

- Habitat fragmentation and loss;
- Introduction of exotic species and diseases;
- Over-exploitation of plant and animal species;
- Use of hybrids and single-crop plantations by agribusiness and reforestation programs;
- Contamination of the soil, water and air by pollutants; and
- Climate change and variability.

Building dams and artificial lakes produces a complex series of impacts that affect the chemical, physical and biological components of the original natural environment. The degree of impact on biological diversity will vary according to characteristics of local wildlife, the location of a dam in relation to population distribution in the surrounding area, the morphometry of the Basin, the existence of other dams upstream, the design of the dam, and operating procedures at the power plant.

With respect to the impacts of building hydroelectric dams, in accordance with the provisions of Decree Law 221 of 28 February, 1967, stocking reservoirs with fish and building fish-ladders for migratory species has been recommended. On the other hand, specific legislation for the protection of Brazil's biodiversity foresees that larvae and fry introduced must have the same genetic characteristics as local wild populations. This means that larvae and fry produced in isolation on fish farms by selective breeding techniques are not regarded as suitable for stocking such reservoirs.

Notwithstanding, the results of fish-stocking initiatives have not always been satisfactory. One inevitable result has been alterations in the mix of aquatic fauna in local populations and, whereas some species proliferate excessively, other populations shrink, or even become extinct at the local level.

To an extent, this shift in species composition is consistent with the change in habitat from a lotic, flowing water system to a lentic, static water system in the impounded lake. Thus, in order to develop a more effective ichthyofauna and biodiversity recovery and preservation program, it is necessary to know what stocks are to be found in the various habitats (both natural and modified), and to develop an approach that maintains a balance between conservation and the sustainable use of biological resources, while taking into account the lifestyles of local communities.

In several parts of the world, the management of fish stocks has powerful social, economic and environmental appeal, both within the context of conserving biodiversity, and for the maintenance and expansion of catches. Fish stocks stewardship programs should include the establishment of protective off-seasons, definition of catch quotas, standardization of types of fishing equipment allowed, revitalization of spawning and nursery areas, enhancing of natural environments and recovery of degraded areas, in parallel with environmental education.

These are concerns to be addressed during the preparation phase of the Basin Plan. However, during preparation of the SAP this theme received little emphasis and, thus, for the purposes of estimating costs of the Basin Plan, a minimum investment of US\$ 1 million was proposed for this program component.

Technical and financial assistance to municipalities for sustainable management of urban and rural land: Although average erosion rates in the São Francisco River Basin are not very high, some areas are subject to rampant erosion, with significant social, economic and environmental impacts. Such erosion occurs on steeply-sloping, easily-degradable soils, and where improper land management and patterns of use exist. These areas are particularly prevalent in the Greater Belo Horizonte and Abaeté Valley regions in Minas Gerais, as well as around the Sobradinho Reservoir in Bahia, and in the Pajeú River valley in Pernambuco.

Aside from soil losses occurring at a rate of over thirty tons/hectare/year, that jeopardize the sustainability of agricultural outputs in these areas, this level of erosion produces large amounts of sediment that cause siltation in the downstream reservoirs.

The entire São Francisco River Basin bears marks of the hand of man, be it through rural activities such as farming and livestock-raising, or through the spread of human settlements and the expansion of towns. In general, human settlements and economic activities have tended to spring up near water-courses, and have resulted in significant alterations to the landscape and removal of native vegetation. Burgeoning problems of point and non-point source pollution associated with these activities have had adverse effects on water resources throughout the Basin. Foremost among these problems are siltation of soils lost due to improper land use, pollution by urban and rural wastewaters (sewage) and agrochemicals, and eutrophication caused by runoff from intensive farming and livestockraising activities. These impacts have, in turn, adversely affected water quality in the Basin, resulting in the spread of disease, plummeting fish catches and a decrease in the biodiversity of ichthyofauna, higher water-treatment costs and a shortening of the useful life of dams.

In larger towns, the municipal authorities have frequently had to deal with flooding during periods of heavy rainfall, exacerbated by poor urban drainage, and with the consequent high rates of waterborne diseases associated with contaminated flood waters.

It is these same mayors' offices that are responsible for regulating settlement patterns and land use, with a view to ensuring sustainable management of urban and rural land. Consequently, all initiatives relating to access to land and facilitating urban and rural land tenure are of significant interest to them, as are also questions relating to environmental zoning, biodiversity conservation, restoration of micro-basins and the establishment and expansion of conservation units, and other specific proposals targeted at solving problems in each district, on a case-by-case basis. The promotion of sustainable agriculture and control over the use of agrochemicals, environmental restoration of headwaters and springs and of water-courses and areas where aquifers are replenished, restoration and conservation of vegetation, are also rated as important activities.

However, frequently, municipalities are poorly prepared to deal with these issues owing either to a lack of funds or a shortage of professional skills. They tend not to have a broader overall appreciation of issues that relate to the Basin as a whole and need guidance in fulfilling their duties with respect to land use and settlement patterns within the scope of the larger landscape.

In view of these limitations, these concerns must be addressed in the Basin Plan. However, during preparation of the SAP this theme received little emphasis and, once again, for the purposes of estimating costs of the Basin Plan, a minimum investment of US\$ 1 million was proposed for this program component.

## Environmental Sanitation Works and Services Component

Engineering works and projects for ensuring

**universal access to safe water supplies:** Providing access to high quality water for human consumption in urban and rural communities, with a view to improving coverage rates and achieving universal access in the near future, has been a high priority in the Basin. According to

the census, in 2000, the total population of the São Francisco River Basin was 14,017,822, of which the urban population comprised 10,240,341.

Consequently, the populations of the 503 in Table 4 p. 35 municipalities in the Basin were considered in the planning and delivery of sanitation works and services. The Federal District was not included in this survey since its urban communities make no significant demands upon the waters of the São Francisco River Basin. Likewise, small towns that make only limited demands on the water resources of the Basin, or whose municipal seats are located outside the Basin, were also not included. Municipalities partially located within the Basin were considered, regardless of the location of their municipal seats.

In evaluating the water-supply status of these communities, and to establish priority rating criteria, indicators such as the Human Development Index (HDI) and cover-



Aerial view over the São Francisco Valley

age rates were used. In this assessment, urban populations not served by water-distribution networks, and of rural populations that could potentially be reached by simple water supply systems, were estimated. Based upon this survey, some 14% of the urban population of the Basin, or some 1.4 million people, was considered to lack access to treated water supply.

To estimate the investment needed for the provision of water supply throughout the Basin, a model known as "Sizing of investment requirements for universal access to water supply, sewage collection and treatment services in Brazil," developed by the National Secretariat of Environmental Sanitation of the Ministry of Cities, was adopted. This management instrument, developed in May 2003, aims to provide public managers with guidelines for drawing up and implementing sanitation policies at the national level.

The model analyzes the sum total of investments needed to ensure availability of supply as well as the costs of expanding and refurbishing distribution systems in the São Francisco River Basin, in order to achieve universal access, on a year by year basis. Consequently, the sums presented represent the cumulative sum required over a twenty-year period.

These costs are estimated at US\$ 1.7 billion, and can be broken down in terms of serving urban and rural communities; system components (catchment and distribution); or type of investment (expansion and replacement).

Deployment of the actions could initially be targeted at municipalities with HDI ratings of under 0.60, and water-supply coverage rates of less than 80%; however, the guidelines provided by the Ministry of Cities are designed to provide universal access to water supply services within a twenty-year period. Population-growth estimates for the Basin over this period foresee a total population of seventeen million, and a projected urban population of fifteen million. Projects and engineering works to improve urban sewage and industrial wastewater collection and treatment levels: The control of water pollution and expansion of access to sewage collection and treatment services in urban and rural communities is focused on upgrading their respective HDI indicators and attaining universal access to sanitation services.

An assessment of the proportion of the urban population not served by sewage collection and treatment networks, and of the total rural population that could potentially be serviced by simple sewerage systems, indicated that some 73% of the urban population of the Basin, or roughly 7 million people, has no access to sewage collection facilities. With respect to sewage treatment, only 3% of the total volume of sewage collected receives any form of treatment, according to data for the year 2000.

According to estimates from the National Water Agency (ANA), 50% of the urban population of the Basin lives in fifteen municipalities with populations of over 100,000, nine of which are located in the Velhas and Paraopeba sub-basins, the region that includes the Belo Horizonte Metropolitan Region.

The Belo Horizonte Metropolitan Region (BHMR) discharges the largest volumes of sewage into the Basin, but the volumes discharged into the Rio Grande sub-basin, including those of the town of Montes Claros, located close to its headwaters, are also significant.

According to recent data from the Minas Gerais State Sanitation Utility (Companhia de Saneamento de Minas Gerais - COPASA-MG), the Arrudas Sewage Treatment Station (ETE) currently services wastes generated by a population of 1.8 million individuals. When the Onça Sewage Treatment Station goes into operation, a total of 3 million people will benefit from treatment of the sewage and wastewater effluents generated in the cities of Belo Horizonte and Contagem.

Source of the São Francisco River - Serra da Canastra

In order to assess the status of sewage collection and treatment in the 15 largest communities, and to establish priorities for actions, indicators such as HDI and coverage ratings were used. Similar to the objectives established for water supply, the target is to attain universal access to sewerage services in twenty years. In order to estimate the investments required for installing universal sewage collection and treatment services, the model developed by the National Secretariat of Environmental Sanitation of the Ministry of Cities was adopted.

This model estimates the investments required for sewage collection and treatment in the São Francisco River Basin with a view to attaining universal access, on a year by year basis. Consequently, these figures represent the cumulative amount over a twenty-year period.

With respect to industrial wastewaters, it is significant that the largest-scale industrial activities in the São Francisco River Basin take place in the Rio das Velhas sub-basin. According to a study carried out under the Environmental Sanitation Program for the Arrudas and Onça Stream Basins (PROSAM), there are some 3,125 industrial plants in the area, of which 1,576 are classified as being potentially polluting.

Solutions for treating these industrial wastewaters could be implemented, either by connecting them to the public sewage-collection network, thus allowing the costs to be born along with those of treating urban sewage, or by means of installation of treatment systems by the companies themselves.

The cost of providing wastewater treatment to both domestic households and industries in the Basin has been estimated at US\$ 2.7 billion. This can be broken down according to the type of rural or urban community served, the type of system (collection or treatment), and the type of investment (expansion and replacement). Funding already allocated, such as those sums relating to the installation of the Arrudas and Onça Sewage Treatment Stations, are estimated at around US\$ 150 million, and should be deducted from this total.

Initially, implementation of this action could be targeted at municipalities where the problem of wastewaters has not been tackled. In particular need of such actions are municipalities in the Belo Horizonte Metropolitan Region not covered by the PROSAM, in addition to 36 towns with populations of over 100,000, located within the Basin. Among these municipalities with populations of over 100,000 are: Sete Lagoas, Santa Luzia, Sabará, Ribeirão das Neves, Divinópolis, Betim and Montes Claros, all in Minas Gerais; Petrolina, in Pernambuco; Barreiras, in Bahia; and Arapiraca, in Alagoas.

Projects and engineering works for upgrading the collection and final disposal of solid urban wastes: The overall goal is to implement pollution controls through upgrading urban garbage collection services, eliminating garbage dumps and establishing sanitary landfills. An assessment was made of the urban population not served by garbage collection facilities, and of the current status of facilities for final disposal of solid wastes.

It is significant that only 37% of households in the São Francisco River Basin enjoy urban cleaning services or garbage collection ratings of more than 90%, and that some 20% of the urban population in the Basin is in need of improved services in order that universal access to garbage collection facilities can be attained. Data analyzed under the National Basic Sanitation Survey (PNSB) indicate that 90% of districts in the Basin dispose of their solid wastes through garbage dumps. It is noteworthy that the issue of urban garbage has almost been resolved in the municipalities of Belo Horizonte, Contagem and Betim.

The principal actions proposed to address this concern are expansion and replacement of collection equipment and vehicle fleets, shutting down of garbage dumps in municipalities with populations under 100,000, and the



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establishment of sanitary landfills in municipalities with populations under 1.5 million.

In order to assess the required upgrades in garbage collection services, the elimination of garbage dumps and the establishment of sanitary landfills in municipalities in the Basin, the National Basic Sanitation Survey (PNSB) diagnostic methodology was used, as well as an analysis drawn up by the Secretariat of Environmental Quality of the Ministry of Environment (MMA) entitled: "Estimated investment shortfalls for garbage collection equipment, elimination of garbage dumps and infrastructure for establishing sanitary landfills in Brazil," dated February 2003.

The cost of actions associated with achieving this goal has been estimated at US\$ 137 million, over a ten-year period.

The actions rated as highest priority should take social indicators into consideration, as well as the spatial distribution of municipalities within the Basin. On-site diagnoses will also be necessary to assess the most critical solid-waste dumps and their proximity to water sources. Initial implementation of these actions could focus on 77 municipalities with a garbage collection coverage rates of less than 70% and urban communities with less than 10,000 population.

**Environmental restoration of areas affected by mining:** The environmental impacts of mining operations on the water resources of the São Francisco River Basin are most evident in areas where mining is most prominent, namely the Rio das Velhas sub-basin. This area concentrates a number of mining operations, while also providing a significant portion of the water supply for the Belo Horizonte Metropolitan Region.

Mining in this region consists, mainly of iron ore extraction in what is known as the Iron-Bearing Quadrilateral, the geological characteristics of which support numerous aquifers that are the source and headwaters of the Upper Rio das Velhas.

Another significant mining area is the Upper Paraopeba River sub-basin, that lies alongside the Rio das Velhas Basin, where similar land-use patterns and mining activities take place. The Paraopeba River is of special significance within the context of the Upper São Francisco River Basin, since it runs through the Belo Horizonte Metropolitan Region and, in addition to serving as a source for public water supply for various municipalities, it also receives significant discharges of solid wastes from countless small-scale mining operations. These solids are subsequently deposited downstream in the reservoir behind the Três Marias hydroelectric dam.

In addition to the iron ore found in the Quadrilateral Region, the São Francisco River Basin also encompasses significant deposits of various metal ores such as zinc and copper, quarries for such industrial materials as limestone and quartzite, and materials used in construction such as slate and ceramic clays, as well as countless pits where sand is extracted for use by the construction industry.

To provide a complete assessment of this scenario, it is vital that a general database on mining activities be established, as these activities have a direct bearing upon the development of soil and water-use planning studies.

These efforts could result in the preparation of an Environmental Action Plan, focused on promoting environmental recovery studies in areas degraded by mining. This would provide guidelines and proposals for a set of environmental projects aimed at fostering preservation of water resources and promoting sustainable development of the Basin. Although the principal focus of these actions is the Rio das Velhas and Paraopeba sub-basins, they should also seek to expand knowledge on the effects of mining in other parts of the São Francisco River Basin.

This being the case, the Environmental Action Plan should include:

- Definition of a hydro-geological model and the technical bases for a Management Plan for the Aquifer System of the Upper Velhas and Paraopeba Rivers US\$ 880,000.
- Expansion of the Water Quantity and Quality Monitoring Network for the Upper Rio das Velhas Basin – US\$ 750,000.
- Preparation of Mining Damage Assessment and Evaluation of Adverse Effects on Water Resources in the Upper Velhas and Paraopeba Rivers – US\$ 920,000.
- Preparation of the Environmental Zoning for the Upper Velhas and Paraopeba River Basins – US\$ 650,000.
- Preparation of a Media, Awareness-building and Socioenvironmental Education Program for the Upper Rio das Velhas region – US\$ 350,000.
- Expansion of the mining database for the São Francisco River Basin to include an Assessment of the Effects of

Mining on Water Resources in the Principal Mining Districts – US\$ 930,000.

The preparation of these six studies, as essential components of an Environmental Action Plan within the overall Basin Plan, will require funding in the amount of US\$ 4,480,000. Note that the control of erosion and siltation associated with mining activities is covered under the Water Resources Works and Services Component. This action foresees the preparation of an erosion prevention and siltation containment program for the Upper Velhas and Paraopeba River Basins which, alongside other projects, may compete competitively for project funding totaling US\$ 700,000, and for funding for services and works totaling US\$ 20 million.

In the future, when drawing up the Basin Plan under the aegis of a Technical Group to be established by the National Water Agency (ANA) in partnership with the São Francisco River Basin Committee (CBHSF) and representatives of the States, these actions should be subjected to a fresh assessment, with a view to studying the possibility of grouping them into a single action, in the light of the high degree of interdependence among them.

The National Water Agency (ANA) has devoted considerable effort to the preliminary structure of the Basin Plan during the preparation phase of the SAP. These efforts led to the preparation of a Table illustrating current liabilities in the São Francisco River Basin, in terms of demands for investments in water resources.

Table 25 provides estimates of the investment requirements based on the evaluations presented above, indicating total liabilities in the Basin of around US\$ 5.3 billion. It should be stressed that the most costly investments (in water supply and sewage) are spread over a 20-year implementation period.

It should be stressed that these estimates are based on numerous assumptions and scenarios that have yet to

Table 25. Investment Requirements for the São Francisco River Basin over the next 20 years	
Component/Action	US\$
Water Resources Services and Works Component	698,000,000
Regularization of flow-rates, multiple uses and flood control*	666,667,000
Upgrading navigability in the Basin	8,633,000
Erosion and siltation control	20,700,000
Technical and financial assistance to municipalities for sustainable management of urban and rural lands	1,000,000
Development and implementation of ichthyofauna and biodiversity preservation and rehabilitation strategies	1,000,000
Environmental Sanitation Works and Services Component	4,602,132,658
Projects and works for universal access to water supply **	1,734,226,200
Projects and works for upgrading urban and industrial garbage collection and sewage treatment **	2,726,412,410
Projects and works for upgrading collection and final disposal of urban solid wastes	137,014,048
Environmental recovery of areas degraded by mining	4,480,000
Total for Works and Services Component US\$	5,300,132,658

Notes: Capital investments (in water supply and sewerage services) are scheduled for implementation over twenty years.

(\*) CODEVASF

(\*\*) Ministry of Cities

take into account sector-specific priorities and strategic options that may be pursued at the regional and state levels. Likewise, they do not take into consideration either the ranking of needs or the availability of funding. Nonetheless, this exercise constitutes a valid approach, in that it provides an initial overview of the scope of existing liabilities, in terms of the need for investments in water resources. Consequently, these estimates illustrate what could be characterized as a 'desirable' investment scenario.

Comparing this estimate with budgetary allocations of the Brazilian Federal Government, and those earmarked by the States in their annual budgets, and with the potential revenues that could be raised through the introduction of water-use charges, a general overview of difference between what is 'desirable' and what is 'executable' emerges, making it possible to determine selection criteria and priority ratings for actions to be carried out within the scope of the São Francisco River Basin Committee (CBHSF). On the basis of such priority ratings, the São Francisco River Basin Committee (CBHSF) would be in a better position to structure the Basin Plan and its investment program, prior to submitting its requirements to financial agents for funding.

Based upon data from the Multi-year Action Plan (PPA) for 2004-2007, Table 26 indicates that the investment capacity of the Brazilian Government to meet the investment needs in the São Francisco River Basin, through programs focusing upon issues relating to water resources, sanitation and environment, could amount to US\$ 412 million over a four-year period; i.e., US\$ 103 million per year.

Assuming that estimated liabilities in the Basin amount to a total of US\$ 5.3 billion over twenty years (see Table 25), equivalent to an average of US\$ 265 million per year, it would appear that there is an investment shortfall of around US\$ 160 million per year.

Table 26. Estimated investment capacity of the Federal Government in the São Francisco River Basin			
Dreamer/Actions DDA 2004 2007	Planned Amounts		UC¢ million/voor
Programs/Actions - PPA 2004-2007	R\$ million	US\$ million	- US\$ million/year
Programs relating to water resources *	630.1	210.0	52.5
Programs for revitalizing the São Francisco River **	605.2	201.7	50.4
Total	1,235.3	411.7	102.9

(\*) Estimate for the São Francisco River Basin, based on 10% of the total sums foreseen for all PPA programs/actions relating to water resources, sanitation and environment. (\*\*) Revitalization actions in the Basin and water supply in the semi-arid region.

Note: Estimates do not include the PPA funding earmarked for works and studies relating to inter-basin transfers, nor the implementation or transfer of irrigation perimeters.

Preparation and approval of the Basin Plan by the São Francisco River Basin Committee (CBHSF), through ample public discussion, will result in greater public and political backing for the investment program, thereby increasing the likelihood of its inclusion in future Multiyear Action Plans (PPAs). Moreover, the establishment of the Basin Water Agency and instituting of water-use charges will increase the amount of funding available, closing the gap between estimated income and envisioned expenditures.

### 6.4. Risks and Sustainability

All planning must be accompanied by caveats since forecasting the future is fraught with hazards. In the face of such uncertainties, planners must be bold in their reliance upon projections, while having the prudence to monitor the results over time so as to enable adjustments to be made as the course of events may justify over time.

Management initiatives also will develop over time. No matter how appropriate projected and implemented systems may seem at the time, they will inevitably have to be adjusted as they progress, as new situations arise, and as basic assumptions are challenged. As uncertainties are clarified or discarded, others are identified through an ongoing and dynamic process of management.

Notwithstanding, at this stage, it is already possible to identify some of the potential risks, along with the essential conditions necessary to underpin the sustainability of the SAP, based on the opinions of specialists and the conclusions of countless meetings involving the inputs of numerous stakeholders from throughout the Basin.

Risks do indeed exist. However, the proposed actions provide a means of establishing foundations for the economic sustainability of activities targeted at certain critical regions in the Basin, while at the same time imbuing them with social sustainability. This entails developing mechanisms for ensuring the delivery of high-quality water supplies to the poorest communities, through rational and environmentally-sustainable water and land resource management activities. The associated programs also heighten awareness of the importance of water, and the rational use of water resources, with a view to improving the living conditions of local communities. This awareness is bolstered by a collective vision of the Basin as a whole, including the entire system from headwaters to estuary.

The major risks, along with means of mitigating them, are presented below, with remarks on sustainability of the SAP.

#### 6.4.1. Risks

- Inter-institutional Competition. There are powerful vested interests at stake among water users, and deep-rooted cultural hurdles that must be overcome in order to achieve compliance with the provisions of Law 9.433/97. Awareness-building and educational approaches must be adopted, and it will take time for the new rules to be assimilated. The legal framework exists, but compliance will not occur automatically. The strategic action that is targeted at strengthening institutional linkages and networking foresees activities designed to help minimize this risk.
- Dependence upon sector-specific economic performance. Most of the actions focus directly or indirectly upon the principal economic activities pursued throughout much of the Basin; i.e., farming and livestock raising. If these segments of the local economy do not perform well, there will be stumbling-blocks that may hamper the achievement of objectives, since many stakeholders will find it hard to undergo a transition to other forms of sustainable activities. SAP activities targeted at facilitating interactions among sectorspecific policies, and fostering rational use of irrigation water, will certainly mitigate this risk.
- Poorly defined institutional and legal frameworks in the sanitation sector. The regulations

that govern the sanitation sector have yet to be properly established. Though Bills providing the new legal framework for the water-resources sector are before the National Congress, in the absence of legislative action on these initiatives, it has not been possible to establish cost-sharing arrangements whereby private companies, NGOs and the various levels of government can participate jointly in investments in wastewater collection and treatment, with a view to stopping or reducing the discharge of untreated sewage into water bodies. Stakeholders are lobbying political leaders to approve this Bill. Activities designed to 'develop measures for controlling point and non-point pollution will strengthen these efforts.

- Awakening environmental awareness. The environmental dimension has yet to be adequately assimilated by all institutions in the Basin. This same lack of environmental awareness also constitutes an obstacle to the development of shared planning responsibilities, that contemplate all of the multiple uses of water resources in the Basin. A consensual overview is still lacking in relation to coastal management, in the area around the mouth of the São Francisco River, that requires handling on an integrated basis with the management of the Basin as a whole. Formal approval of the SAP, the work of the Basin Committee and the institution of the Basin Water Agency and of state water-resource management systems, training and capacity-building components will help to mitigate risks associated with a lack of awareness.
- **Insufficient resources.** There are still shortages of human resources and funding at some levels of government that could have adverse effects on the prescribed integrated-management approach. The Multi-year Action Plan (PPA) assigns high priority to government actions, and the SAP helps encourage incremental investments.
- **Dispersion of actions.** As the Basin is very large, encompassing portions of various states and hundreds of municipalities, there will always be political pressures to effect a sharing out of the scarce funding available among a multitude of beneficiaries. Such a thin

spreading of resources can only lead to a loss in efficacy, resulting in ineffective and incomplete actions. The SAP activities that foster links between federal programs, water-resources and environmental protection systems, the federal, state and municipal administrations, and other stakeholders will play a key role in addressing this risk by focusing attention on key strategic actions.

- Cultural resistance to water-resource policy instruments. The introduction of water-use charges for bulk water will not pass unchallenged in certain parts of the Basin. Currently, in some municipalities, the municipal water and sewage utility does not charge even for provision of treated-water supply. The introduction of licensing, subject to limits and inspections, will have to entail a massive effort to convince many of today's users, who believe that they have a right to continue drawing water merely because they have always done so, of the need to submit to licensing procedures. Enlisting the effective and well-coordinated participation of water users in decision-making, with respect to licensing criteria and the rates to be charged, will be a critical aspect for success of the project. Establishing clear and straightforward criteria and guidelines, as stipulated in the SAP, will tend to weaken this resistance.
- Water transfers and disputes. As this is a controversial topic that involves States with differing positions or at least doubts over their positioning in terms of the use of the waters of the São Francisco River in other River Basins, and as this is a topic that warrants the attention of the Federal Government, the transfer of waters into or out of the São Francisco River Basin may have certain implications for the implementation of the SAP. The establishment of dispute management criteria and the actions proposed through the Strategic Actions Program (SAP) that focus on the revitalization of the Basin, will certainly help minimize this type of dispute.

#### 6.4.2. Sustainability

• **Public Involvement.** Effective participation of society in the implementation of the program, unquestion-

ably, constitutes the principal instrument for strengthening the organization of current users and establishing conditions for ensuring sustainability of the program. This is the reason behind the guidelines laid down for public involvement in this document.

- Legal and institutional framework. The legal and institutional basis for water resource management, and especially the definition of water resources as inseparable from land and water management, of issues relating to water quality and quantity, of the role of multiple use considerations in sector-specific planning, and the compatibility of environmental and water-resources management, as defined at the federal level and to which the states are currently adapting, paves the way for sustainable development.
- The Basin Committee. The establishment of this 'parliament' is the single most significant achievement of the SAP in the São Francisco River Basin. Now the task remains to strengthen the Basin Committee and provide it with the instruments needed to ensure its success. These instruments range from technical equipment to capacity-building for its members. The strengthening of the Basin Committee, and the estab-

lishment of institutional links with the states, municipalities and water-users that comprise its membership, will foster efficient water use and the development of sustainable management of water resources in the Basin, during and after implementation of the Project.

- **Technical aspects.** The main strategic issues relating to the management of the Basin will be solved on a demonstration basis: assuring appropriate implementation of programs and policies relating to information systems, licensing criteria, billing and classification, and planning and priority ratings for actions and investments.
- Environmental aspects. The basis for sustainability will be the adoption of rational water use; the recovery of degraded areas; the development of sustainable models for utilizing natural resources of the Basin; the establishment of legally protected areas; the application pollution controls; the consolidation of public awareness of environmental issues relating to water resources; and the rational use of estuarine water resources with a view to improving living conditions of the population in balance with the needs of the ecosystems that comprise their environment.
- Economic aspects. The proposed actions foresee more efficient water use, reducing the need for new investments while boosting productivity rates in the major economic sectors through implementation of instruments designed to heighten awareness of the economic value of water; the adoption of licensing criteria that should assign high priorities to the most efficient allocations; upgrading conditions of the subsistence farmers and enabling inclusion of remote populations in

the economy by providing them with opportunities to market their produce; reduced shipping costs through development of waterways, thereby making products originating in the Basin more competitive; and creation of income generation opportunities through the development of ecotourism.

- Social aspects. Sustainability should be based on upgrading the living standards of urban and rural communities, and by ensuring improvements in health and income; enhancing the ability of remote communities to survive droughts; assuring population safety in relation to floods; and promoting grassroots participation in the decisions on investment priorities in the Basin.
- Financial aspects. Sustainability is a long-term goal that cannot be expected to result directly from short-term actions under the SAP, but, rather, can be engendered by the multiplying effect to be achieved through the development of production models tailored to the Basin. Such models, once implemented, will result in increased production of goods and services on a sustainable basis, leading to a higher standard of living throughout the Basin.

### 6.5. Monitoring and Evaluation

In a multilateral context, ANA, as the National Executing Agency will be responsible for the technical quality of the Project, whereas UNEP, as the GEF Implementing Agency, will cooperate with the OAS, the Regional Executing Agency, to ensure that the project is carried out in compliance with GEF financial and administrative requirements. In the Brazilian context, the National Water Agency (ANA) is the national executing entity responsible for formulation of the SAP; however, its implementation will involve many other institutions at the various levels of government, in order to ensure attainment of the SAP's proposed objectives.

The São Francisco River Basin Committee (CBHSF) is the principal partner in this initiative, and should be informed promptly and regularly on the progress of actions being carried out under the SAP, in order to orient its decision making. The products to be generated through the implementation of the SAP will provide important inputs for such decision making, and the SAP will provide an initial Agenda for the proceedings of the Basin Committee.

Within this context, it is worthwhile stressing the importance of implementing planning systems which will allow the Committee, and other members of the Integrated Basin Management System, to undertake and support actions on an ongoing, systematized basis over the short, medium and long terms.

At the first meeting of Steering Committee, during this proposed implementation stage, the monitoring and assessment protocol should be approved, in agreement with the institutions involved, and contain, at a minimum, indicators covering:

- Disbursements and measures of physical progress of the SAP;
- Performance standards for institutions, rated 'as planned' and 'as is';
- Management performance standards;

• Technical performance standards for actions and activities. It is further proposed that Monitoring Reports, addressing these indicators, be presented on a quarterly basis, with the half-yearly reports being reviewed at the regular meetings of the Steering Committee of the project, describing the progress attained in the implementation of each of the activities.





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River Transport – São Francisco River

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Principal players in preparation of the SAP



## **Principal players in preparation of the SAP**





To understand the scope of public participation and the number of players involved in preparation of the GEF-São Francisco Project, aside from the listing provided in this chapter, it is also worthwhile examining Chapter 1, sub-sections 1.3.1 and 1.3.2, that provide further information on public involvement in the formulation of the DAB and the SAP.



São Francisco River – Pirapora-MG

Photo: Alain Dhomé

8.1 Governmental and non-governmental organizations involved in the Project		
8.1.1 Federal Government Bodie	S	
Federals		
ANA	National Water Agency	
ANEEL	National Electric Energy Agency	
CEEIVASF	Executive Committee for Integrated Studies of the São Francisco Valley	
CEFET	Federal Center for Technological Education	
CHESF	Hydroelectric Company of the São Francisco	
CNRH	National Water Resources Council	
CODEVASF	São Francisco and Parnaíba Valley Development Company	
CPATSA	Tropical Semi-arid Farming and Livestock Research Center	
CPRM	Mineral Resources Research Company	
DNIT	National Department of Transport Infrastructure	
DNOCS	National Department of Works for Combating Drought	
EB	Brazilian Army	
EMBRAPA	Brazilian Agricultural Research Corporation	
FNMA	National Environment Fund	
FNS	National Health Foundation	
FUNAI	National Indian Foundation	
FURNAS	Furnas Centrais Elétricas S.A.	
GERCO	Coastal Management	
IBAMA	Brazilian Institute of Environment and Renewable Natural Resources	
INCRA	National Institute of Colonization and Land Reform	
INMET	National Meteorology Institute	
JF	Federal Courts	
МА	Ministry of the Air Force	
МАРА	Ministry of Agriculture, Livestock and Supply	
ME	Ministry of Education	
MI	Ministry of National Integration	
MMA	Ministry of Environment	
MME	Ministry of Mines and Energy	
MP	Office of the Public Prosecutor	
MPOG	Ministry of Planning, Budget and Management	
MT	Ministry of Transport	
ONS	National Operator of the Electric System	
PROÁGUA	Program for Sustainable Development of Brazil's Semi-arid areas	
SRH-MMA	Secretariat of Water Resources of the Ministry of Environment	
SUDENE	Superintendency for Development of the Northeast	
UFAL	Federal University of Alagoas	
UFBA	Federal University of Bahia	
UFF	Fluminense Federal University	
UFG	Federal University of Goiás	
UFMG	Federal University of Minas Gerais	
UFOP	Federal University of Ouro Preto	
UFPB	Federal University of Paraíba	
UFPE	Federal University of Pernambuco	
UFRN	Federal University of Rio Grande do Norte	
UFS	Federal University of Sergipe	
UFV	Federal University of Viçosa	
UnB	University of Brasília	
UNICAMP	University of Campinas	

Below is a listing of institutions that participated in the SAP preparation process

State level bodies	
Alagoas	
Ass. Leg.	Alagoas Legislature of Alagoas
CASAL	Water Supply and Sanitation Company of Alagoas
CEAL	Energy Company of Alagoas
DHM	Hydrometeorology Board of Alagoas
EPEAL-	Farming and Livestock Research Enterprise of Alagoas
IMA	Environment Institute of Alagoas
NMRH	Center for Meteorology and Water Resources
PM	Military Police of Alagoas
SAAE	Autonomous Water and Sewage Services of Alagoas
SAI	Secretariat of Agriculture and Irrigation of Alagoas
SEMARHN	Executive Secretariat of Environment, Water and Natural Resources
SPDA	Secretariat of Planning and Development of Alagoas
Bahia	
ADAB	State Agricultural Defense Agency
Ass.Leg.	Bahia Legislature
CERB	Rural Engineering Company of Bahia
CODEBA	Bahia State Docks Company
COELBA	Electricity Company of Bahia
CRA	Environmental Resources Center of Bahia
CRB	Regional Council of Biology
DERBA	Highway Department of Bahia
DIB	Irrigation District of Bahia
EBDA	Bahia Agricultural Development Company
EMBASA	Bahia Water and Sanitation Company
FAMESE	Faculty of Agronomy of the Middle São Francisco
ICA	Cocoa Institute of Bahia
PA	Environmental Police of Bahia
PM	Military Police of Bahia
SAAE	Autonomous Water and Sewage Services of Bahia
SEAGRI	Secretariat of Agriculture, Irrigation and Land Reform of Bahia
SEFAZ	State Secretariat of Finance of Bahia
SEIBA	Superintendency of Economic and Social Studies of Bahia
SEINFRA	State Secretariat of Infrastructure of Bahia
SEMARH	Secretariat of Environment and Water Resources of Bahia
SEPLANTEC	Secretariat of Planning Science and Technology of Bahia
SESAB	Secretariat of Health of Bahia
SFEBA	State Secretariat of Finance of Bahia
SIRBA	Superintendency of Irrigation of Bahia
SRH	Secretariat of Water Resources of Bahia
UEB	State University of Bahia
UEFS	State University of Feira de Santana
UNEB	University of the State of Bahia
Federal District	
CAESB	Brasília Sanitation Company
DLFMA	Environmental Licensing Control and Monitoring Board of the Federal District
SEMARH	Secretariat of Environment and Water Resources of the Federal District
Goiás	
SEMARH	Secretariat of Environment and Water Resources of Goiás
SRH	Secretariat of Water Resources of Goiás
Minas Gerais	
CEMIG	Minas Gerais Energy Company

CEPEMG	Center for Education Studies and Research of Minas Gerais
CERH	State Water Resources Committee of Minas Gerais
CETEC	Technological Center Foundation of Minas Gerais
СОРАМ	State Council of Environmental Policy of Minas Gerais
COPASA	Minas Gerais Sanitation Company
CREDINOR	Rural Credit Cooperative of the North of Minas Gerais
CRH	Minas Gerais State Water Resources Council
EMATER	Rural Technical Assistance Company of Minas Gerais
EPAMIG	Minas Gerais Agricultural Research Company
FASF	Faculty of Philosophy, Sciences and Letters of the Upper São Francisco
FEAM	State Environment Foundation of Minas Gerais
FEP	Polytechnic School Foundation
FRANAVE	São Francisco Navigation Company
IEF-MG	State Forests Institute of Minas Gerais
IGAM	Minas Gerais Water Management Institute
INDI	Minas Gerais Industrial Development Institute
INESP	Minas Gerais Higher Learning and Research Institute
PMMA	Military Environmental Police
PM	Military Police of Minas Gerais
PPNL	Office of the Public Prosecutor of Nova Lima
PPOP	Office of the Public Prosecutor of Ouro Preto
PRODEMGE	State Data Processing of Minis Gerais
RURALMINAS	Minas Gerais Rural Foundation for Colonization Agrarian Development
SAAE	Autonomous Water and Sewage Services of Minas Gerais
SEEF	State Superintendency of Finance of Minas Gerais
SEMAD	Secretariat of Environment and Sustainable Development of Minas Gerais
-	
SETASCAD	Secretariat of Labor, Association for Children and Adolescents
SETASCAD SUDECOOP	Secretariat of Labor, Association for Children and Adolescents Superintendence of Development and Cooperation
SETASCAD SUDECOOP UEMG	Secretariat of Labor, Association for Children and Adolescents Superintendence of Development and Cooperation State University of Minas Gerais
SETASCAD SUDECOOP UEMG Pernambuco	Secretariat of Labor, Association for Children and Adolescents Superintendence of Development and Cooperation State University of Minas Gerais
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SETASCAD SUDECOOP UEMG Pernambuco COMPESA COMTRAP CPRH CPRH CPMA EBAPE ITEP SECTMA SRH-PE São Paulo	Secretariat of Labor, Association for Children and Adolescents Superintendence of Development and Cooperation State University of Minas Gerais Pernambuco Sanitation Company Airport Operations Company Pernambuco Water Resources Company Pernambuco Environment Company Supply and Development Company of Pernambuco Technological Institute of Pernambuco Secretariat of Sciences, Technology and Environment of Pernambuco Secretariat of Water Resources of Pernambuco
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SRH-SE	Superintendence of Water Resources of Sergipe
TAMAR	Tamar Project
UNIT	Tiradentes University
Municipal bodies	
Alagoas	
PM-AL	Military Police of Alagoas
	Municipal Administration of Belo Monte
	Municipal Administration of Feliz Deserto
	Municipal Administration of Pão de Açúcar
	Municipal Administration of Penedo
	Municipal Administration of Piaçabuçu
	Municipal Administration of Piranhas
SAAEPA	Autonomuos Water and Sewage Services of Pão de Açúcar
Bahia	
	Municipal Chamber of Codijipe
DIBS	Distribuition of Irrigation Barreiras do Sul
EAC	Agricultural School of Correntina
EAM	Agricultural School of Macaúbas
EFAJ	Family Farming School of Jaboticaba
	Municipal Administration of Ariranha Azul
	Municipal Administration of Campo Formoso
	Municipal Administration of Carmo do Cajurú
	Municipal Administration of Correntina
	Municipal Administration of Cristópolis
	Municipal Administration of Curaçá
	Municipal Administration of Ibotirama
	Municipal Administration of Itacarambi
	Municipal Administration of Jacobina
	Municipal Administration of Jaguarari
	Municipal Administration of Juazeiro
	Municipal Administration of Luiz Eduardo Magalhães
	Municipal Administration of Miguel Calmon
	Municipal Administration of Mirangaba
	Municipal Administration of Morro do Chapéu
	Municipal Administration of Niansivão
	Municipal Administration of Ourolândia
	Municipal Administration of Paulo Afonso
	Municipal Administration of Piratinga
	Municipal Administration of Rio Pires
	Municipal Administration of Santa Brígida
	Municipal Administration of São Desidério
	Municipal Administration of Sento Sé
	Municipal Administration of Umburanas
	Municipal Administration of Várzea Nova
SAAEJ	Autonomous Water and Sewage Services of Juazeiro
Minas Gerais	
ADLUZ	Development Agency of Luz
CCRGT	Rural Community Councils of Guarita and Teixeira
CDAR	Regional Action and Development Company
CEPALUZ	Agricultural Production Cooperative of Luz
CIBAPAR	Inter-municipal Consortium of the Paraopeba River Basin
CMDR	Municipal Rural Development Council of São Sebastião do Oeste
CIVII	iviunicipal Chamber of Itabirito

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CMNL	Municipal Chamber of Nova Lima
CMR	Municipal Chamber of Raposos
CMRA	Municipal Chamber of Rio Acima
CODEMA	Municipal Council for Environmental Defense and Development
COPASA	Luz Office
DIJ	Jaiba Irrigation District
DIPCP	Contiguiba/Pindoba Irrigation District
FMMA	Municipal Environment Foundation
FUNEDI	Education Foundation of Divinópolis
FUTAG	Municipal Foundation for Cultural Action and Training
PFNL	Forestry Police of Nova Lima
	Municipal Administration of Bom Despacho
	Municipal Administration of Capitão Enéas
	Municipal Administration of Congonhas
	Municipal Administration of Conselheiro Lafaiete
	Municipal Administration of Divinópolis
	Municipal Administration of Itaúna
	Municipal Administration of Janaúba
	Municipal Administration of Lagoa da Prata
	Municipal Administration of Lagoa Grande
	Municipal Administration of Luz
	Municipal Administration of Montes Claros
	Municipal Administration of Ouro Branco
	Municipal Administration of Pará de Minas
	Municipal Administration of Pirapora
	Municipal Administration of Pitangui
	Municipal Administration of São Gonçalo do Abaeté
	Municipal Administration of São João Lagoa
	Municipal Administration of São Roque of Minas
	Municipal Administration of São S. do Oeste
	Municipal Administration of Serra Talhada
	Municipal Administration of Tiradentes
	Municipal Administration of Três Marias
RET	Tripuí Ecological Reserve
SAAEB	Autonomous Water and Sewage Services of Bocaiúva
SAAEIT	Autonomous Water and Sewage Services of Itabirito
SAAEP	Autonomous Water and Sewage Services of Pirapora
SMDEI	Municipal Secretariat of Economic Development of Itabirito
SMMA	Municipal Secretariat of Environment of Ouro Preto
SMMAI	Municipal Secretariat of Environment of Itabirito
SMMALUZ	Municipal Secretariat of Environment of Luz
SMMANL	Municipal Secretariat of Environment of Nova Lima
SMMAR	Municipal Secretariat of Environment of Raposos
SMMARA	Municipal Secretariat of Environment of Rio Acima
SODAEOP	Secretariat of Works/Department of Water and Sewage of Ouro Preto
SODAERA	Secretariat of Works/Department of Water and Sewage of Rio Acima
Pernambuco	
AEDA	Education Bureau do Araripe
СРР	Peoples Council of Petrolina
	Municipal Administration of Orocó
	Municipal Administration of Petrolina
	Municipal Administration of Poço Redondo

	Municipal Administration of Porto da Folha
	Municipal Administration of Salgueiro
	Municipal Administration of Santa Maria da Boa Vista
Sergipe	
EMURB	Municipal Urbanization Company
	Municipal Administration of Aracaju
	Municipal Administration of Brejo Grande
	Municipal Administration of Capela
	Municipal Administration of Ilha das Flores
	Municipal Administration of Neópolis
	Municipal Administration of Poco Redondo
	Municipal Administration of Porto da Folha
	Municipal Administration of São Francisco
SAAECAP	Autonomous Water and Sewage Services of Capela
8.1.2. Non-governmental bodies	and professional associations
International	
	The Nature Conservancy
WFT	World Fisheries Trust
National	
ABAS	Brazilian Groundwater Association
ABID	Brazilian Irrigation and Drainage Association
ABRH	Brazilian Water Resources Association
FUNCATE	Science Foundation, Applications and Special Technologies
	Foundation for the Integrated Development of the São Francisco
Alagoas	
	Community Association of Capela
ACPM	Association of Concessionaires of the Marituba Project
ACSSI	Community Association of Sítio Salgado do Lino
	ÁGIIA E VIDA Association
AMBSB	Neighborhood Association of Senhor do Bonfim
	Neighborhood Association of Ponta Morfina
AMVB	Neighborhood Association of Vale do Boaca
	Fisherman's Associations of Alagoas
	Resources Training Association
	Farmers Association
ATRM	Association of Rural Workers of Marieziro
	State Center of Associations of Settlers and Small Farmers of Alagoas
COPPABACS	Small Farmers Cooperative Community Seed Banks
	Caca de Penedo
	Fishing Colonies of Alagoas
CPRP	Farmers Cooperative of Penedo
FPAI	Ederation of Fishermen of the State of Alagoas
FTV	Fundação Teotônio Vilela
FUNDERES	Extension Research and Development Foundation
	Marina Velho Chico
	Olha o Chico Association
STDDA	Unian of Pural Workers of Dão de Acúcar
STAFA	710 Fishing Colony
	22 Fishing Colony
	ZZ7 FISHING COLONY

Bahia	
ABCR	Street Sprinters Association of Barreiras
ABIR	Boatmen's Association Ilha do Rodeador
ACA	Agricultural Commercial Association of Xique-Xique
ACAFLC	Community Association of Farmers and Families of Lagoa Clara
ACRF	Community Association for Land Reform of Serra Azul
AIA	Industry and Agronomy Association of Xique-Xique
AIBA	Irrigated Farming Association of Western Bahia
AJEB	Young Entrepreneurs Association of Barreiras
AMINA	Friends of Nature Association of Barreiras and the surrounding Region
AMPPRVI	Association of Mini and Small Farmers of Vale do Itaguari
AMVBE	Neighborhood Association of Vila Boa Esperança
APLB	Retired Teachers Association of Bahia
APMSF	Fishermen's Association of Muquem do São Francisco
APRSS	Farmer's Association of Sento Sé
APSB	Fishermen's Association of Saco de Boi
AQMBV	Quilomba Association of Mangal Barro Vermelho
ASPAVARG	Professional Fishermen's Association of Friends of the Rio Grande Valley
	Association of Canaã
	Association of Iguarape
	Association of Mexedeira
	Association of Nonacolonha
	Association of Serra Dourada
	Association of Utinga
AUSO	United Association of Santo Onofre
САВ	Center for Associations of Barreiras
CDL	Shop Managers Chamber
СРВА	Fishing Colonies of Bahia
FDISE	Integrated Development Foundation of the São Francisco
FONASC	National Eorum of Civil Society Committees of Bahia
PT	Worker's Party - Bahia
SEMMARH	Municipal Secretariat of Environment and Water Resources
SPR	Union of Earmers
STC	Union of Workers of Coríbe
STR	Union of Rural Workers
Minas Gerais	
AAASE	Environmental Association of the Upper São Francisco
ABANORTE	Central Eruit Farmers Association of the North of Minas Gerais
ABESA-MG	Brazilian Association of Sanitation and Environmental Engineering of Minas Gerais
ABID	Brazilian Irrigation and Drainage Association
ABMG	Biologists Association of Minas Gerais
ACAL	Community Association of Water Limpa
ACBOV	Community Association of Bairro Ouro Velho
AC.IC	Community Association of Jardim Canadá
ACSB	Community Association of São Bartolomeu
ACT	Tangará Condominium Association
ADESA	Environmental Development Association
AFAP	Agronomists Association of Paracatu
AMAMC	Association of Friends of the Environment of Morro do Chapéu
AMDA	Minas Gerais Association for Defense of the Environment
AMMVI	Municipal Association of the Vale do Itaparica Micro Region
AMOVILE	Neighborhood Association of Ville de Montagne

Continued	
АМРА	Environmental Preservation Association of Mingú
ASF	São Francisco Association
ASSEMAE	National Association of Municipal Sanitation Services
ATPPRBG	Small Farmers and Rural Workers Association of Buriti Grande
BE	Ecological Brigade
СВНРА	Pará River Basin Committee
CBHRS	Salitre River Basin Committee
CBHVG	Verde Grande River Basin Committee
CCA	Canto das Waters Condominium
CODEMA	Municipal Council for Environmental Conservation and Defense
COMPCANA	Cana Protection Committee
CPMG	Fishing Colonies of Minas Gerais
СРТМ	Fishing Colony of Três Marias
FAEMG	State Federation of Agriculture of Minas Gerais
FETAEMG	Federation of Agricultural Workers of Minas Gerais
FIEMG	Federation of Industries of the State of Minas Gerais
FJP	Fundação João Pinheiro
FOBES	Ouro Preto Social Welfare Foundation
FPA	Federation of Traditional Fishermen
FPEMG	State Federation of Fishermen of Minas Gerais
FPP	Federation of Professional Fishermen of Minas Gerais
	Foundação Biodiversitas
	Foundação Gorceix
GARRA	Environmental Movement
IMAN	Instituto Manoel Novaes
	Instituto Guaicuy – SOS Rio das Velhas
IRPAA	Regional Institute for Appropriate Small Farming Techniques
	MANUELZÃO Projeto
MCA	Movement for Citizenship and Waters
MEL	Free Ecological Movement
MEST	Seiva da Terra Ecological Movement
MSA	Alternative Society Movement
MVP	Paracatu Green Movement
OAB-MG	Brazilian Bar Association - Ouro Branco-MG
PROMUTUCA	Association for Environmental Preservation of Vale do Mutuca
SIGMNM	Union of Gypsum and Non-Metallic Materials Industries
SINDIEXTRA	Union Extractive Industries
SINDRP	Rural Union of Pirapora
SPRLUZ	Rural Employers' Union of Luz
UAI	Environmental Union of Itabirito
UAVS	United Associations of Irrigation Users of Vale do Salitre
Pernambuco	
ABRH-PE	Brazilian Water Resources Association of Pernambuco
ACPRJ	Commercial Farmers Association of Jiló
ADMA	Association for Defense of the Environment
ADSQ	Development Association of Santa Quitéria
WATERVALE	Environmental Guardians Association of the São Francisco Valley
ARFB	Barra Rural Finance Association
CBG	Garça River Basin Committee
DSCAS	Diaconia Civil Society and Social Action
FPP	Federation of Fishermen of Pernambuco
PCH	Association of Representatives of Small Hydroelectric Plants
PV	Green Party - Petrolina
Continued	
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STRJ	Union of Rural Workers of Juazeiro
UAMP	United Municipal Associations of Pernambuco
Sergipe	
AGROECO	Agro-ecological
APS	Fishermen's Association of Saúde
	Comunidade Saramem
СРМАВ	Fishing Colony of the Municipality of Areia Branca
FDRSF	Forum for Defense of the São Francisco
FJN	Foundação Joaquim Nabuco
	Xingo Scientific and Technological Development Institute
LCI	Lions Club International
MOPEC	Popular Ecological Movement
MPV	Movimento Pensar Verde
0AB-SE	Bar Association Brazil - Sergipe
SSABSFCT	Socio-Environmental Society of the Lower São Francisco - Canoa da Tolda
8.1.3. Private and State Compar	nies
State Companies	
PETROBRAS	Petróleo Brasileiro S.A.
VALE	Companhia Vale do Rio Doce
Bahia	
AGENCY 5	Agency 5 Arte e Multimídia
AGOL	Agropecuaria Grande Oeste Ltda.
Coop. Pesc. Ibotirama	Ibotirama Fishermen's Cooperative
Curtume	Curtume Moderno S.A.
DR	Diário da Região
HIDROBASA	Hidrogeólogos Consultores
HIDROCON	Hydro-geological Consultants
HIDROLOG	Serviços de Perfilagem Ltda.
MAUERBERG	Mauerberg Poços Artesianos Ltda.
TCF	Turismo Campo Formoso
Federal District	
DM	Diário dos Municipios
GNL	Administração de Negócios Ltda.
IKHON	Administração e Tecnologia
JFMA	Jornal Folha do Meio Ambiente
TDA	Desenho e Arte
Minas Gerais	
ACA	Água Consultores Associados
AÇOMINAS	Aços Minas Gerais
AFA	América Frutas e Alimentos S.A.
AHRSF	Administration da Hidrovia do Rio São Francisco
ANGLOGOLD	Mineration Morro Velho Ltda.
BB	Balsa Britânica
BELMIL	Bemil Ltda.
CAD	Cooperativa Agropecuária de Divinópolis
CC	Curtume Campelo
CI	Chuvatel Irrigação
СМ	Curtume Moderno
СММ	Companhia Mineira of Metais
CNC	Casa Nobre Consultoria
CONEMAL	Conemal Ltda.
CONSUB	Consub SG
COOPADAP	Cooperativa Agropecuária do Alto Parnaíba

Continued	
COOPERC	Cooperativa Agrícola de Irrigação e do Projeto de Ceraíma
ECONSULT	Empresa Consult de Engenharia Ambiental Ltda.
ECOPLAN/MAGMA/CAB	Consórcio ECOPLAN/MAGMA/CAB
EHIL	Estância Hidromineral Itabirito Ltda.
FAHMA	Planejamento e Engenharia Agrícola Ltda.
FORTECO	Forteco S.A.
FRUTIVALE	Frutivale
FTN	Fazenda Terra Nova
GA	Golder Associates
GAIA	Consultoria Ambiental
IMNE	Italmagnésio - Nordeste
LEME	Engineering Ltda.
LIASA	Ligas de Alumínio S.A.
MAGNESITA	Magnesita S.A.
MBR	Minerações Brasileiras Reunidas
MORGAN	Cerâmica Morgan
MPMM	Minas Pérola Mármore de Minas Ltda.
MRV	Mineração Rio Verde
PCEAI	Pedras Congonhas Exportação Arte e Indústria Ltda.
PEDOGEO	Empresa Pedogeo de Consultores Associados Ltda.
PROPEL	Propel Ltda.
TIMCI	Topázio Imperial Mineração Comércio e Indústria Ltda.
TRANZDUARTE	Empresa Tranzduarte Ltda.
TV CEMIG	TV Cemig
UL	Usina Luciana
VALEÉ S.A.	Valeé S.A.
VM	Visão Mundial
VOTORANTIM	Grupo Votorantim Metais
Pernambuco	
VE	Vale Export
Sergipe	
ODEBRECHT-SE	Construtora Odebrecht
8.1.4. São Francisco River Basin	Participative Water Resources Management Board
CBHSF	São Francisco River Basin Committee
8.1.5. Overseas Institutions	
LAVAL	University – Canada
UCAL	University of California -USA
	Universidad Jaume I - Spain
	Universidad del País Basco - Spain
8.1.6. International Institutions a	and Agencies
GEF	Global Environmental Facility
OAS	Organization of American States
UNEP	United Nations Environment Programme
IWRN/RIRH	Inter-American Water Resources Network

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Landscape – semi-arid Region



Annexes

9



Petroglyphs – Valley of the Peruaçu-MG



**ANNEX I** DECISIONS OF THE SÃO FRANCISCO RIVER BASIN COMMITTEE RELATING TO THE SAP

**ANNEX II** PROJECT ACTIVITIES

**ANNEX III** CAUSAL CHAIN

**ANNEX IV** LEGAL AND INSTITUCIONAL ASPECTS

### ANNEX V

INVESTMENTS FORESEEN IN THE MULTI-YEAR ACTION PLANS (PPAs) FOR THE SÃO FRANCISCO RIVER BASIN AND ITS COASTAL ZONE





# **ANNEX I**

### 1. DECISIONS OF THE SÃO FRANCISCO RIVER BASIN COMMITTEE (CBHSF) RELATING TO THE STRATEGIC ACTION PROGRAM (SAP)

### 1.1. Recommendations of the Plans and Programs Work Group

As a result of public debates held during preparation of the Strategic Action Program (SAP) that included the participation of governmental agencies and, especially, the Plans and Programs Work Group, a recommendation was drafted for submission to the Plenary of the São Francisco River Basin Committee (CBHSF). The text of this recommendation, as approved by the Plenary Meeting of the Committee in Penedo, and recorded in the minutes, is reproduced below:

São Francisco River Basin Committee (CBHSF)

Theme: Strategic Action Program for the Management of the São Francisco River Basin and its Coastal Zone - SAP - Activity 4.5-B/2204-07

Considering that actions foreseen under the Program are targeted at contributing, in a permanent manner, to the integrated management of the São Francisco River Basin and its coastal zone;

Considering that the structure of the SAP and its basic components, by providing technical and institutional strengthening for the Integrated Water Resources Management System for the São Francisco River Basin, and stimulating public involvement, is in line with the general guidelines of the National Water Resources Policy (PNRH) and thus assists in the promotion and consolidation of the Basin Committee;

Considering that the methodological strategy put into effect for the preparation of the SAP resulted in an intense process of integration betwen the São Francisco River Basin Committee (CBH SF) and state-level agencies, and through the holding regional workshops, organized by the Consultative Chambers, fostered debate with a great variety of stakeholders on issues relating to the São Francisco River Basin and, above all, in view of the incorporation of the suggestions formulated by this Work Group in its systematized version, on the occasion of the work meeting held in Aracaju-SE on September 29 and 30;

Considering that this version, with its eight actions and 14 activities foreseen, is representative of the suggestions proposed during the regional Workshops; and,

Considering, lastly, that the SAP will contribute with significant inputs to the drafting of a Basin Plan,

Be it resolved by this Work Group that the process of the drawing up and negotiating the Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone be recommended to the Committee, and that the Committee's political support be provided for its consolidation within the Basin Planning process.

Penedo-AL, October 2, 2003

Members of the Plans and Programs Work Group Francisco Sandro Rodrigues de Holanda Antônio Thomaz da Matta Machado José Holanda Neto Edison Ribeiro dos Santos Alexander Max Figueiredo Sá"

### 1.2. Decision 03 of the São Francisco River Basin Committee (CBHSF), October 3, 20031

Provides for the drafting of a Water Resources Plan for the São Francisco River Basin.

The São Francisco River Basin Committee, created by Presidential Decree on June 5 2001, through the exercise of the powers vested in its Bylaws and in Articles 37 and 38 of Law 9.433, of January 8, 1997; and,

In view of the preparation of the Water Resources Plan for the São Francisco River Basin, in accordance with Articles 6, 7 and 8 of said Law, the provisions of National Water Resources Council (CNRH) Resolution 17, of May 29, 2001, and the powers vested in the National Water Agency (ANA), as foreseen in Article 4 of Law 9.984 of July 17, 2000; and,

### Considering that,

- "the hydrographic basin is the territorial unit for the implementation of the National Water Resources Policy and activities under the National Water Resources Management System" (Article 1, paragraph V of Law 9.433, of January 8, 1997);
- 2. Hydrographic Basin Water Resources Plans are longterm plans, with planning horizons compatible with the implementation period of their programs and projects, and contain diagnoses, plans for the allocation and regulation of water use, indications of measures to be taken, programs to be developed and projects to be carried out for attainment of the goals foreseen (Article 7, paragraph V), and thereby comprise the technical and political instruments for management of the Basin, approved by the Committee;
- the Declaration of Principles of the São Francisco River Basin Committee, and especially Principle III—"the São Francisco River Basin Committee shall

prioritize, in the exercise of its management and administrative activities, approval of a Basin Plan, that shall serve as the principal element to guide and substantiate implementation of all other instruments of the National Water Resources Policy; namely: the licensing of the right to use water resources, water use charges, classification of bodies of water, and shall seek to promote effective revitalization, by means of utilization of the instruments foreseen and through management of the quality and quantity of water for multiple use"-and of Principle IV-"the São Francisco River Basin Committee shall approve, on the basis of the Basin Plan, a strategic and operational program for revitalization of the Basin, through elucidation of concepts relating to the management of water and the definition of technically-justified measures to promote the preservation, conservation and rehabilitation of waters to the benefit of biodiversity, environmental-economic and social sustainability, and to ensure the quality and quantity of water for the fulfillment of human needs by means of the consolidation of effective environmental education instruments, so as to provide communities with critical and discursive autonomy, and to demonstrate the close relationship of interdependence among natural, socio-economic, and cultural dimensions";

- the lack of institutional networking links, identified in previous and current diagnostic analyses as one of the principal causes, and as a consequence, of current degradation in the Basin;
- 5. the discussions held in the four Regional Workshops carried out during 2003, by the Regional Consultative Chambers of the Upper, Middle, Lower-middle and Lower São Francisco River, which are integral parts of the structure of the CBHSF, with supervision of the Plans and Programs Work Group of the Committee; and,
- 6. the need to obtain a consensus, among all stakeholders in the Basin, with respect to the concept of revitalization and the establishment of measures and actions needed for the management of projects, services and engineering works;

<sup>&</sup>lt;sup>1</sup>Published in the Official Gazette (DOU) on October 31,2003.

#### **RESOLVES:**

Article 1. For the preparation of the Water Resources Plan for the São Francisco River Basin, a high-level Technical Work Group shall be established by the National Water Agency (ANA), by the São Francisco and Parnaíba Valley Development Company (Codevasf), and by the state-level and Federal-District water-resources management bodies that share the river basin, to submit to the Committee, within the period of six (6) months, a draft for discussion and decision, to which the plenary may effect amendments, deletions, modifications or additions, prior to approval.

§ 1. Drafting of a Master Plan for the Water Resources of the São Francisco River Basin shall be monitored and appraised by the Technical Chamber for Plans and Projects of the CBHSF and by the Regional Consultative Chambers, in compliance with the provisions of the Terms of Reference and in accordance with the work schedule.

§ 2. The Technical Work Group foreseen in the caption of this Article shall promote articulation with the Inter-ministerial Work Group, established by Presidential Decree on June 11, 2003.

§ 3. The process of preparation, analysis, discussion and approval of the Water Resources Plan shall be supervised by the Board of the CBHSF, in accordance with the terms of CNRH Resolution 17, Article 2, of May 29, 2001.

Article 2. The Technical Work Group referred to in Article 1 shall, within the period of thirty (30) days, review and present the Terms of Reference, containing the guidelines and schedule of work, to the Technical Chamber for Plans and Projects of the CBHSF.

§ 1. The Technical Chamber for Plans and Projects of the CBHSF shall inform and collect suggestions from the Regional Consultative Chambers, with a view to enhancing the Terms of Reference, and forward them to the Technical Work Group, as foreseen in Article 1 of this Decision. Article 3. In the process of preparing the Water Resources Plan for the São Francisco River Basin, an assessment should be made of the opportunity for, and appropriateness of, incorporating SAP actions contained in component I; component II; and the the DAB, into programs and projects that comprise the Basin Plans agreed by the Committees of the Sub-basins, stakeholder representatives and civil society in the São Francisco River Basin.

Article 4. Revitalization of the São Francisco River Basin, understood as meaning the rehabilitation of water and environmental resources in the Basin, entails a set of measures and management actions, projects, services and works, that comprise an integrated and integral planned project, within the scope of the Basin, to be carried out by municipalities, the Federal District, states, federal government, private enterprise and organized civil society, with the aim of restoring the quality and quantity of ground and surface waters, so as to ensure multiple use, preservation and recuperation of biodiversity in the Basin.

Article 5. The management measures and actions, revitalization services and engineering works that make up the Water Resources Plan for the São Francisco River Basin comprise no less than the following components:

I - Component I – Implementation of the Integrated Water Resources Management Information System (SIGRHI).

- a) Strengthening institutional networking links and harmonizing actions carried out by public bodies in the Basin;
- b) Implementing and strengthening institutional management instruments (e.g., the Basin Committee, Basin Water Agency, and related Management Bodies) and training throughout the Basin;
- c) Developing and implementing regulatory instruments for the use of water resources in the Basin (e.g., licensing, water-use charges, and enforcement);
- d) Developing and implementing an environmental education program.

II- Component II - Sustainable use of water resources and environmental restoration in the Basin.

- a) Promoting multiple uses of water, in a sustainable manner, and preventing impacts due to extreme hydrological events;
- b) Implementing actions aimed at the sustainable use and protection of groundwater;
- c) Developing and implementing actions for the preservation and recuperation of the ichthyofauna and biodiversity;
- d) Reforesting and restoring degraded areas (riparian forests, hill tops and springs);
- e) Environmentally rehabilitating areas degraded by mining activities.

III- Component III - Water resources services and works, and land use.

- a) Implementing actions for regularization of flows, multiple use, and flood control;
- b) Implementing actions to improve navigability in the Basin;
- c) Implementing actions for the control of erosion and siltation;
- d) Fostering technical and financial assistance for municipalities for the sustainable management of urban and rural land.

IV- Component IV – Environmental sanitation services and works.

- a) Implementing projects and engineering works for achieving universal water supply;
- b) Implementing projects and works to improve levels of collection and treatment of urban sewage and industrial effluents;

c) Implementing projects and works to improve levels of collection and treatment of urban solid wastes;

§ 1. The Technical Work Group foreseen in Article 1 shall coordinate with the Management Committee of the Project for Conservation and Revitalization of the São Francisco River Basin, created by Presidential Decree on June 5, 2001.

§ 2. The Technical Work Group foreseen Article 1 shall coordinate with the Management Committee of the Project for Conservation and Revitalization of the São Francisco River Basin, instituted by the Ministry of the Environment pursuant to Ministerial Order 384 of September 25, 2003.

Article 6. Instruct the Executive Secretariat of the CBH-SF to promote articulation between the Technical Work Group, foreseen in Article 1 of this Decision, and the Technical Chamber for Plans and Projects, and take other measures so as to ensure full compliance with this Decision.

Article7. This Decision shall be dispatched to:

- the National Water Resources Council (CNRH), for its information;
- the National Water Agency, for implementation of the necessary measures; and,
- the Federal District, the States of Minas Gerais, Goiás, Bahia, Pernambuco, Sergipe, and Alagoas, and their respective state water resources councils and other bodies in the Basin, for implementation of the necessary measures;

Article 8. This Decision shall go into effect on the date of its approval by the plenary of the São Francisco River Basin Committee.

JOSÉ CARLOS CARVALHO President of the CBHSF LUIZ CARLOS DA SILVEIRA FONTES Secretary of the CBHSF



# **ANNEX II**

### 2. ACTIVITIES

### 2.1 Project Components

In preparing the proposal for the Project for Integrated Management of Land-based Activities in the São Francisco River Basin, the Secretariat of Water Resources of the Ministry of Environment (SRH/MMA), the Organization of American States (OAS) and the United Nations Environment Programme (UNEP) conducted broad-based public consultations to identify the principal problems of the Basin and its coastal zone, and to solicit proposals for project activities.

During this phase, known as the Project Development phase, supported by Global Environment Facility (GEF) Project Development Facility, Block B funds (PDF-B), seminars were held in three towns in the different physiographic regions of the Basin and its coastal zone: Belo Horizonte, in November 1997; Penedo, in February 1998; and Petrolina, in December 1998. More than 270 persons, representing over 110 federal, state, and municipal bodies, universities, non-governmental organizations, associations, unions, and private businesses, attended these seminars.

Various proposals were presented, debated and selected at these meetings. These proposals could be categorized in four components:

- Environmental Assessment of the São Francisco River Basin and its Coastal Zone;
- II. Public and Stakeholder Participation;
- III. Development of the Organizational Structure;
- IV. Formulation of the Strategic Action Program for the Integrated Management of the São Francisco River Basin (SAP).

These four components are summarized below.

### Component I – Environmental Analysis of the São Francisco River Basin and its Coastal Zone.

This Component was designed to provide a solid technical and scientific basis for strategic corrective actions, aimed at protecting the marine environment, through management of land-based activities identified during Project preparation. Specifically, these included activities targeted at:

- quantification of priority environmental issues, identified during the preparatory phase of the SAP, with updating and consolidation of the available data, for the purpose of preparing future scenarios for land, aquatic and marine systems;
- identification and quantification of the impact of landbased activities and of the regularization of flows on the hydrology and water quality of the São Francisco River, with special emphasis on the transport of sediments and nutrients, fisheries and aquatic ecology of the entire system, and, above all, the adjacent coastal zone;
- identification and appraisal of the most probable reasons for changes in the morphology of the São Francisco River, and the composition and distribution of its aquatic fauna, with a view to determining the underlying causes of changes observed;
- provision of a quantitative basis for determining strategic actions with a view to optimizing the multiple use of the water resources of the São Francisco River Basin, and protecting and restoring ecosystems in the coastal zone currently suffering the negative effects of land-based activities.

### Component II – Public and Stakeholder Participation.

This Component was designed to promote the involvement of communities in the identification of problems and in studies of potential corrective measures, and also to establish a dialogue between persons and institutions with economic and social interests in the Basin. The aim was to take advantage of their understanding, and to appropriate the experiences of communities in identifying actions to be carried out under the SAP, these being essential requisites for ensuring the effectiveness and environmental sustainability of such actions. The activities carried out included:

- mapping of the region, at an appropriate scale, with a view to determining land use patterns;
- identification, for purposes of coordination and stakeholder involvement, of persons and bodies with institutional responsibilities in the São Francisco River Basin, including such sectors as fisheries, shipping, mining and agro-industry and the public sector;
- demonstration of sustainable farming and irrigation management measures, with the aim of implementing appropriate water and soil management techniques, correct utilization of agro-chemical products, enhanced crop-management methods and designs of irrigation systems, and maintenance of such infrastructure as roads and irrigation channels;
- creation of professional qualification and training programs, at all levels, with the aim of providing technical and administrative support for the implementation and operation of community-based soil and water management programs.

# Component III – Development of an Organizational Structure.

The aim of this Component was to enhance institutional capacities and the quality of human resources for the establishment of the São Francisco River Basin Committee (CBHSF), thereby contributing to the strengthening of institutions, with a view to ensuring continuity of management actions identified during the SAP preparation process, implemented in the Basin.

### Component IV – Formulation of the Strategic Action Program for Integrated Management of the São Francisco River Basin (SAP).

The objective of this Component was to synthesize data and experiences resulting from research and cost-analysis assessments, developed under the three previous Components, and in the preparation of the SAP. Included among the principal elements of this Component were aspects relating to fundamental legal, institutional, human and natural resources that are indispensable requisites for implementation of corrective measures, identified during the SAP preparation process. The aim was to promote cooperative development of a comprehensive Program, based upon a multi-sectoral and holistic approach to the environmental management and economic development of the São Francisco River Basin and its Coastal Zone. Figure 24 shows the locations, of the Activities, and there follows a listing containing essential information.

### 2.2. Results of the Activities

During the preparation of the Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone (DAB), various aspects emerged which contributed significantly to the technical and scientific knowledge base, and to the elucidation of some unsubstantiated statements that had been in circulation. This knowledge made it possible to explain or confirm some of the myths which had gained currency in the Basin. Among these were alleged desertification in the Cabrobó region, and increased salinity in the bed of the São Francisco River following construction of Xingó Dam.

Under the environmental appraisal of the São Francisco River Basin and its coastal zone, in the Upper São Francisco Basin, the impacts of mining on water resources were assessed and mapping of land use carried out. In the Middle São Francisco Basin, multi-year evaluation studies were carried out on the dynamics of alterations in the shape of the bed of the São Francisco River, and a study of combined use of surface and ground waters, was carried out in the sub-basin of the Fêmeas River. In the Lower-middle portion of the Basin, work was carried out to determine land use patterns, and a system for water quality monitoring and assessment of



Figure 24. Location of the Activities of the GEF São Francisco Project

the impact of agriculture on groundwater resources in the Verde/Jacaré River Basin. In the Lower São Francisco Basin, studies of hydrodynamic–sedimentation processes along the banks and in the bed of the river, its estuary and adjacent coastal zone were carried out, along with studies of erosion on river banks, its effects on the dynamics of sedimentation in the river and nutrient loads in the region closest to its mouth, and of measures for restoration of the rheophilic [potamodromous] ichthyofauna and determination of land use.

Intense stakeholder participation characterized all phases of this work. Public participation, in which NGOs and municipalities performed significant roles, facilitated the dissemination of information on activities through such initiatives as: the Partnership to Improve Water Quality in Ribeirão São Pedro (MG), and Recuperation of Our Forests in Luz (MG), both in the Upper São Francisco River Basin; and Training in Participative Water Resources Management and Environmental Education (PB), in the Lower-middle portion of the São Francisco River Basin.

Acknowledgement of the need for institutional strengthening led to efforts to support the creation and strengthening of the São Francisco River Basin Committee, the Board of which has now been inaugurated and is currently exercising its full powers. In the sub-basins of the São Francisco River, such support was behind the installation of the Basin Committee of the Rio Salitre Sub-Basin in Bahia, in the Lower-middle São Francisco, which is currently functioning with a provisional structure owing to alterations in the Water Resources Law of the State of Bahia; and a feasibility study for implementing a Basin Water Agency for the Maranhão River in Minas Gerais in the Upper São Francisco.

Lastly, other activities for the Integrated Management of the São Francisco River Basin and its Coastal Zone were carried out to provide a solid foundation for the formulation of the Strategic Action Program (SAP), such as the Evaluation of Economic Instruments for the Sustainable Management of Water Resources in the Verde Grande River Sub Basin; Quantification and Analysis of the Efficiency of Water Use by the Agricultural Sector in the São Francisco River Basin; Evaluation of the Contribution of Shipping on the São Francisco River to Increasing the Competitiveness of Agriculture in the São Francisco River Basin; Determination of Operating Policies for the Principal Reservoirs of the São Francisco River Basin; and other, similar activities. Executive Summaries of the Final Reports of the Activities of the GEF São Francisco River Basin Project are available in Portuguese and English, on the web page of the National Water Agency (ANA), that can be accessed at: http://www.ana.gov.br/gefsf/.There follows a listing of these Activities, by Project Component:

#### Table 27 Activities of the Project Components

#### Component I. Environmental Assessment of the São Francisco River Basin and its Coastal Zone

#### Upper São Francisco

- Environmental Effects of Mining Activities on the Water Resources of the Upper das Velhas River Basin-MG (Activity 1.2)
- Determination of Land Use in the Upper São Francisco River Basin (Activity 2.1)

#### Middle São Francisco

- Multi-temporal Analysis of Riverbed Shape Alteration Dynamics in the Middle São Francisco -BA (Activity 2.2C)
- Conjunctive Use of Surface and Ground Waters in the Fêmeas River Basin-BA (Activity 3.2)
- Impact of Agriculture on Groundwater Resources in the Verde/Jacaré River Basins-BA (Activity 1.5)

#### Lower-middle São Francisco

- Determination of Land Use in the Lower-middle São Francisco River Basin (Activity 2.1)
- Development of a Water Quality Monitoring System in the Lower-middle São Francisco -BA/PE (Activity 1.4)

#### Lower São Francisco and its Coastal Zone

- Hydrodynamic and Sediment Studies of the Lower São Francisco, its Estuary and Adjacent Coastal Zone-AL/SE (Activity 1.1A)
- Riverbank Erosion Evaluation Studies and the Effects of Riverbank Erosion on Sedimentation Dynamics-AL/SE (Activity 2.4)
- Determination of Estuarine Nutrient and Sediment Loads in the Region of the Mouth of the São Francisco River (Activity 1.1B)
- Restoration of Rheophilic Ichthyofauna of the Lower São Francisco-AL/SE (Activity 1.3)
- Determination of Land Use in the Lower São Francisco (Activity 2.1)

#### **Component II – Public and Stakeholder Participation**

- Fostering Public Participation in the São Francisco River Basin (Activity 4.1)
- Partnership for Improvement of Water Quality in São Pedro Stream-MG (Activity 2.2A)
- Recovering Our Forests A Pilot Project in the Municipality of Luz-MG (Activity 2.2B)
- Training for the Participatory Management of Water Resources and Environmental Education -PE (Activity 3.3A)

#### **Component III – Development of the Organizational Framework**

- Support for the Creation of the São Francisco River Basin Committee (Activity 3.4) and Support to the Strengthening of the São Francisco River Basin Integration Committee (Activity 3.5)
- Pilot Study for the Implementation of a Basin Water Agency in the Sub-basin of the Maranhão River -MG (Activity 3.1)

• Integrated Management Plan for the Salitre River Basin -BA (Activity 3.3B)

#### Component IV - Formulation of the Strategic Action Program for the Integrated Management of the São Francisco River Basin (SAP)

- Evaluation of the Contribution of Shipping to the Competitiveness of Agriculture in the São Francisco River Basin (Activity 1.1C)
- Evaluation of Economic Instruments for the Sustainable Management of Water Resources in the Verde Grande Sub-basin -MG/BA (Activity 4.2A)
- Quantification and Assessment of the Efficiency of Agricultural Water Use in the São Francisco River Basin (Activity 4.3)
- Formulation of Operational Policies for the Principal Reservoirs of the São Francisco River Basin (Activity 4.4)
- Diagnostic Analysis and Proposal for Expanding the Hydro-Meteorological Network of São Francisco River Basin (Activity 4.7A)
- Proposal for a Piezometric Monitoring Network in the Verde Grande River Sub-basin -MG (Activity 4.7B)
- Development of a Metadata-based Reference Information System (Activity 4.7C)

## 2.3. Basic information on the Activities

I. ENVIRONMENTAL ANALYSIS OF THE BASIN AND ITS COASTAL ZONE					
Activity	Goals and outputs	Executing institutions and	Coordinator	Number of persons	
		participants	Consultants	involved	
1.1A. Hydro-dynamic-	Goals	Federal	Coordinator	Consultants : 14	
sedimentlogical study	Identify the current hydrodynamic	UFAL*; CHESF; CODEVASF;	Arno Maschmann	Workshop**:76	
of the Lower São	status of the lower reaches of the	UFBA; UFRN	Consultants	Seminar:500***	
Francisco, Estuary and	São Francisco River, its estuary and	State	Adriana Reis		
Adjacent Coastal Zone	adjacent ocean region, quantifying	IMA; SERHI-AL; SRH-SE	Arthur Hernandez		
-AL/SE	current sediment transport and dis-	NGOs	Geórgenes Caval-cante		
	tribution, and relating them to biotic	FUNDEPES; Inst. Xingó	Helenice Vital		
	productivity of tropic levels of phyto-,		Paulo Mafalda Júnior		
	zoo-and ichthyo-plankton.		Allysson Matos		
	Outputs		Anderson Nunes		
	Final Report		Christiane Souza		
	- Hydrodynamic-sedementologic		Marco Gonçalves		
	study of the Lower São Francisco		Newton Júnior		
	River, its Estuary and Adjacent		Oberdan Oliveira		
	Coastal Zone -AL/SE		Rivaldo Júnior		
	5 annexes		Werner Tabasa		
	1 workshop**- Lower São Francisco:		Yatska Hernandes		
	Identification of Water Problems				
	and Mitigating Measures. Xingó-AL,				
	2000				
	1 seminar*** – Do Velho at Novo				
	Chico: A Discussion of Problems and				
	of Hydro-Environmental Solutions				
	for the Lower São Francisco and the				
	Mouth – Propriá-SE, 2002				
1.1B. Determination of	Goals	Federal	Coordinator	Consultants : 9	
Nutrient Loads in the	Characterize nutrient loads and sea-	UFAL*	Paulo Petter		
São Francisco River	sonal variation at the mouth of the		Consultants		
in the Region near its	São Francisco River; identify the im-		Bastiaan Knopper		
mouth, and the Impact	portance of the river for enrichment		Geórgenes Cavalcante		
of Artificial Floods on	of nutrients in the adjacent ocean		João Lorenzetti		
their Control	environment; and relate the findings		Manuel dos Santos		
	with available fisheries statistics		Silvana Quintela		
	Outputs		Sinval G. Júnior		
	Final Report		Alex N. Oliveira		
	– Determination of Nutrient Loads		Esdras L. Andrade		
	of the São Francisco in the Region of		Paulo Barros Omena		
	its Mouth.				

\* Executing institution

\*\* Carried out together with Activities 1.1A, 1.1B and 2.1

\*\*\* Carried out together with Activities 1.1A, 1.1B, 1.3, 2.1 and 2.4

Activity	Goals and outputs	Executing institutions and	Coordinator	Number of persons
		participants	Consultants	involved
1.1C. Evaluation of	Goals	Federal	Coordinator	Consultant: 1
the Contribution of	Analyze waterway transportation,	MT*; ANA; DNIT	Paulo Godoy	Collaborators :7
Navigation on the São	integrated with other transport	State	Nathércia Schneider	
Francisco River to	modalities, as a factor for increasing	CODEBA; FRANAVE		
Increased Competitive-	the competitiveness of agriculture	Private		
ness of Agriculture in	in the São Francisco River Basin ,	AHRSF		
the Basin	especially in the West and Southwest			
	of Bahia			
	Outputs			
	Final Report			
	- Evaluation of the Contribution			
	of Navigation on the São Francisco			
	River to the Increase in Competitive-			
	ness of Agriculture in the Basin			
1.2. Assessment of the	Goals	State	Coordinator	Consultants : 3
Environmental Effects	Identify and quantify the impact of	IGAM*; CEMIG; CERH-MG;	Elisa Boechat	Collaborators :21
of Mining on Water	mining on the quality and quantity	COPAM-MG; CO-PASA-MG;	Consultants	Seminars: 70
Resources in the Upper	of water available in the Upper Rio	Emater-MG; FEAM-MG; IEF-	Golder Associates	
Rio das Velhas Basin	das Velhas	MG; PPNL; PPOP; SEEF-MG;	Victória Tuyama	
	Outputs	Semad-MG	Willer Hudson Pós	
	Final Report	Municipal		
	– Assessment of the Environmental	CMI; CMNL; CMR; CMRA;		
	effects of Mining on Water Resources	PFNL; SAAEIT; SMDEI;		
	in the Upper Rio das Velhas Basin	SMMA; SMMAI; SMMANL;		
	-MG	SMMA-RA; SODAEOP; SO-		
	6 annexes	DAERA		
	2 seminars	NGOs		
		ACAL; ACBOV; ACJC;		
		ACSB; ACT; AMAMC;		
		AMOVILE; AMPA; CCA;		
		FOBES; Fund. Gorceix;		
		MEL; PM-MG; RET; UAI		
		Private		
		ANGLOGOLD; BEMIL;		
		MORGAN; CONEMAL; EHIL;		
		FURIECO; FRUIIVALE; GA;		
1.2 Postavation of the	Cools		Coordinator	Concultants . E
Rheonhylic Ichthyo	Identify native species of economic	Inst Xingó*	Eábio C. Branco	ounsuitants . 5
fauna of the Lower São	importance in the Lower São Fran		Consultants	
Francisco-AL/SF	cisco and generate proposals for		Rivaldo Couto	
. anoiste ne/oe	a Program to Restock the Xingó		Sineide Montenearo	
	Reservoir and areas Downstream		Enaide M. Magalhães-	
	Outputs		Maria Célia Lyra	
	Final Report		Manoel dos Santos	
	- Restoration of the Rheoph-			
	vlic Ichthyofauna of the Lower São			
	Francisco			
	1 seminar***			

1.4. Development	Goals	Federal	Coordinator	Consultants: 21
of a Water-Quality	Define a monitoring methodology to	EMBRAPA-MA*; ANA;	Aderaldo Silva	Collaborators:
Monitoring System in	evaluate the quality of water for mul-	CODEVASF; CPATSA; UnB	Consultants	554
the Lower-middle São	tiple uses, in view of agro-industrial,	State	Ana de La Cruz	Courses: 246
Francisco-BA/PE	forestry and industrial activities in	ITEP; UNICAMP NGO	Anderson S. Pereira	
	the region of the Lower-middle São	IRPAA	Carlos Alcebíades	
	Francisco		Cláudio Buschinelli	
	Outputs		Daniel Lobo	
	Final Report		Daniela M. Mariuzzo	
	– Development of a Water-Qual-		Enio Farias e Silva	
	ity Monitoring System for the		Francisco N. da Silva	
	Lower-middle São Francisco River:		Izilda A. Rodrigues	
	Environmental Sustainability Index		José Aragão	
	of Water-Use (ISA-Água)		José M. Gascó	
	9 annexes		Julián Del Rey	
	4 Courses		Luis Carlos Hermes	
	- Training of Volunteer Water Agents		Luíza Brito	
			Marcos C. Ferreira	
			Maria Inês Ferreira	
			Osmar Abílio	
			Renato F. Guimarães	
			Roberto A. Marino	
			Ronalton Machado	
			Zacarias Vaz Filho	
1.5. Impact of Agricul-	Goals	Federal	Coordinator	Consultants : 7
ture on Groundwater	Conduct a diagnostic study of impacts	UFBA*;CODEVASF; EMBRA-	Heraldo Silva	Collaborators : 7
Resources in the Rio	and structure, as a basis for the	PA; UFBA; UFV; UFS	Consultants	Courses: 26
Verde/	establishment of a pilot system for	State	Everardo Mantovani	Workshops: 49
Jacaré Basins -BA	monitoring and data collection in the	CERB; CRH-MG; EMBASA;	Haroldo S. Dórea	Seminars: 119
	non-saturated zone, where intensive	ITEP; SRH-BA	Ignácio Evangelista	
	irrigated farming is carried out, to as-	International	Iñaki Antigüedad	
	sess the impacts on the quantities and	CYTED; LAVAL;	José Llamas	
	quality of surface and ground waters	Univ. Jaume I; Univ. País Basco	Semara de An-drade	
	available in the Basin of the Verde/		Ricardo Rodrigues	
	Jacaré River. Identify root causes and			
	recommend mitigating measures.			
	Outputs			
	Final Report			
	– Impact of Agriculture on Surface			
	and Groundwater Resources of the			
	Verde/Jacaré Basin-BA			
	9 annexes			
	2 Courses			
	1 workshop			
	1 seminar			

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II. PUBLIC AND STAK	EHOLDER PARTICIPATION			
2.1. Definition of Land	Goals	Federal	Coordinator	Consultants : 11
Use in the Lower,	Determine land-use and settlement	CODEVASF*	Rui Junqueira	Collaborators : 3
Lower-middle and	patterns in the Upper, Lower-middle		Consultants	
Upper São Francisco	and Lower São Francisco River		Albano H. Araújo	
River Basin	Basin as a basis for the management		Jurema Ribeiro	
	of water resources, preservation and		Carlos Alcebíades	
	environmental monitoring		Carlos H. Saito	
	Outputs		Francisco Fer-nandes	
	Final Report		Ileana Mota	
	- Determine Land Use patterns in the		Karla C. Rosa	
	Lower, Lower-middle and Upper the		Mário J. Gon-calves	
	São Francisco River Basin		Ricardo Marques	
	7 annexes		Roberto Rodriguez	
	1 workshon**		Verner Riebold	
	1 seminar***			
2 2A Partnershin to	Goals	Federal	Coordinator	Consultants · 6
Improve Water Quality	Improve the quality of water of the	FMBRAPA	Regina Greco	Collaborators ·
in the Ribeirão São	Ribeirão São Pedro hy means of	State	Consultants	210
Pedro-MC	community involvement and adop	CEMIC: CORASA-MC: Emotor	Edwaldo A Santana	Courses: 1.826
	tion of corrective soil-management	MG: FEAM-MG: IGAM: IMA:	Loaquim A Júnior	Workshops: 146
	measures with special focus on		José Poberto Possato	Sominars: 595
	nollution associated with secondary	Municipal	Marcelo M. Pinto	Jenniars. 375
	reads farming urban and industrial	CCPCT: CMDP: Prof São S	Roberto Rodrigues Ve	
	pativities	de Oeste	tor Dani da Soura	
	Activities.		tor Keni de Souza	
	Final Banart			
		CBHPA*		
	- Partnership to Improve water			
	Quality in the Ribeirao Sao Pedro do	CAD; ECONSULT PEDOGEO;		
	Deste-MG	TRANZDUARTE		
	10 annexes			
	66 courses			
	8 meetings			
	4 seminars			0 11 1 -
2.2B. Restoration of	Goals	Federal	Coordinator	Consultants : 7
Our Forests	Carry out environmental conserva-	ME	Francisco Soares	Collaborators : 8
	tion and restoration activities,	State	Consultants	Courses: 204
	through the planting of riparian for-	CEMIG; COPASA-MG; Emater-	Fernando Sasdelli	
	ests, soil conservation practices, en-	MG; FASF; IMA	Marília Q. Nogueira	
	vironmental education, participatory	Municipal	Bruno O. Miranda	
	management, and the strengthening	ADLUZ; CEPALUZ; Pref. Luz;	Dayvisson Paulinelli	
	of organizations in the municipality	SMMALUZ	Emerson Macedo	
	of Luz-MG	NGOs	Márcia C. da Silva	
	Outputs	ASF*; SPRLUZ	Vagno A. da Silva	
	Final Report			
	– Community-Government Partner-			
	ship and Public Participation as an			
	instrument for the Restoration of			
	Riparian Forests and Environmental			
	Conservation			
	17 annexes			
	12 Courses			

2.2C. Multi-temporal	Goals	Federal	Coordinator	Consultants : 4
Analysis of the Dynam-	Analyze the dynamics of changes in	CODEVASF*; CHESF; UFBA;	Rui Junqueira	Collaborator: 1
ics of Changes in the	the shape of the bed of the São Fran-	UFS	Consultants	
Shape of the Bed of the	cisco River (Middle stretch) in the	State	Albano H. Araújo	
Middle São Francisco	1946-1948, and 2000-2001 periods	SRH-BA	Francisco B. Rolim	
River -BA	and correlate these with natural and	International	Jurema B. Ribeiro	
	anthropogenic changes in physical	LAVAL	Karla C.Rosa	
	conditions in the area			
	Outputs			
	Final Report			
	– Multi-temporal Analysis of the			
	Dynamics of Changes in the Shape of			
	the Bed of the Middle Stretch of the			
	São Francisco River -BA			
	5 annexes			
2.4. Study of Erosion	Goals	Federal UFS*; CODEVASF;	Coordinator	Consultants : 6
of the Banks of the	Identify changes that have taken	UFF; UFG	Luís Carlos Fontes	Collaborators : 7
Lower São Francisco	place in the dynamics of the river	State	Consultants	
and its Effects on the	since the construction of large dams,	FAPESE; SRH-SE; Seplantec-	Francisco S. Holanda	
River's Sedimentation	and of the causes, the principal	SE	Ana Patrícia Casado	
Dynamics	agents and processes involved in the		Cícero dos Santos	
	dynamics of erosion on the banks of		Edgardo Latru-besse	
	the lower reaches of the São Fran-		Rivaldo dos Santos	
	cisco River		Sandra B. da Cunha	
	Outputs			
	Final Report			
	– Study of Erosion on the Banks			
	of the Lower São Francisco and its			
	Effects on the River's Sedimentation			
	Dynamics			
	2 annexes			
	1 seminar***			
III. DEVELOPMENT 0	FAN ORGANIZATIONAL FRAMEWO	RK		
3.1. Pilot study for the	Goals	State	Coordinator	Consultants : 3
Implementation of a	Provide support for the implementa-	Igam*; FEAM-MG	Elisa Boechat	Collaborators : 21
Basin Water Agency in	tion of Federal Law 9.433/97, of the	Municipal	Consultants	Courses: 71
the Rio Maranhão Sub-	corresponding State-level legislation,	CODEMA; COPASA	Antônio Leão Lanna	Meetings : 300
basin -MG	and other water-resources manage-	Pref. CNGOonhas;	Carlos Orsini Nunes	
	ment instruments foreseen in law to	Pref. Conselheiro Lafaiete;	Percival I. Souza	
	support of the Basin Committee of	Pref. Ouro Branco		
	the Rio Maranhão-MG	Private		
	Outputs	AÇOMINAS		
	Final Report			
	- Feasibility Study on the Implemen-			
	tation a Basin Water Agency in the			
	Sub-Basin of the Rio Maranhão-MG			
	3 annexes			
	2 Courses			
	11 meetings			

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Continued				
3.2. Combined Use of	Goals	Federal UFBA; UFPB	Coordinator	Consultants : 12
Surface and Ground	Identify the hydro-geological	State	Kátia Nascimento	Colaborators : 38
Waters in the Rio das	characteristics of aquifers and the	SRH-BA*	Consultants	
Fêmeas Sub-Basin -BA	hydrological characteristics of the	Municipal	Claudia Vieira	
	principal water bodies; determine hy-	Pref. Luís Ed. Magalhães; Pref.	Emanuel Barros	
	drodynamic parameters for the uti-	São Desidério	Hans Dieter Schuster	
	lization of simulation models; study	NGO	Heráclio Araújo	
	the relationships between surface and	AIBA	Fernando Genz	
	ground waters; and propose criteria	Private HIDROBASA;	José P. dos Santos	
	for the licensing of water-use rights	HIDROCON;	João Ilton de Oliveira	
	Outputs	HIDROLOG;	Lúcia Tenório	
	Final Report	MAUERBERG	Olivar Lima	
	- Combined Use of Surface and		Paulo Henrique Prates	
	Ground Waters in the Rio das		Rosane Aquino	
	Fêmeas Sub-Basin -BA		Zoltan Cavalcante	
	13 annexes			
3.3A. Training for Par-	Goals	Federal	Coordinator	Consultants : 9
ticipative Management	Institute and implement Councils	CODEVASF	Paulo Dutra	Collaborators : 40
of Water Resources and	of Users for participative manage-	State	Consultants	Courses: 76
Environmental Educa-	ment of reservoirs; train extension	SRH-PE*; EBAPE	Marisa S. Figueiroa	
tion -PE	agents for environmental education	Municipal	Déborah A. Trajano	
	activities; train users in the rational	Pref. Petrolina; Pref. Serra	Fábio C. Aquino	
	multiple-use of reservoirs; and train	Talhada	Janayna Farias Silva	
	farmers in restoration and adequate		José Carlos Borba	
	land use		José Oto de Oliveira	
	Outputs		Jucélio M. de França	
	Final Report		Luiz C. de Oliveira	
	- Participative Management of		Paulo F. Araújo	
	Water Resources in Pernambuco:			
	Experiences of Açude Jazigo and the			
	System for Ensuring Perennial Flows			
	in Riacho Pontal			
	4 annexes			
	2 Courses			
3.3B. Integrated	Goals	Federal	Coordinators	Consultants : 25
Management Plan for	Prepare a Management Plan for the	UFBA*; ANA; CHESF; CNRH;	Yvonilde Medeiros	Collaborators : 45
the the Rio Salitre	Rio Salitre Basin, by means of a par-	CODEVASF; CPRM; EM-	Maria S. Gon-çalves	Courses: 102
Basin -BA	ticipatory process, as a pilot project	BRAPA; FNMA; FNS;IBAMA;	Consultants	Meetings : 30
	to be applied in other sub-basins of	MIN; MMA; SRH-MMA	Antônio M. da Silva	
	the São Francisco River	State	Isabel Galo Martins	
	Outputs	CERB; CRA-BA;	Lenise C. B. Santos	
	Final Report	EBDA; EMBASA; FEP; SRH-	Maria E. dos Santos	
	- Integrated Management Plan for	BA; UEFS; UNEB		
	the Rio Salitre Basin	Municipal		
	11 annexes	CDAR		
	40 meetings	Municipal Administrations of		
		Campo Formoso; Jacobina;		
		Juazeiro; Miguel Calmon; Mi-		
		rangaba; Morro do Chapéu;		
		Ourolândia; Umburanas; Várzea		
		Nova		

		l		
3.4. Support for the	Goals	Federal ANA*; ANEEL; CBH-	Coordinator	Consultants : 8
creation of the do São	Collaborate in the creation of the	SF; CHESF; CODEVASF;	Rodrigo Flecha	Collaborators : 187
Francisco River Basin	São Francisco River Basin Com-	FUNAI; MIN; MMA; MME;	Consultants	CBHSF
Committee	mittee and provide support for	MP; MT	Rui Anastácio Silva	Federal: 6
	strengthening it as a means of foster-	State	Rosana Garjulli	State: 12
3.5. Support for	ing development of an institutional	ABESA; CASAL; CEMIG;	Flávia Barros	Municipal: 16
Strengthening of the	Framework for the São Francisco	COELBA; COPASA-MG;	José T. de Araújo	Civil Society: 32
São Francisco Basin In-	River Basin	EMBASA; FEP; FUNDI-	Ana de Menezes	Users: 47
tegration Committee	Outputs	FRAN: IGAM: MEB: SAAE-	Antônio Lima	Plenary and meet-
	Final Report	AL: SAAF-BA: SAAF-MG:	Maria G. Ogata	ings : 5.726
	- The Process of Creation of the São	SEIN-ERA: SEPLANTEC-BA:	Patrícia Souza Lima	
	Francisco River Basin Committee :	SERHIAL SRH-GOULEAL		
	Peport and Evaluation of Method	HERA HEDE HES HNER		
	alogical Normative and Contextual	UNIT		
	Accests	Municipal		
	Aspects			
	12 annexes	ADESA; AEAP; AEDA; CPP;		
	39 plenary and mobilization meetings	DIPCP; FUNEDI; FUTAG;		
		SAAEB; SAAECAP; SAAEJ;		
		SAAEPA;		
		Municipal Administrations of		
		Carmo do Cajuru; Ibotirama;		
		Itacarambi; Jua-zeiro; Luiz Ed.		
		Magalhães; Pão de Açúcar;		
		Pira-nhas; Pirapora; Poço		
		Redondo; Porto da Folha; Sal-		
		gueiro; Santa M. da Boa Vista;		
		São Roque de Minas; Sento Sé;		
		Três Marias		
		NGOs		
		ABIR; ABRH-PE; ACSSL;		
		AMDA; AMPPRVI; APRSS;		
		APS; ARFB;		
		ASPAVARG; ATPPRBG;		
		CBHRS; COPPABACS;		
		CPBA; CPMG; DSCAS;		
		FAEMG: FETAEMG:		
		FIEMG: FPEMG: Fund. Biodi-		
		versitas: IMAN: Inst. Guaicuv:		
		MEST: OAB-MG:		
		SAAF: SIGMNM:		
		SINDIFXTRA: SINDRP		
		SSABSECT: STC: STRDA.		
		Private		
		COODEDC.CC.CCM.CMMA		
		FRUTIVALE; IMINE; LIASA;		
		VALEE		

IV. FORMULATION OF AN INTEGRATED BASIN MANAGEMENT PROGRAM				
4.1. Promoting Public	Goals	Federal	Coordination	Consultants : 4
Involvement in the São	Promote public involvement in water-	ANA*; ABRH; CODEVASF;	José Luiz de Souza	Collaborators : 10
Francisco River Basin	resources management in the São	PRO-ÁGUA; UFAL	Consultants	Workshop: 120
	Francisco River Basin;	State	Fernando Cordeiro	Symposium: 493
	create a webpage for the São	SERHI-AL	Rui Junqueira Sandro	
	Francisco River Basin Committee;	Private	Quadros	
	produce a primer on the São Fran-	AGENCY5; TDA	Marcos Rebouças	
	cisco River; and promote workshops		Wilde C. G. Júnior	
	and meetings			
	Outputs			
	2 Final Reports			
	- Preparation of a webpage for the			
	São Francisco River Basin Com-			
	mittee			
	– VI Regional Symposium on Water			
	Resources of the Northeast			
	1 primer – 10.000 copies			
	– The São Francisco River			
	1 video/CD – 250 copies			
	– The GEF São Francisco Project			
	1 folder – 5.000 copies – The GEF			
	São Francisco Project – in Portu-			
	guese and English			
	1 Symposium			
	– VI Regional Symposium of Water			
	Resources of the Northeast – min-			
	utes			
	- GEF São Francisco webpage			
	– http://www.ana.gov.br/gefsf			
4.2A. Evaluation of	Goals	Federal	Coordinator	Consultants : 8
Economic Instruments	Evaluation of financial mechanisms,	ANA*; CODEVASF; DNOCS;	Devanir G. Santos	
for the Sustainable	especially licensing and water-use	UFBA; UFV	Consultant	
Management of Water	charges, for the sustainable manage-	State RURALMINAS; CETEC;	Guilherme E. Simão	
Resources in the Rio	ment of water resources in the Verde	DERBA; EMBASA; IGAM;		
Verde Grande Sub-	Grande River Basin	INDI; SRH-BA; UFBA		
Basin -MG/BA	Outputs	Municipal		
	Final Report	CUPASA		
	- Evaluation of Instruments	Private		
	Economic for Sustainable Water-	FAHMA		
	Resources Management in the Verde			
	Grande Sub-Basin -MG/BA			
	3 annexes			

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4.2B. Evaluation of	Goals	Federal	Coordinator	Consultant: 1
Economic Instruments	Provide a detailed framework for the	ANA*; CODEVASF; SRH-	Devanir G. Santos	
for the Sustainable	use of economic instruments for the	MMA; CHESF	Consultant	
Management of Water	management of water resources , in-		Raymundo Garrido	
Resources in the São	cluding a proposal for legislation and			
Francisco River Basin	the strengthening of administrative			
	mechanisms necessary for implemen-			
	tation of such instruments			
	Outputs			
	Final Report			
	– Proposal for Supplementary Water-			
	Use Charges in the São Francisco			
	River Basin			
	15 annexes			
4.3. Quantification and	Goals	Federal	Coordinators	Consultants : 13
Analysis of the Ef-	Characterize agricultural water-use	UFV*; CODEVASF; EMBRAPA	Márcio Mota Ramos	Collaborators : 5
ficiency of Agricultural	patterns and quantify their ef-	State	Fernando F. Pruski	
Water-Use in the São	ficiency, with a view to optimizing the	CEASA; IGAM; RuralMinas;	Consultants	
Francisco River Basin	use of water resources and increase	SEIBA; SIRBA; SRH-BA	Alessandro Teixeira	
	the availability of water in the São	NGO	Cassiana S. Rocha	
	Francisco Basin	AIBA	Demetrius da Silva	
	Outputs	Private	Gessionei Santana	
	Final Report	CI; PROPEL; VE	Lineu Neiva	
	- Quantification and Analysis of the		Luciano Novaes	
	Efficiency of Agricultural Water-use		Nori Paulo Giebeler	
	in the São Francisco River Basin		Rafael Ribeiro	
	13 annexes		Sergio O. de Avellar	
			Silvio Bueno	
			Suely Silveira	
			Wallisson Freitas	
4.4. Determine Operat-	Goals	Federal	Coordinator	Consultants : 3
ing Procedures for the	Present alternative operational	ANA*; CHESF; ONS	Marcos Freitas	
Principal Reservoirs	models for reservoirs on São Fran-	State	Consultants	
in the São Francisco	cisco River, taking into account the	CEMIG	João Eduardo Lopes	
River Basin	multiple uses of water resources.		João Luiz Brandão	
	Outputs		Mario T. de Barros	
	Final Report			
	Operating Procedures for the Princi-			
	pal Reservoirs in the São Francisco			
	River Basin			
	3 annexes			

4.5A. Diagnostic Analy-	Goals	Federal	Coordinator	Consultants : 5
sis of the São Francisco	Identify and harmonize development	ANA*; CODEVASF; IBAMA;	José Luiz de Souza	Collaborators : 2
River Basin and of its	efforts in the São Francisco Basin	MI; MMA; SRH-MMA	Consultants	
Coastal Zone – DAB	and in its coastal zone and promote	State	Fernando Rodri-guez	
	strategic and rational integration	SERHI-AL; SRH-BA; SRH-PE;	Guilherme P. Holtz	
	of such efforts for the sustainable	SRH-SE; SEMARH-MG	Arno Maschmann	
	development of the region		Rolando Gaal Vadas	
	Outputs		José Lins de A. Filho	
	Final Report			
	– Diagnostic Analysis of the São			
	Francisco River Basin – DAB			
	8 annexes			
4.5B. Formulation of	Goals	Federal	Coordinator	Consultants : 7
an Integrated Manage-	Formulation of a Strategic Action	ANA*	João Lotufo	Collaborators : 14
ment Program for the	Program for Integrated Management		Consultant	
São Francisco River	of the São Francisco River Basin and		Coordinator	
Basin and its Coastal	its Coastal Zone		Antônio Carlos T.	
Zone – SAP	Outputs		Holtz	
	Final Report		Deputy Coordinator	
	Strategic Action Program for		Fernando Rodriguez	
	Integrated Management of the São		Consultants	
	Francisco River Basin and its Coastal		Hiroaki Makibara	
	Zone - SAP		Aílton F. Rocha	
			Cézar Pimentel	
			Guilherme P. Holtz	
			Albano H. Araújo	

Continued				
4.6. Events with Public	Goals	Federal	Coordinator	Seminar: 119
Participation for the	Inform, consult and involve special-	ANA*; ANEEL; CHESF;	José Luiz de Souza	Workshops: 356
Drafting of the SAP	ists in water-resources, and other	CODEVASF; EM-BRAPA;	Consultant	Plenary: 119
(International Semi-	relevant areas, in the diagnosis and	FUNAI; IBAMA; INCRA; MI;	Guilherme P. Holtz	
nars on Protection of	proposing of corrective measures for	MMA; MPOG; MT; UFAL;		
the Marine Environ-	environmental problems in the São	UFBA; UFPE; UFS; UFV		
ment from Land-based	Francisco River Basin, in preparation	State		
Activities in the São	of the SAP.	ADAB; CASAL; CEDA;		
Francisco River Basin)	Disseminate experiences acquired in	CEMIG; COELBA; COMPESA;		
	the process of implementing water-	COMTRAP;		
	resources management actions	COPASA-MG; CRB; CREA-SE;		
	Outputs	DESO; DIB; EBDA; EMATER-		
	Final Report- Events with Public	MG; EMBASA; EPAMIG;		
	Participation and Inputs for the	FEAM-MG; FS; IEF-MG;		
	Preparation of the Strategic Action	IGAM; IMA; MEB; PM-AL;		
	Program for Integrated Management	PM-BA; PM MA; PM-MG;		
	of the São Francisco River Basin and	RURALMINAS; SEMARHN-		
	its Coastal Zone - SAP	AL; SAAE-AL;		
	1 seminar	SEAGRI-BA; SEPLANTEC-		
	Brasília-DF	BA; SECTMA; SEDU; SEES;		
	4 Regional workshops	SEMA-BA; SEMA-SE; SEMA-		
	Upper – Belo Horizonte-MG	RH-MG; SESAB; SFEBA; SRH-		
	Lower – Aracaju-SE	BA; TAMAR; UNEB; UNIT		
	Lower-middle – Petrolina-PE	Municipal		
	Middle – Barreiras-BA	ABRH-PE; ADSQ; AEDA;		
	1 plenary meeting of the São	AGUAVALE; ARFB; Cam. Mun.		
	Francisco River Basin Committee	Codigipe; CIBAPAR;		
	(CBHSF) - Penedo-AL	CPP; DIBS; DIPCP; EAC;		
		EMURB; FUNEDI; FUTAG;		
		Municipal Administrations of		
		Brejo Grande; Capela; Correntina;		
		Cristópolis; Divinópolis; Ilha das		
		Flores; Itacarambi; Jaguarari;		
		Lagoa da Prata; Luiz Ed. Magal-		
		hães; Niansivão; Pão de Açúcar;		
		Piaçabuçu; Piranhas; Pirapora;		
		Poço Redondo; Porto da Folha;		
		Rio Pires; S. J. da Lagoa; Sal-		
		gueiro; Santa M. Boa Vista; São		
		Roque de Minas; Três Marias;		
		Sento Sé;		
		SAAE; SAAEP; SAAEB; SAA-		
		ECAP; SAAEJ; SAAEPA		

		NGOs		
		AGROECO; ÁGUA e VIDA; APLB;		
		APS: AS-SEMAE: Assoc Igarapé:		
		Assoc Mevedeira:		
		Assoc Nonacolonha: Assoc & Dou		
		Assoc. Nonacolonna, Assoc. S. Dou-		
		rada; Assoc. Utinga; ATPPRBG;		
		CBHRS;		
		CBHVG; Com. Saramem; CPMAG;		
		COMPCA-NA; FAEMG; FDRSF;		
		FETAEMG; FIEMG; FJN; FPA;		
		FPAL; FPP; Fund. Biodiver-		
		sitas; Inst. Guaicuy; LCI; MEST;		
		MOPEC; MVP; OAB-MG; OAB-		
		SE; OLHA O CHICO; SIG-MNM;		
		PCH; SINDIEXTRA; SINDRP;		
		SOS Rio das Velhas; MANUEL-		
		ZÃO: SSABS-FCT: STR: STRJ:		
		UAVS		
		Private and state		
		CMM: CONSUR: Coop Pose		
		Thotizama: AEA:		
		GA; GAIA; IMNE; LIASA;		
		ODEBRECHT-SE; PETRO-		
		BRAS; SG; TV CE-MIG; UL;		
		VM; VALE;		
		VOTORANTIM-MG		
		Participatory Management		
		Boards		
		CBHSF		
		International		
		IWRN/RIRH; OEA; TNC;		
		UCAL; WFT		
4.7A. Diagnosis and	Goals	Federal	Coordinators	Consultant: 1
Proposal for Extend-	Optimize the network for the col-	ANA*; CHESF;	Augusto Braganca	Collaborators : 18
ing the São Francisco	lection of hydro-meteorological	CODEVASE: CPRM: DNOCS:	Waldemar Guima-rães	
River Basin Hydro-me-	information, and of water-quality and	SUDENE: FUR-NAS: INMET: MA	Consultant	
teorological network	sediment data in the São Francisco	State	Christian A Govastki	
	River Basin by means of a diagnostic			
	study and a proposal for extending	CEAL CEMIG CERBICETEC		
	the network	COEL BAY CODASA MCYCODAY		
	Outputs	CDA RAYDUM ALYDU FMA		
	Final Panavt	DELEBDALEme ter MC		
		DF, EBDA; Ema-ter-IVIG;		
	- Diagnosis and Proposal for Ex-	EWIBASA; ENERGIPE; FEAM-		
	tending the Hydro-meteorological	MG; IC-BA; IEF-MG; IGAM;		
	network in the São Francisco River	IMA; SEAGRI-BA; Se-mad-		
	Basin and its Coastal Zone	MG; SERHI-AL SEMARH-		
	12 annexes	DF; SEMARH-PB; SRH-BA;		
		SRH-PE; SEMARH-GO		
4.7B. Proposal for a Piezometric Monitor- ng Network in the Rio Verde Grande Sub- Basin -MG	Goals Propose a piezometric monitor- ing network to provide inputs and detailed knowledge on groundwater availability in the Rio Verde Grande Basin. Outputs Final Report - Proposal for a Piezometric Monitoring network for the Rio Verde Grande Sub-Basin –MG 1 annex	Federal ANA*; CODEVASF; CPRM State COPASA; CREDINOR; Emater-MG; IGAM; Semad-MG Municipal Pref. Capitão Enéas; Pref. Janaúba; Pref. Montes Claros NGO ABANORTE Private	Coordinator Fernando Dantas Consultant Waldemir B. da Cruz	Consultant: 1 Collaborators : 24
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		LEME		
4.7C. Reference System for Metadata- based Information	Goals Compile a database of reference information and documents on the São Francisco River Basin contained in various federal government institu- tions. Outputs Final Report - Information Network on the São Francisco River Basin- RISF 4 annexes 6 meetings 1 webpage- http://risf.ana.gov.br	Federal ANA*; ANEEL; CODEVASF; CPRM; IBAMA; INMET; SRH- MMA	<b>Coordinators</b> Augusto Bragança Waldemar Guima-rães <b>Consultants</b> Luiz Bursztyn Francisca A. Neta	Consultants : 2 Collaborators : 40 Meetings : 28
4.7D. Management Information System on Water Resources Projects	Goals Compile an information system for the monitoring of GEF funded water-resources projects Outputs Final Report- Establishment of a Management Information System on GEF Projects 1 management information system	Federal ANA* Private IKHON TOTAL	Coordinator A. Félix Domingues Consultants Alexandre M. Braga Fabiano Carvalho	Consultants : 2
29 Activities	216 events	483 institutions 50 Federal 102 State 110 Municipal		13.559 persons involved 200 Consultants 1,262 Collabora-

150 NGOs

63 Private 10 International tors

pants

12.097 Partici-

Continued.



**ANNEX III** 

## **3. CAUSAL CHAIN ANALYSIS**

## **3.1. Definition and Objective of Causal Chain Analysis**

Causal Chain Analysis is a tool used by the GEF for the definition and determination of strategic actions in hydrographic basins, and in water-resources and environmental projects. The methodology plots paths of cause and effect of significant environmental issues, with a view to tracing root causes and identifying potential, sustainable solutions. The basic premise is that addressing the cause of concern will result in a more sustainable solution than treating the symptoms of that concern in the environment.

The goal of causal chain analysis, as utilized in the Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone (SAP), is to identify essential aspects of critical problems to be addressed and to define appropriate mitigating measures and policies. In order to construct the causal chain of a specific problem or theme, the questions, "Why?" and "What is the cause?," must be asked exhaustively at technical meetings attended by specialists in various fields of knowledge, including not only water resources, but also legal and social science specialists, among others. The causal matrix or chain presented herein uses the conclusions and recommendations developed during the GEF- São Francisco Project, reflecting the views of the principal stakeholders and multidisciplinary specialists, to identify primary, secondary and tertiary causes, leading

to the identification of the root causes. The root causes, in general, tend to stem from problems of a technical, scientific, economic, institutional and socio-political nature, identified as being the most critical issues facing the Basin.

A priority rating (in relation to other causes of the same type) is attributed to each causal factor identified, and the trend (increasing, declining, or constant) for each is noted. Priorities were rated from 1 to 3, from highest to lowest; and trends were indicated by colors, with red indicating an increasing trend; yellow indicating a constant trend; and green indicating a decreasing trend. Plotting these combinations of priorities and trends assisted in the identification of the most significant problems. The primary, secondary, tertiary and fundamental causes are linked to each other by means of lines, indicating the logic and sequence of causes. These lines relate the principal aspects of the problems thus identified, and their inter-relationships, to the proposed actions for resolving them.

Under the auspices of the GEF São Francisco Project, a series of meetings was held to promote public involvement, on the part of stakeholders, specialists, community representatives, and government officials, in the identification of problems, their causes, and proposed corrective actions to be carried out. Among these were the seminars held in Brasilia (November 2001) and in Recife (January 2002), attended by Project Activity coordinators, the national and international technical coordinators, and Project consultants. Further meetings were held at the National Water Agency (ANA) in April and May 2003. The purpose of these meetings was to foster understanding and disseminate knowledge of the array of experiences revealed during the process of identifying problems and causes, and to draw up actions to be carried out. The

structure of the causal chains, as conceived and prepared during these meetings, with the participation of the various stakeholders and specialists, is shown in Figure 25.



## **3.2 Critical problems** and priority actions

Based on the results of the meetings, seminars, and workshops held by the various institutions and governmental organizations and non-governmental organizations involved, eight relevant critical problems were identified:

- Lack of institutional articulation;
- Water use;
- Insufficient water for multiple uses;

#### Table 28. Logical Framework: Critical Problems / Activities

- Degradation of the aquatic ecosystem;
- Sources of point and non-point pollution;
- Changing and inappropriate land use patterns;
- Unregulated use of groundwater, without regard to surface water;
- Limitations to navigation.

Table 28 presents a logical framework that correlates the most critical problems with each of the Activities. The causal chains for each problem trace the primary, secondary and tertiary causes to their ultimate or root causes.

	1. Lack of institutional articulation	2.Water use conflicts	3.Insufficient water for multiple uses	4.Degradation of the aquatic ecossystem	5.Sources of point and non-point pollution	6.Changing and inappro- priate land use patterns	7 Unregulated use of groundwater, without regard to surface water	8.Limitations to navigation
1.1.A - Hydrodynamic-Sedimentological Study of the Lower São Francisco, its Estuary and Adjacent Coastal Zone -AL/SE								
1.1.B – Determination of Nutrient Loads in the Region of the Mouth of the São Francisco River and the Im- pacts of Artificial Flooding								
1.1.C - Evaluation of the Contribution of Shipping to the Competitiveness of Agriculture in the São Francisco River Basin								
1.2 - Evaluation of Environmental Effects of Mining on Water Resources in the Upper Rio das Velhas Basin								
1.3 - Restoration of the Rheophyllic Ichthyofauna of the Lower São Francisco River Basin -AL/SE								
1.4 - Development of a Water-Quality Monitoring Sys- tem in the Lower-middle São Francisco -BA/PE								
1.5 - Impact of Agriculture on Groundwater Resources in the Verde/Jacaré River Basin –BA								
2.1- Determination of Land Use in the Lower, Lower- middle and Upper São Francisco River Basin								
2.2.A- Partnership to Improve Water Quality of Ribei- rão São Pedro -MG								

2.2.B - Restoring Our Forests				
2.2.C- Multi-temporal Analysis of Alterations in the Sha- pe of the Bed of the Middle São Francisco River –BA				
2.4 – Study of Erosion of the Banks of the Lower São Francisco River and its Effects on Sedimentation Dynamics				
3.1- Pilot Study on Implementation of a Basin Water Agency in the Rio Maranhão Sub-basin -MG				
3.2- Combined Use of Surface and Ground Waters in the Rio das Fêmeas Sub-basin - Bahia				
3.3.A - Training for Participatory Management of Wa- ter Resources and Environmental Education -PE				
3.3.B - Integrated Management Plan for the Rio Salitre Basin -BA				
3.4 - Support for Creation of the São Francisco River Basin Committee				
3.5 - Support for Strengthening of the São Francisco River Basin Integration Committee				
4.1 – Promotion of Public Involvement in the São Francisco River Basin				
4.2.A - Evaluation of Economic Instruments for Sustainable Management of Water Resources in the Sub-basin of the Verde Grande River -MG/BA				
4.2.B - Evaluation of Economic Instruments for Sus- tainable Management of Water Resources in the São Francisco River Basin				
4.3 - Quantification and Analysis of the Efficiency of Agricultural Water Use in the São Francisco River Basin				
4.4 - Determination of Operating Policies for the Prin- cipal Reservoirs of the São Francisco River Basin				
4.5.A – Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone - DAB				
4.5.B - Formulation of an Integrated Management Program for the Basin and its Coastal Zone - PGI/PAE				
4.6 - International Seminars on the Protection of the Marine Environment from Land-based Activities in the São Francisco River Basin				
4.7A – Diagnosis and Proposal for Expansion of the Hydro-meteorological Network of the São Francisco River Basin				
4.7B - Proposal for a Piezometric Monitoring Network for the Sub-basin of the Verde Grande River -MG				
4.7.C - Reference System for Metadata Based Infor- mation				
4.7.D – Computerized System for the Management of Water Resources Projects				

## 3.2.1. Lack of institutional articulation

Although institutional articulation was acknowledged to be an essential element for successful implementation of laws and regulations, and for the implementation of integrated-development procedures and projects, such articulation was found to be lacking throughout the Basin. This problem encompasses limited institutional capacities, especially with regard to the definition of goals and establishment of roles among the various organizations involved in the Basin, and scare or absent skills needed by the organizations to perform their functions in a coordinated, articulated and integrated manner (Figure 26).

The Activities of the GEF São Francisco Project conducted in the Basin uncovered a variety of issues relating to the lack of institutional networking links, among them:

- lack of communication skills on the part of institutions and the consequent inability of the institutions to perform their duties in a coordinated manner;
- shortages of trained staff and equipment;
- insufficient funding, exacerbated by the failure to share knowledge and experiences;
- lack of methodological and administrative continuity, especially following elections at the federal, state and municipal levels;
- lack of political articulation among spheres of government, and other institutions;
- lack of awareness, commitment and involvement on the part of communities, hampering effective and efficient participation, and the need to enhance effective public involvement;
- lack of a comprehensive understanding of the needs of society and lack of trust in the various players involved, hampering the setting of priorities;
- lack of performance indicators upon which to consolidate networking and partnerships.

Recommendations for resolving the problem of poor institutional articulation include:

- strengthening the São Francisco River Basin Committee and the application of legal instruments for promoting the sustainable use and conservation of natural resources;
- implementing mechanisms for institutional articulation and inter-sectoral coordination;
- developing and strengthening economic instruments and financial mechanisms;
- implementing and strengthening an information system for the Basin, with an ample network and wide accessibility for all;
- strengthening institutions for implementing integrated management at all levels, based upon financial and budgetary planning;
- formulating and implementing integrated basin management plans.

In order to overcome such shortcomings, it will be necessary to optimize current human resources, to apply effective administrative methods and processes, to identify and seize opportunities for networking, to provide organizational training, to share knowledge and experiences, and to secure the financial autonomy of institutions.

## 3.2.2. Conflicts over water use

The prospect of intensification of conflicts over the use of water in the São Francisco River Basin is real, in view of increasing demands for water. To allay this threat, it is necessary that an operating system for the Basin be established that addresses the multiple demands for water resources and establishes priorities in accordance with the provisions of Law 9.443/97 (Figure 4). Little concrete information is available, however, with respect to current and future regional and sectoral demands, hydro-geological potentials, and surface water availability (especially in intermittent water courses), upon which to base predictions relating to such potential conflicts.

There also is an urgent need to quantify levels of surfaceand ground-water pollution. Such information is needed for the formulation of sound fiscal and legal management mechanisms, including the allocation of water rights, the establishment of water-use charges, and other regulations governing water use. Hydraulic simulation models of water use and management in the Basin, and application of the management instruments foreseen in Law 9.433/ 97, could be of great value in predicting the development of future scenarios.

#### 3.2.3. Insufficiency of water for multiples uses

In recent decades, the Government has carried out a number of actions to foster development in the São Francisco River Basin. Most of these, however, have been sectoral approaches, the greatest benefits of which, so far, have been in the areas of electric power generation and irrigation.

According to Article 4 of Law 9.984, of 2000, it is the responsibility of the National Water Agency (ANA), to define and control operating rules for reservoirs operated by public and private agents. These rules should seek to ensure availability of water for multiple uses, in accordance with the terms of water resources plans in effect in the respective river basins. In such a context, the above-mentioned law requires that the definition of operating rules for the reservoirs of hydroelectric plants be implemented in cooperation with the Operator of the National Electricity System (ONS). At present, however, this does not appear to be taking place.

Utilization of the reservoir of a hydroelectric dam for multiple uses may affect the operation of power plants and, consequently, the volume of water that can be delivered to downstream users, in view of regulations governing maximum and minimum flows. It may also affect the capacity of the power plants to generate electric power, the volume of electricity produced, and the usable volumes of water stored and available for discharge or the production of electric power at specific times. All this implies limitations on maximum discharges over spillways and minimum discharge levels. Efforts have been made to reconcile utilization of water by hydroelectric power plants while, at the same time, providing water for other uses, such as irrigation, navigation, flood control, leisure and tourism, and ensuring water quality and the preservation of aquatic wildlife and flora. These efforts have identified the shortfall between current demands for water and the volume of water available to meet the demands. The causal chain relating the shortages of water to the multiple demands for and uses of water in the various sub-basins of the São Francisco River Basin is shown in Figure 28. In this regard, it is important to examine closely when, where and how such water shortages take place.

Problems/T	hemes	Primar (tech	y Cau: nical)	ses	Seconda (man	ary Ca ageria	uses  )	Tertiary (politica	/ Caus I - soc	es ial)	Roo (socio-ecor	t Caus 10mic-	es cultural)	Actions
Description	Priority	Description	Trend	Priority	Description	Trend	Priority	Description	Trend	Priority	Description	Trend	Priority	
								Lack of political articulation		1				
		Lack of institutional capacity		2	Lack of financial resources		2	Projects and programs too short term		1	Lack of systemic analysis		1	
		(personnel and equipment)			objectivity in the use of resources and implementation		3	Failure to treat the Basin as a management unit		1	Lack of a political, legal and institutional framework		1	Strengthening of sub-basin Committees
		Poor definition of goals and		2	Lack of stimulus and optimization		2	comprising various jurisdictions Lack of		2	Inadequate finance and		1	Formulation and deployment of a legal framework for sustainable
Lack of	1	responsibilities of the various bodies			Lack of			<ul> <li>stimulus for staff and managers</li> <li>Lack of</li> </ul>			Lack of awareness,			Application of
articulation					administrative methods and processes		▼ 1 	acceptance and recognition from society			and community participation and failure to promote such participation		1	articulation and inter- sectoral coordination
	-	_			Failure to identify development opportunities		3	Poor definition of short, medium and long-term plans		1	Poor understanding of the needs of society		1	strengthening of an information system for the Basin Formulation and
		_			Lack of organizational capacities		2	Lack of partnerships		1	Resistance to change		2	implementation of integrated basin management plans, environmental zoning, and land-use planning
		Lack of skill on the part of the institutions		1	Failure to share knowledge		1	Lack of knowledge of the competences		1	Lack of decentraliza- tion		1	as basic instruments of the planning system Strengthening of institutions
		and carry out their roles in a coordinated manner			and experiences			and responsibilities of the various players			Great geographical distances between institutions			at all levels for integrated management based on financial and budgetary planning
					Lack of updated knowledge		2			<b>•</b>	Poor alignment among federal and state laws		1	Development and strengthening of economic instruments and financial mechanisms
					Lack of a documented		1				Lack of performance indicators		2	
					the discussion among bodies						conflict- resolution procedures		1	
					Institutions lack legal and financial autonomy		2				Lack of citizen participation in the development phase		3	
					Inadequate		7				Lack of multiple action strategies for the various		1	
					to sustainable technologies		I				and conflict- resolution scenarios		7	
Key:											planning and coordination among jurisdictions		1	
Trend:	Proble	m Decreasing		Problen	n Constant		Problem	Increasing	Prio	rity: 1 More	important	2 Sec	condary	3 Less important



Figure 27. Causal chain – Water use conflits





## 3.2.4 Change and degradation of the aquatic ecosystem

The São Francisco River Basin is a very complex area. The historical development of the Basin occurred in a tumultuous and segmented manner, with little integrated planning, and within a relatively fragile institutional structure. This piecemeal and sectoral-oriented development, over time, has resulted in the degradation of the Basin and its coastal zone. Flows on great stretches of the São Francisco River have been regularized, causing alterations in the natural pattern of rise and fall of water levels during periods that coincided with the fish breeding season. Such alterations also affect the deposition of sediments and other contaminants in the system. Changes in the rates of erosion and the deposition of sediments also affect the availability of nutrients, principally in the lower stretches of the Basin and its coastal zone, further modifying the aquatic environment upon which the fish and other aquatic species depend. As a consequence, significant changes have taken place in the fresh-water fauna and flora of the River.

All of these problems, manifested in the upstream portions of the Basin, have contributed to, or are related to, environmental problems in the Lower São Francisco and in its coastal zone. Foremost among these are: sedimentation in the river; eutrophication of the reservoirs; oligotrophication of the coastal waters; alteration of river flow patterns; reduction in the numbers and diversity of populations of aquatic species and of such endangered species as sea turtles that nest on coastal beaches; and increased incidences of endemic diseases.

The causal chain relating to these critical problems to the degradation of the aquatic ecosystem is shown in Figure 29.

#### 3.2.5. Sources of point and non-point pollution

Each physiographic region of the São Francisco River Basin has its own peculiarities and specific problems, and these differ from one region to another. Among the most serious environmental problems identified in the Upper São Francisco River Basin were the direct dumping into the river of untreated urban storm- and waste-waters, and of industrial and mining effluents containing heavy metals and cyanides. Moreover, the indiscriminate use of agrochemicals and large-scale land clearing, with wood being removed for charcoal production, and land converted for agricultural cultivation, industrial uses and mining, are additional Basin-wide concerns.

The influence of the large- and medium-sized reservoirs along the course of the river tends to amplify the effects of pollution in its upper reaches, and contribute to the impacts observed in the aquatic fauna throughout the Basin. In the Middle São Francisco River Basin, the principal environmental problems relate to poor water quality stemming, to a great extent, from sources of pollution upstream, soil degradation, and increasing erosion. In the Lower-middle São Francisco River Basin, environmental problems generally relate to poor water quality, the accumulation of pollutants in reservoirs, interruption of fish migrations, high rates of soil erosion stemming from farming activities, contamination of surface and ground waters by runoff from irrigation areas, and alterations in the shape of the river bed and in the geo-morphology of the estuary owing, principally, to the presence of structures designed to regulate the River's flow.

Figure 30 shows the causal chain referent to the critical problem of increases in sources of point and non-point pollution.



Figure 29. Causal chain – Alterations and degradation of the aquatic ecosystem



Figure 30. Causal chain - Sources of point and non-point polluition

## 3.2.6. Changes in land use and inadequate settlement patterns

The various Government actions targeted at promoting development of the Basin have focused on specific economic sectors, with little concern for the integrated, planned and sustainable development of the Basin as a whole. Socio-economic problems stemming from this sectoral approach persist, and are aggravated by the significant environmental problems that have arisen in their wake. Among the most serious environmental aspects are:

- soil erosion, with the consequent silting of watercourses;
- land clearing for farming and cattle-raising;
- poorly-maintained rural roads;
- removal of timber for domestic and industrial consumption;
- degradation of the water-source areas;
- erosion of the river banks;
- loss of soil fertility;
- compaction of the soil;
- increased salinity;
- loss of beach areas;
- siltation due to the accumulation of slag and mining wastes.

The respective causal chain is shown in Figure 31.

# 3.2.7. Uncontrolled exploitation of groundwater, dissociated from surface water

The use of surface waters, principally for irrigation, has intensified the number of requests for water licenses in the states that share the Basin. In some of the sub-basins of the São Francisco River Basin, licenses have been granted for the full volume of sustainable supply, the maximum limit established on the basis of estimated mean annual discharge, thereby making it unfeasible to grant any further licenses. As a consequence, some farmers have sought to tap groundwater sources by drilling deep wells. As some of these wells produce significant quantities of water, other farmers are stimulated to engage in this unregulated exploitation of groundwater resources.

There are currently no studies to demonstrate the hydrodynamic parameters of most of these groundwater sources in the Basin, the areas involved, or the volumes of groundwater available and their potential for exploitation, much less the relationship between groundwater and surface waters. Thus, there is a need to conduct quantitative surveys of surface and groundwater resources and to compile a register of existing wells and regulate the drilling of new wells. A study is also needed to determine the relationships between surface- and ground-water resources, and to define clear criteria for the issuing of licenses to exploit the latter, in such a manner that interference with surface water uses is controlled, and the impact on production and water levels in wells minimized. Furthermore, mechanisms are needed for monitoring, controlling and enforcing regulations relating to the drilling of new wells and exploitation of groundwater resources.

Figure 32 shows the causal chain relevant to the critical problem of uncontrolled exploitation of groundwater, dissociated from surface water.

#### 3.2.8. Restrictions on navigation

Historically, inland shipping was a major factor in the development of the São Francisco River Basin, when approximately 1,900 kilometers of navigable waterway served as the gateway to, and primary transportation route within, the São Francisco Valley. In recent decades,



Figure 31. Causal chain - Alterations in land use and inadequate settlement patterns

Problems/Themes	Primary Causes (technical)	Second (mar	lary Causes nagerial)	Tertiary ( (political -	Causes - social)	Root Cau (socio-economic	ises :-cultural)	Actions
Description Priorit	y Description P	Priority Description	Priority	Description	Priority	Description	Priority	
	Lack of hydro-	Lack of hydro- geological and hydro- meteorologica 1 knowledge	1					Integrated studies, research and multi- institutional technical events in hydro- geology and hydro-meteorology
	hydro- meteorological studies	Lack of an articulated information system on	1	Lack of human and financial resources	1	Inadequate institutional, policy and legal	2	Research and implementation of efficient water use to avoid pollution of surface and groundwater
	Failure to acknowledge the strategic importance of	surface and groundwater Lack of integrated	1		1	Lack of integrated planning and coordination	1	Preparation of a groundwater information system
	groundwater resources	groundwater and surface water use policies		Lack of long- term planning		among the various institutions and jurisdictions		Implementation of registers of users, licenses, and enforcement
Uncontrolled exploitation of groundwater, dissociated from surface	Lack of awareness of the need for conservation	awareness, commitment and participation on the part of the community and failure to	2	Lack of systemic analysis	1	Lack of alignment between state and federal laws	1	Development of decision-making support systems for the integrated management
water	Lack of	promote such participation		Lack of a	1	Inadequate financing and support mechanisms	1	of surface and groundwater Development of studies on a water market
	the drilling and utilization of wells	Lack of hydro- meteorologica		licensing system		Lack of monitoring and control	1	Transfer of information and technology and dissemination of educational programs on preservation (non-pollution)
		and hydro- geological research, inventories and monitoring	d					of groundwater Application of mechanisms for inter- sectoral articulation and coordination
								Formulation and implementation of environmental zoning plans
								Institutional strengthening at all levels of the integrated management of surface and groundwater
								Development of aquifer replenishment studies and implementation of their recommendations Development and
Key:								strengthening of economic instruments and financial instruments
Trend: Probl	em Decreasing	Problem Constant	Problem	Increasing	Priority: 1 More	important 2 Se	econdary	3 Less important

Figure 32. Causal chain – Uncontrolled exploitation of groundwater, dissociated from surface water

maintenance of the waterway has been neglected and the shipping routes have fallen into disuse, owing to transport policies that focus primarily on highways and (to a lesser degree) on railways. As productive activities, and especially agricultural production, increases in the São Francisco River Basin, competition for transporting such products to market has reawakened interest in the potential of shipping on the inland waterway.

The waterway offers freight transport potential for 2.5 million tones, of which 85% is on the Pirapora-Ibotirama / Juazeiro-Petrolina stretch. The principal goods transported include: corn (maize), soy beans, soy meal, tomato paste, gypsum and fertilizers. This waterway transportation route is currently in use, but its operations are hampered lack of reliability due to frequent variations in depth that depend upon hydroelectric plant operations. In order to reestablish inland navigation as a competitive mode of transport, it is essential that the waterway be dredged, rocks and other navigational hazards removed, and signage and markers installed. Studies carried out with the aim of assessing the potential savings that could be generated by utilization of multimodal transport systems in the area of influence of the waterway, in comparison to other means of transporting freight currently in use, indicate that these could amount to US\$ 45.5 million per year, relative to the current highway freight system. Waterways offer certain advantages compared to other modes of transportation. In view of these, efforts to integrate shipping on the São Francisco River with the other modes of freight transport ought to seek to increase the competitive edge of irrigated agricultural in the Basin, and develop links with the West and Southwest regions of Brazil. Among the aspects that merit analysis in this regard are the shortage of public policies for the waterways sector and the inadequate depth of navigation channels. The process of siltation that poses barriers to shipping stems from inadequate soil management and must be addressed within the context of overall planning for the Basin.



Figure 33. Causal chain - Restrictions to Navigation





## **ANNEX IV**

## 4. LEGAL AND INSTITUTIONAL ASPECTS

## 4.1. Introduction

The legal framework that underpins institutional actions is, unquestionably, an aspect of great importance to the implementation of public policies. Water Resources Policies require a legal framework that enables the introduction of innovative approaches to integrated, decentralized and participative water management in such a way as to maintain the essential integrity of the aquatic ecosystems while meeting human needs in a sustainable manner. Guaranteeing effective implementation of such principles within the National Water Resources Policy is, most certainly, one of the greatest challenges to be met by all segments that comprise the National Water Resources Management System.

With this in mind, this Annex seeks to plot the development of the legal and institutional bases for the implementation of Water Resources Policies, both at the federal and state levels, and highlights their interfaces with the National Environment Policy. By means of an examination of the legal texts relating to water resources management in the São Francisco River Basin, the development of participatory water-resources management processes in federal legislation, and in that of the states that share the São Francisco River Basin, is summarized in tables, covering such varied aspects as: the legal and institutional framework for the implementation of the Water Resources Policy, the institutional structure of the state water resources-management systems and of the areas within their domain throughout the Basin, the collegiate bodies and other forms of organization involved with water resources management, the methodologies for supporting the public-participation process, the level of decentralization, and public participation in the implementation of management instruments.

# 4.2. Federal Legislation on water resources and related issues

There follows a listing of aspects of the interfaces of water resources management referent to: integration of the management of such resources with environmental management; integration of river basin management with that of estuarine systems and coastal zones; definition on the part of the states with respect to implementation of the National Water Resources Policy; and regulation of Law 9.433 for the implementation of the National Water Resources Management System, especially as it relates to the São Francisco River Basin.

#### Laws on policy and management systems

Decree 24.643, of July 10, 1934 – Creates the Water Code.

Law 6.938, of August 31, 1981 – Provides for the National Environment Policy, its purposes and mechanisms of formulation and application, and takes other actions.

CONAMA Resolution 20, of June 18, 1986 - (Published in the DOU of July 30, 1986) - Establishes classifications for fresh, brackish and saline water throughout Brazil, in accordance with principle uses.

The Federal Constitution of 1988 - Provides, in Article 21, paragraph XIX, that the Federal Union shall establish a National Water Resources Management System.

The United Nations Convention on Environment and Development ("Agenda 21"), Chapter 18 - Provides for the protection of the quality and supply of water resources through application of integrated development criteria for management and use of water resources.

Law 9.433, of January 8, 1997 - Institutes the National Water Resources Policy, creates the National Water Re-

sources System, regulates paragraph XIX of Article 21 of the Federal Constitution, and takes other measures.

CIRM Resolution 5, of December 3, 1997 – Provides the bases for implementation of an integrated coastal management program.

Law 9.605, of February 12, 1998 – Creates the Law of Environmental Crimes.

Law 9.984, of July 17, 2000 - Creates the National Water Agency (ANA), the federal body entrusted with implementation of the National Water Resources Policy, as part of the National Water Resources Management System, establishing rules for its activities, its administrative structure and its sources of funding.

#### Regulations

Decree 2.612, of June 3, 1998 - Regulates the National Water Resources Council, a consultative and deliberative body within the organizational structure of the Ministry of Environment, of Water Resources and of the Amazon region, and takes other measures.

Presidential Decree of June 5, 2001 – Provides for a project on the conservation and revitalization of the São Francisco River Basin, and takes other measures, comprised of actions conceived and executed, in a participatory and integrated manner, by federal, state and municipal governments, and the Federal District, and organized civil society.

Presidential Decree of June 5, 2001 - Institutes the São Francisco River Basin Committee, a collegiate body, with normative, deliberative and consultative powers, within the scope of the respective river basin, linked to the National Water Resources Council (CNRH), in accordance with the terms of CNRH Resolution 5, of April 10, 2000.

The 9th Ordinary Meeting of the National Water Resources Council, of June 25, 2003 - Creates the Rio Verde Grande Basin Committee.

## 4.3. State water resources legislation

The states, since they hold dominion over water, have approved their own laws for the administrative organization of their respective water-resources sectors. When establishing their water resources policies, the states sought, at the same time, to establish their own management systems, whereby they designed institutional arrangements for the implementation of actions relating to the sector which, in most cases, closely coordinated with environmental management. In this respect, it is worth noting that the states that share the São Francisco River Basin, and the Federal District, have developed and instituted water resources legislation, and that, in most cases, such regulations are already in effect.

## 4.3.1. Alagoas

#### Laws on policy and management systems

Law 5.965, of November 10, 1997, issued on November 11, 1997 – Provides for the State Water Resources Policy, institutes the Integrated Water Resources Management System, and takes other measures.

#### Regulations

Decree 37.784, of October 22, 1998, issued on October 23, 1998 - Regulates the State Water Resources Council.

Decree 006, of January 23, 2001 - Regulates the licensing of rights to use water resources.

#### Institutional water resources structure

Law 6.126, December 16, 1999 - Creates the State Secretariat of Water Resources.

Law 6.145, of January 13, 2000 - Provides basic guidelines for reform and organization the Executive Branch in the State of Alagoas. Delegated Law 32, of April 23, 2003 - Provides for the structure of the Executive Secretariat of Environment, Water and Natural Resources, and takes other measures.

## 4.3.2. Bahia

#### Laws on policy and management systems

Law 6.855, of May 12, 1995 - Provides for policy, management and for the state water resources plan (published in the DOU on May 13 and 14, 1995).

Law 7.435, of December 30, 1998 - Provides for the organization and structure of the public administration and the State Executive Branch.

Law 8.194, of January 21, 2002 - Provides for the creation of the State Water Resources Fund of Bahia (FER-HBA) and the reorganization of the Superintendency of Water Resources (SRH) and of the State Water Resources Council (CONERH).

Law 8.538, of December 20, 2002 - Alters the organizational structure of the public administration of the State Executive Branch.

#### Regulations

Decree 4.082, of March 27, 1995 - Approves the Bylaws of the Superintendency of Water Resources (SRH).

Decree 6.295, of March 21, 1997 - Institutes the System of Planning, Coordination and Implementation of the Water Resources Management Project of the State of Bahia.

Decree 6.296, of March 21, 1997 - Provides for licensing of the right to use water resources, and specifies offences and penalties.

Law 7.354, of September 14, 1998 - Creates the State Water Resources Council.

Decree 8.247, of May 8, 2002 - Approves the Bylaws of Superintendency of Water Resources of Bahia (SRH).

#### Institutional water resources structure

Law 6.812, of January 18, 1995 - Creates the Superintendence of Water Resources, an independent agency linked to the Secretariat of Water Resources, Sanitation and Housing.

Decree 4.082, of March 27, 1995 - Approves the bylaws of the Superintendency of Water Resources (SRH) which, at present, is linked to the State Secretariat for Environment and Water Resources.

## 4.3.3. Federal District

#### Laws on policy and management systems

Law 2.725, of June 13, 2001 - Institutes the Water Resources Policy of the Federal District, creates the Water Resources Management System of the Federal District, and revokes Law 512, of July 28, 1993.

Law 41, of September 13, 1989 - Provides for the Environmental Policy for the Federal District.

#### Groundwater

Decree 22.358, of August 31, 2001 - Provides for licensing of the right to use groundwater in the Federal District which is the subject of paragraph II, of Article 12, of Law 2.725, of June 13, 2001, and takes other measures.

#### Regulations

Decree 21.410, of August 2, 2000 - Provides for the organizational structure of the State Secretariat of Environment and Water Resources. Decree 21.170, of May 5, 2000 - Creates the Under-Secretariat of Water Resources.

Article 31 of Law 2.725 - Creates the Water Resources Council of the Federal District.

Decree 22.356, of August 31, 2001 - Regulates the Water Resources Information System of the Federal District, and takes other measures.

Decree 22.359, of August 31, 2001 - Provides for licensing of the right to use water resources in the Federal District, and takes other measures.

#### Institutional water resources structure

Decree 21.410, of August 2, 2000 - Provides for the structure of the Secretariat of State for Environment and Water Resources.

## 4.3.4. Goiás

#### Laws on policy and management systems

Law 12.603, of April 7, 1995 - Institutes the Secretariat of Environment and Water Resources (SEMARH).

Law 13.025, of January 13, 1997 - Provides for fisheries, aquaculture and protection of aquatic fauna.

Law 13.040, of March 20, 1997 - Approves the State Water and Minerals Resources Plan for the four-year period 1995/1998.

Law 13.061, of May 9, 1997 - Amends the above-mentioned State Water and Minerals Resources Plan.

Law 13.123, of July 16, 1997 - Provides for the State Water Resources Policy, and takes other measures. Law 13.456, of April 16, 1999 - Transforms the Secretariat of Environment and Water Resources into the Secretariat of Environment, Water Resources and Housing.

#### Groundwater

Law 13.583, of January 11, 2000 - Provides for conservation and takes measures for environmental protection of groundwater deposits in the State of Goiás.

#### Regulations

Decree 4.468, of June 19, 1995 - Provides for the State Water Resources Council (CERH).

Order 130, of April 22, 1999 - Regulates licensing instruments.

#### Institutional water resources structure

Law 12.603, of April 7, 1995 - Institutes the Secretariat of Environment and Water Resources (SEMARH).

Law 13.456, of April 16, 1999 – Transformed the Secretariat of Environment and Water Resources into the Secretariat of Environment, Water Resources and Housing.

Law 14.475, of July 16, 2003 - Provides for creation of the Goiás State Water Agency, and takes other measures.

## 4.3.5. Minas Gerais

#### Laws on policy and management systems

Law 11.903, of September 6, 1995 - Creates the Secretariat of State for Environment and Sustainable Development, changing the name of the Secretariat.

Law 12.503, of May 30, 1997 - Creates the State Water Conservation Program.

Law 12.581, of July 17, 1997 - Provides for organization of the Secretariat of State of Environment and Sustainable Development (SEMAD), and takes other measures.

Law 12.584, of July 17, 1997 - Changes the name of the Water Resources Department of the State of Minas Gerais (DRH-MG) to Minas Gerais Water Management Institute (Instituto Mineiro de Gestão das Águas – IGAM), provides for its reorganization, and takes other measures.

Law 13.194, of January 29, 1999, issued on January 30, 1999 - Creates the Fund for the Rehabilitation, Protection and Sustainable Development of River Basins of the State of Minas Gerais (FHIDRO), and takes other measures.

Law 13.199, of January 29, 1999, issued on January 30, 1999 - Provides for the State Water Resources Policy, and takes other measures.

#### Groundwater

Law 13.771, of December 11, 2000 - Provides for the administration, protection and conservation of groundwater in the State domain.

#### Regulations

Decree 29.961, of April 28, 1987 – Creates the State Water Resources Council.

Decree 37.191, of August 28, 1995 - Provides for the State Water Resources Council (CERH-MG), and takes other measures.

Decree 40.057, of November 16, 1998 - Provides for enforcement and control of the use of water resources in the State, under the Minas Gerais Water Management Institute (IGAM). Law 11.516, of December 30, 1997 - Provides for environmental licensing.

Administrative Order 010, of December 30, 1998 - Alters the wording of Order 030/93, of June 7, 1993.

IGAM Order 007, of October 19, 1999 - Changes the wording of item 3 of Article 8 of Order 030/93, of June 7, 1993, and creates new wording provided by Order 010/98, of December 30, 1998, that regulates the process of licensing the right to use water in the State domain.

IGAM Order 6, of May 25, 2000 - Adds a paragraph to Article 12 and changes the wording of Article 13 of Order 030/93, of June 7, 1993, and creates new wording provided by Order 010/98, of December 30, 1998, and amended by IGAM Order 007/99, of October 19, 1999, which regulates the process of licensing the right to use water within the State domain.

IGAM Order 01, of April 4, 2000 - Provides for publicity of applications for licenses for the right to use water resources.

Decree 41.136, of June 20, 2000 - Regulates the Fund for Recuperation, Protection and Sustainable Development of River Basins in the State of Minas Gerais (FHI-DRO).

Decree 41.578, of March 8, 2001 - Regulates Law 13.199, of January 29, 1999, which provides for the State Water Resources Policy.

#### Institutional structure for water resources

Decree 40.055, of November 16, 1998 - Contains the bylaws of Minas Gerais Water Management Institute (IGAM), that is linked to the Secretariat of State for Environment and Sustainable Development (SEMAD).

## Committees of the tributaries of the São Francisco River

Committees have been established for the Paracatu, Paraopeba, das Velhas, and Pará rivers, and for the tributaries of the Upper São Francisco in Minas Gerais.

Committees are in the process of being formed for the Abaeté/Borrachudo, Urucuia, Pandeiro/Calindó, and Pacuí/Jequitaí rivers.

## 4.3.6. Pernambuco

#### Laws on policy and management systems

Law 9.377, of December 1st, 1983 - Creates measures for protection of the environment.

Law 11.426, of January 17, 1997 - State Water Resources Policy and Plan: provides for an integrated water-resources management system in the State of Pernambuco.

Law 11.427, of January 18, 1997 - Provides for the conservation and protection of groundwater in the State of Pernambuco.

Law 11.629, of January 28, 1999 - Provides for the organizational structure of the State Executive Branch, creates and extinguishes positions, and takes other measures (created the Secretariat of Water Resources).

#### Groundwater

Law 11.427, of January 17, 1997 - Provides for conservation and protection of groundwater in the State of Pernambuco.

#### Regulations

Decree 19.281, of August 22, 1996 - Provides for the management of water quality and control of water pollution.

Decree 19.286, of 6 June 1997 - Approves the bylaws, structure and organization of the Secretariat of Science, Technology and Environment.

Decree 20.269, of December 25, 1997 - State Water Resources Policy and Plan: Provides for an integrated water resources management system in the State of Pernambuco.

Decree 20.423, of March 26, 1998 - Regulates Law 11.427, of January 18, 1997, and takes other measures.

Decree 23.941, of January 11, 2002 - Regulates Law 12.008, of January 1, 2001, which provides for the State Solid-Waste Policy, and takes other measures.

Decree 25.275, of March 6, 2003 - Approves the bylaws of the Secretariat of Science, Technology and Environment, and takes other measures.

Decree 25.387, of April 14, 2003 - Regulates the State Agenda 21 Program, and takes other measures.

Decree 25.388, of April 14, 2003 - Regulates the Integrated Water Resources Management Program, and takes other measures.

#### Institutional water resources structure

Decree 21.281, of February 4, 1999 - Provides for the basic structure of the Secretariat of Water Resources, and takes other measures.

## Committees of tributaries of the São Francisco River

Pajeú and Moxotó Rivers

## 4.3.7. Sergipe

#### Laws on policy and management systems

Law 3.870, of September 5, 1997 - Provides for the State Water Resources Policy, institutes the Integrated Water Resources Management System, and takes other measures.

Law 4.600, of September 13, 2002 - Amends Article 12, paragraph IV, and Article 13 of Law 3.870.

#### Regulations

Decree 18.099, of March 26, 1998 - Provides for the State Water Resources Council (CONERH/SE), and takes other measures.

Decree 18.456, of December 3, 1999 - Regulates the licensing of the right to use water resources.

Decree 18.931, of July 3, 2000 - Corrects the values of operational costs in the annex to Decree 18.456, of December 3, 1999, which regulates licensing of the right to use water resources.

Decree 19.079, of September 5, 2000 - Regulates the State Water Resources Fund (FUNERH).

Decree 19.675, of May 4, 2001 - Suspends the licensing of the right to drill new deep tube wells, for any purpose, in the region between parallels 8.770.000 m and 8.830.000 m N; MC = 390 W GR, in the sedimentary basin of the State, and takes other related measures. Decree 20.778, of June 21, 2002 - Institutes the Sergipe River Basin Committee, and takes other related measures.

#### Institutional water resources structure

The management body responsible for the State Water Resources Policy is the State Secretariat for Planning, Science and Technology (SEPLANTEC). Within the organizational structure of SEPLANTEC, the Superintendency of Water Resources was created to serve as the operational body responsible for water resources management.

## 4.4. Summary of the legislation

Table 29 shows the set of legal instruments, described in the text above, which underpin institutional actions relating to implementation of water resources policies, and the inter-relation between these policies, in the São Francisco River Basin.

Table 30 examines how the legal framework has expedited or hampered the development of participatory water-resources management processes. While it can be concluded that the principles and mechanisms established in legislation have expedited participatory management, the most significant obstacles arise when instituting new legislation, either owing to inadequacies on the part of the state in ensuring the exercise of participatory and decentralized management, or owing to contradictions contained in the complementary legislation itself.

Table 31 presents the institutional structure underlying water-resources management in the states, conceived to ensure the implementation state water resources policies. One striking characteristic is the variety of approaches followed to ensure the implementation of state water resources management systems. To what point such diversity of institutional arrangements expedites or hampers water resources management is an issue to be examined in greater depth, taking into account the conditions prevailing in each state. Table 32 lists the collegiate bodies foreseen under the respective state water-resources management systems, highlighting the way in which they are being structured, and the results obtained. The State Water Resources Councils and Basin Committees have slightly different powers in each state, but practically all of them have broad consultative and deliberative powers.

Lastly, Tables 33 and 34 provide a comparative analysis of the powers of these Councils and Committees in the states, which may also reflect their physical, social, economic, cultural, institutional and political realities. It is worth noting that, when preparing these Tables, care was taken to report only what is explicitly contained in the texts of the various laws.

Table 29	. Synopsis of legal and institutiona	al aspects			
Federal Union and States	Laws relating to policies and management systems	Groundwater	Regulations	Institutional Water Resources Structure	Committees
Federal Union	Decree 24.643 of 07/10/1934 Law 6.938 of 08/31/1981 CONAMA Resolution 20 of 06/18/1986 Agenda 21 – Chapter 18 Law 9.433 of 01/08/1997 Law 9.605 of 02/12/1998 Law 9.984 of 07/17/2000	Not covered	Decree 2.612, of 06/03/1998 Presidential Decree of 06/05/ 2001 Presidential Decree of 06/05/ 2001 (Instituted the CBHSF).	Law 9.984 of 07/17/2000	(1)
Alagoas	Law 5.965 of 11/10/1997	Not covered	Decree 37.784 of 10/22/1998 Decree 006 of 01/23/2001	Law 6.126 of 12/16/1999 Law 6.145 of 01/13/2000 Delegated Law 32 of 04/23/2003	(2)
Bahia	Law 6.855 of 05/12/1995 Law 7.435 of 12/30/1998 Law 8.194 of 01/21/2002 Law 8.538 of 12/20/2002	Not covered	Decree 4.082 of 03/27/1995 Decree 6.295 of 03/21/1997 Decree 6.296 of 03/21/1997 Law 7.354 of 09/14/1998 Decree 8.247 of 05/08/2002	Law 6.812 of 01/18/1995 Decree 4.082 of 03/27/1995	(3)
Federal District	Law 2.725 of 06/13/2001 Law 41 of 09/13/1989	Decree 22.358, of 08/31/2001.	Decree 21.410 of 08/02/2000 Decree 21.170 of 05/05/2000 Decree 22.356 of 08/31/2001 Decree 22.359 of 08/31/2001	Decree 21.410 of 08/02/2000	(2)
Goiás	Law 12.603 of 04/07/1995 Law 13.025 of 01/13/1997 Law 13.040 of 03/20/1997 Law 13.061 of 05/09/1997 Law 13.123 of 07/16/1997 Law 13.456 of 04/16/1999	Law 13.583, of 01/11/2000.	Decree 4.468 of 06/19/1995 Order 130 of 04/22/1999	Law 12.603 of 04/07/1995 Law 13.456 of 04/16/1999 Law 14.475 of 07/16/2003	(2)

State	Facilitates	Hampers
Alagoas	<ul> <li>Water Resources Law 5965, has been in effect since November 1997.</li> <li>Licensing system drafted and submitted to the State Attorneys</li> <li>The Water Resources Law establishes the principle of participatory management</li> <li>6 Water Resources Master Plans drawn up for 12 Basins</li> <li>2 Water Resources Master Plans being drafted, involving 4 basins</li> <li>Of the 44 Basins, 16 have plans in operation</li> </ul>	<ul> <li>Lack of regulations on some items of the Water Resources Law</li> <li>Licensing has not yet been issued</li> <li>State Water Resources Fund has not yet been instituted</li> <li>Outdated and outmoded classification of water bodies</li> <li>Lack of instruments and mechanisms to ensure participation in Water Resources Master Plans</li> </ul>
Bahia	<ul> <li>Management System not defined , lack of flexibility to establish methodologies</li> <li>Establishment of a state management structure prior to institution of the federal framework</li> <li>Water-Resources Management Plan, as an institutional tool for ensuring participatory management</li> <li>Close links between users and the management body facilitate organization</li> </ul>	<ul> <li>Decentralization of administrative /spatial aspects, rather than of decision making</li> <li>Lack of public involvement in decision-making</li> <li>Institutional: the Decree differs from the Law with respect to the role of committees</li> <li>The institution is not imbued with a participatory-mana- gement philosophy</li> <li>Lack of institutional articulation, owing to failure to install collegiate bodies (CERH, CIRH, COREH)</li> <li>Lack of institutional, economic and financial mechanism to ensure sustainability of management</li> </ul>
Federal District	<ul> <li>Law 2725 establishes the bases for participatory management</li> <li>Establishment of the State Council, Basin Committee and Basin Water Agency</li> <li>Enables integration of civic organizations in the state water-resources management system</li> </ul>	• Does not allow participation of informally constituted civic organizations in the management system
Goiás	• Law 1.313 provides for the creation of State Councils, Basin Committees and Basin Water Agencies	• Does not foresee participation of civic organizations in the management system
Pernambuco	• Facilitates the entire water resources management process	The legal framework has not, to date, hampered mana- gement
Minas Gerais	<ul> <li>Focus on water as a scarce good of economic value</li> <li>A implementation of a water resources policy</li> <li>Deployment of management</li> <li>Approval of licensing</li> <li>Public participation</li> <li>New types of organization</li> </ul>	<ul> <li>Adaptation to the new social-participation scenario</li> <li>Management by Basin vs. other planning units</li> </ul>
Sergipe	<ul> <li>Establishment of the State Council, Basin Committees and Basin Water Agencies</li> <li>Enables participation of civil society organizations in the state water-resources management system</li> </ul>	<ul> <li>Does not allow participation of informally constituted civic organizations in the management system</li> <li>Does not establish compensation mechanisms for transposition of water from one Basin to another</li> <li>Does not foresee participation of Basin Committees in the management of Funerh</li> </ul>

Table 30. Legal framework for participatory water resources management in the São Francisco River Basin

State	Institution	Area of competence
	Secretariat of Environment, Water and Natural	Principal state body responsible for administration, for formu-
Alagoas	Resources	lating, normalizing, coordinating and executing the State Water
		Resources Policy
Bahía	Secretariat of Environment and Water Resources	Water resources management body (semi-autonomous agency
Dama	Superintendency for Water Resources	linked to the Secretariat of Water Resources and Environment)
	Secretariat of Environment and Water	Water management body of the Federal District
Federal District	Resources – SEMARH	
	Under-Secretariat for Water Resources	
	Secretariat for Environment and Water	Coordinates preparation and implementation of the State Water
Goiás	Resources – SEMARH	Resources Plan
	Superintendency for Water Resources	
	Secretariat of Science, Technology and Environment	Water resources management body, with responsibility to plan,
Pernambuco		coordinate and execute the State Water Resources Plan
	State Secretariat of Environment and Sustainable	Formulation and coordination of the state environmental protec-
	Development – SEMAD	tion and water management policy
		Principal body for coordination of the State Environment System.
Minas Gerais	Minos Couris Institute of Motor Monogement	Motor reconnect management had reconnectible for preservation of
	Initial Gerals Institute of Water Management -	water resources management body responsible for preservation of
	IGAM (Inked to SEMAD)	the quantity and quality of water in the State, through shared ma-
		nagement of water resources, with a view to promoting multiple
		use and sustainable development
	State Secretariat of Planning, Science and	State water resources management body
Sergípe	Technology - SEPLANTEC	
	Superintendency for Water Resources - SRH	

Table 31. Institutional frameworks for state water resources management systems and areas of competence within the Basin

State	Provided for by law	Status	Results
Alagoas	State Water Resources Council	The State has mobilized and now has a legal-insti- tutional framework for the implementation of State Water Resources Policy. The State Water Resources Council was regulated on October 22, 1999	Establishment of SERHI, on December 16, 1999, has enabled convergence of actions in the water resources area
Bahia	Institutional Council for the Water Resources Management Project – CIRH Coordinating Committee – COREH State Water Resources Council River Basin Committees	Instituted by Decree 6.295, in March 1997, has not as yet been installed or regulated Created on September 14, 1998 ( Law 7 .354) has not as yet been regulated Water Users Association – AUA, Municipal Water Users Committee – Comua, and Inter-municipal Consortium	AUA: Sítio do Meio (Filadélfia),Várzea Grande (Pin- dobaçu) Lajedinho (Saúde Comua: 11 (5 at the headwaters, 4 around the Ponto Novo Reservoir and 2 downstream from the Reservoir, - Upper and Middle Itapicuru Basin)
Federal District	State Water Resources Council	Created by article 31 of Law 2.725.	
Goiás	State Water Resources Council River Basin Committees	Regulated by Decree 4.468, of June 19, 1995	
	Water Resources Council - CRH	Created in 1998, meets regularly	Currently, the Council is discussing a Licensing Manual for the Pajeú, Moxotó and Pirapama Basin Committees
Pernambuco	River Basin Committees	3 Committees created and 6 Committees in the process of being established	The Pirapama Basin Committee is the best consolidated, and is develo- ping programs for environmental education and the rational use of resources
	State Water Resources Council	Established and meeting regularly	A Legislative Seminar on "Waters of Minas", held in October 1993, established a benchmark for water resources management and provi- ded the bases for State law
Minas Gerais	River Basin Committees Regional Association Water Users	In the process of being established	12 Committees currently in force; 9 Committees in the process of formation/ mobilization : 10 Precursor Committees: I association established
	Inter-municipal Consortia		2 inter-municipal consortia
Sergipe	tate Water Resources Council	Instituted by Decree 8.099, of May 26, 1999, after an awareness-building process and discussion with various institutional players and participation of civil society	The Council is holding regular ordinary meetings, discussing and deliberating issues within its sphere of competence The Rio Sergine Basin Committee
	Kiver Dasin committees	Support for Participatory Management	has been instituted

Table 32. Collegiate bodies foreseen under the state water resources management syste	ems
take per concentre voures foreseen anaer the state nater resources management syst	

Table 33. National and State Water Resources Councils: competences								
1. Legislation, planning and institutional articulation	CNRH	AL	BA	DF	GO	MG	PE	SE
Analyze proposed amendments to legislation relating to water resources	Х							
Examine and deliberate on proposed amendments to legislation relating to water				V			V	V
resources and State Water Resources Policy				^			^	^
Delegate powers to the management body								
Establish principles and guidelines for the State Water Resources Plan and for							V	
basin master plans							~	
Propose and deliberate the State Water Resources Plan, as established by law								
Approve the proposed State Water Resources Plan			Х	Х	Х	Х	Х	Х
Approve and submit to the competent authorities annual and multi-year plans					V		V	V
referent to the water resources sector (budgetary guidelines)					^		^	^
Establish general criteria for the licensing of the right to use water resources and				X				
charges for their use	Λ			~				
Establish complementary guidelines or criteria and general standards for imple-								
mentation of the State Water Resources Policy and for application of its manage-		Х		Х		Х	Х	Х
ment instruments (concessions, state fund, licensing, cost sharing)								
Examine and approve an annual report on the status of water resources					Х	Х	Х	Х
Promote inter-institutional articulation for water resources planning within the	V		V	V				V
context of national, regional, state, and sector-specific user planning	^		^	^				^
Define, in articulation with the State Environment Council, principles and								
guidelines for common action and procedures for the purpose of establishing							Х	
uniformity for activities in the sector								
Monitor execution of the State and National Water Resources Plans and suggest	Y		Y	Y			Y	V
measures to be taken to ensure fulfillment of their goals	~		~	~			~	~
Deliberate on the signing of agreements, with public and private, national, foreign								
or international entities, for the development of water resources, whenever this		Х						
implies contracting of debt on the part of the State								

Continued...
2- Relations with River Basin Committees	CNRH	AL	BA	DF	GO	MG	ΡE	SE
Arbitrate or promote, as the final administrative appeal, negotiation of conflicts								
and disputes among users of different river basins, or among State Councils in	Х						Х	Х
the case of the National Council								
Hear appeals against decisions of the Committees, or of the State Councils in the	$\sim$	V				$\sim$	V	$\sim$
case of the National Council	^	~				^	^	^
Deliberate on projects for water utilization that are beyond the scope of the	$\sim$	V				$\sim$	V	$\sim$
Basin Committee, or of the states in the case of the National Council	^	^				^	^	^
3 - Water use charges	CNRH	AL	BA	DF	GO	MG	ΡE	SE
Approve or establish criteria or general billing standards and, in the cases of						V		X
Paraiba, Sergipe and Espirito Santo, suggest sums to be charged						Х		Х
Propose, to the Governor, billing criteria and standards for each region or river								
basin, observing the provisions of the lei and regulations								
Approve annual and multi-year programs for the investment of resources of the								
State Water Resources Fund								
4 - Classification of water bodies	CNRH	AL	BA	DF	GO	MG	ΡE	SE
Promote the classification of water bodies according to their principal categories								
of use, having consulted the Committees								
Approve the classification of water bodies according to their principal catego-								
ries of use, having consulted the community of stakeholders and, in the case of								
Paraíba, on the basis of a proposal from the management body								
Deliberate on the classification of water bodies according to categories of use, in						V		
line with guidelines issued by the State Environmental Policy Council						~		
5 – Basin Water Agencies	CNRH	AL	BA	DF	GO	MG	PE	SE
Approve the creation of Basin Water Agencies based on proposals made by the								
respective Basin Committees.								
Approve the accounting plan of the Basin Water Agency								

Table 34. River Basin Committees: Competences								
1- Legislation, planning and inter- institutional articulation	CNRH	AL	BA	DF	GO	MG	PE	SE
Propose plans, programs and projects for the utilization of water resources								V
of the respective river basin								^
Approve a plan for the utilization, conservation and protection of water								
resources of the river basin and, in the case of Alagoas, suggest criteria for		Х					Х	Х
utilization								
Approve a proposal referent to the Master Plan or Management Plan for the	V	V				V	$\vee$	V
respective river basin, as a component of the State Water Resources Plan	^	^				^	^	^
Discuss and submit suggestions to the management body on relevant issues			Y					
to the respective basins			~					
Discuss and submit suggestions to the management body on relevant issues						Y		
to the respective basins						~		
Suggest (approve in the case of Minas Gerais) agreements between bod-								
ies and entities that make up the Basin Committees and public or private		Х				Х		
national and international institutions, with interests in the river basin								
Draw up an annual calendar on demand for water								
Carry out control actions in the river basin								
Administrate problems relating to water shortages, the water balance, or		X						
water pollution in the river basin		~						
Establish, by means of technical criteria and standards, cost sharing for	х					Х		х
the multiple use of water resources	~							~
Monitor implementation of the State Water Resources Plan and of Basin								
Master Plans and suggest measures for the fulfillment of goals within the	Х	Х		Х		Х	Х	Х
scope of the river basin								
Approve (provide inputs for) annual reports on the status of water re-		Х			х		Х	
sources in the river basin								
Articulate, with adjacent or nearby Basin Committees, solutions to prob-		Х						
lems relating to groundwater from common hydro-geological sources								
2- Process of social organization	CNRH	AL	BA	DF	G0	MG	PE	SE
Promote debate on issues relating to water resources and coordinate ac-	Х					Х		
tions among the bodies responsible								
Stimulate (approve in the case of Minas Gerais) the process of organiza-								
tion of users and society (inter-municipal consortia, local, regional and							Х	
multi-sector associations of water users)								
Decide / arbitrate conflicts among users, acting as the first level	Х	Х		х		Х		Х
of deliberation								
Promote understanding, cooperation and conciliation among water re-	х	Х				Х	Х	
sources users	~					~		
3- Licensing of the right to use water resources	CNRH	AL	BA	DF	GO	MG	PE	SE
Propose, to the National and State Water Resources Councils, the exemp-	х	Х		х			Х	Х
tion of licensing for small-scale catchments, diversions and discharges								
Deliberate and approve technical opinions on concessions and licenses for								
the use of water resources within the scope of the river basin								
Approve licensing for the use of water resources by large-scale projects						X		
with potential risks of pollution within the scope of the river basin						~		

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Continued								
4 - Classification of bodies of water	CNRH	AL	BA	DF	GO	MG	PE	SE
Propose to the competent authority, a classification system for water bod-							V	
ies in the river basin							~	
Deliberate, at public hearings, proposal for the classification of water ac-		V				V		
cording to the principal categories of use		^				^		
5 Water-use charges	CNRH	AL	BA	DF	GO	MG	PE	SE
Establish criteria and standards for water-use charges and propose sums to	V	V				V		V
be charged within the scope of the river basin	^	^				^		^
Establish billing mechanisms and propose the sums to be charged				Х				
Proceed, through delegation from the licenser and the Executive Secre-								
tariats of the Basin Committees, to effect billing procedures for the use of							Х	
water resources								
Propose, to the State Water Resources Council, billing procedures and the								
sums to be charged								
Approve an Investment Plan for resources accruing from water use						Х	Х	Х
charges to be used in the respective river basin								
Contribute alternative suggestions with regard to investment of the portion								
of resources accruing from water-use charges and other resources in the		Х						
State Fund for the river basin								
Deliberate and express opinions, at the State Water Resources Council,								
on the investment of financial resources and non-returnable funding from		Х						
financial institutions and other sources								
6 - Basin Water Agency	CNRH	AL	BA	DF	G0	MG	PE	SE
Approve the budget of the Basin Water Agency, its accounting system,								
define requisites to be fulfilled by its managers, staff and employees, in		Х				Х		
accordance with career plans for employees, pay and benefits								
Discuss the contracting of engineering works and services on behalf of the		X				x		
river basin to be commissioned by the agency		~				~		
Discuss financing and investments to be carried out by the Water Agency		Х						
Submit, to the State Water Resources Council, general management crite-								
ria and standards for licensing, having consulted the Agency								



# 5. INVESTMENTS FORESEEN IN THE MULTI-YEAR ACTION PLANS (PPAs), FOR THE SÃO FRANCISCO RIVER BASIN AND ITS COSTAL ZONE

The purpose of this annex is to identify federal and statelevel governmental programs that have links or interfaces with actions proposed under the Strategic Action Program (SAP). A similar survey was conducted during the Diagnostic Analysis of the Basin (DAB). For the purposes of the SAP this survey was directed at the Multi-year Action Plans (PPAs) for the period 2004-2007. The results of this survey are presented below.

# 5.1. Surveys conducted during the DAB preparation phase

There are a variety of governmental institutions at the federal, state and municipal levels, and NGOs, engaged in activities in the São Francisco River Basin. Consequently, there are vast number of ongoing and planned projects dealing with themes that relate to the use of water resources within the Basin.

During the DAB phase, a significant number of these planned and ongoing projects and programs were identified. The following list comprises a selection of those most closely linked to actions foreseen under the GEF São Francisco Project.

At the federal level, the following planned and ongoing projects and programs, some of which are covered by the PPA 2004-2007, are regarded as having linkages with actions foreseen in the SAP.

 PROÁGUA – This program addresses water-supply services in the semi-arid region and institutional strengthening for the national water resources management system of the Ministry of Environment (MMA) and the National Water Agency – ANA, with funding from the World Bank. The aim is to increase the supply of water, through strengthening of institutions and priority investment in such engineering works as water mains, canals, dams, inter-basin transfers and tapping of groundwater sources.

- Plan for Water-resources and Environmental Revitalization of the São Francisco River Basin – The Ministry of Regional Integration (MI) proposes to conduct diagnostic studies focused upon the principal waterresources and environmental problems identified through a survey of the literature, especially in the Lower São Francisco River Basin.
- Program for Revitalization and Conservation of the São Francisco – The Ministry of Environment (MMA) seeks: (i) to improve the supply of water in the Basin, in both quantitative and qualitative terms; (ii) improve social and environmental conditions for populations living along the river banks; and (iii) promote a more equitable distribution of benefits stemming from transfer of water between river basins.
- Program for Groundwater in the Northeast (CPRM): This program aims to survey, produce and distribute information relating to the availability, circulation and use of groundwater in semi-arid regions.
- Plan for establishing a water-resources management system for the Verde Grande River Basin – The National Water Agency (ANA) aims to establish mechanisms for deploying instruments defined in legislation, especially those relating to water-use charges and licensing.
- National Water Pollution Control Plan for Hydrographic Basins (PRODES) — The National Water Agency (ANA) proposes financial incentives, in the form of payments for sewage treatment, for service providers that invest in the installation and operation of sewage-treatment plants in river basins with high levels of water pollution.
- Micro-basins Program The Ministry of Agriculture, Livestock and Supply, with Secretariats of Agriculture and rural extension and technical assistance bodies,

aims to promote integrated and sustainable rural development, using micro-basins as the basic organizational planning unit for production as a strategy for enhancing farm productivity through the use of appropriate technologies, from the environmental, economic and social standpoints.

- Ecological-Economic Zoning of the São Francisco River Valley – CODEVASF.
- Coastal Management Program (GERCO) The Ministry of Environment (MMA), Ministry of the Navy (MM), coastal states and NGOs aim to plan and administer the use of natural resources in the coastal zone, with a view to improving the quality of life of local populations, and providing adequate protection for ecosystems. This program is part of the National Coastal Management Program (PNGC), established under Law 7.661, of 16 May 1988.
- The 'Our Rivers' (Nossos Rios) Program São Francisco – The National Water Agency (ANA) serves as the sponsor for a project for conservation and revitalization of the São Francisco River Basin, established by Decree, on June 5, 2001.
- Regularization of flows from the systems of dams on the Velhas, Urucuia and Paracatu rivers – Upper and Middle – São Francisco – CODEVASF seeks to improve efficiency of the use of water resources and promote multiple forms of water use, thereby producing socio-economic and environmental gains.
- Program for development of semi-arid areas

   CODEVASF seeks, through the interconnection of river basins, to make water available in the poorest region of Brazil, using water from the São Francisco River Basin to supply a water distribution system for multiple uses, with a view to fostering sustainable development in semi-arid areas.
- Information System on Land and Water Use in the São Francisco River Valley – CODEVASF seeks to establish linkages and provide data for users on the current status of land and water use in the São Francisco River Basin.
- Study for the recovery of the stretch of the São Francisco River between the Municipalities of Ibotirama

and Juazeiro (BA) - National Water Agency (ANA) and FUNDESPA.

- Strategic Management of Water Resources on the stretch of the Preto River situated in the Federal District – National Water Agency (ANA) and SEMARH-DF.
- Managing Flows Downstream from Hydroelectric Reservoirs in the São Francisco River Basin, based upon weather forecasting – ANEEL/OMM and UFRGS/USP/INPE are currently negotiating this project with the Ministry of Science and Technology (MCT) for possible funding through the Water-Resources Fund.
- Water Producer (Produtor de Água) The National Water Agency (ANA) seeks to improve the quality and quantity of water in rural areas with springs and headwaters.
- Rational Water Use The National Water Agency (ANA) seeks to promote the rational use of water from springs, headwaters and catchments, up until its arrival at the main water bodies, with a view to minimizing waste.

There are also many programs being carried out by the states that share the Basin and by NGOs. There follows a listing of ongoing or planned projects and programs for the São Francisco River Basin and its tributaries:

#### State of Bahia:

- Program for Water Supply Purification and Recovery of Wells – CERB/BA.
- Program for Sustainable Development of Springs and River Bank Areas in the State of Bahia (Nascentes Vivas) – SRH/BA.
- Preservation and Recovery of the Salitre River Basin (BA) – SRH BA.
- Establishment and Operation of a Technical Office for the Verde Grande River Basin (MG - BA)
   National Water Agency (ANA) and FADENOR.

#### State of Minas Gerais:

- Development of Technology for Decontamination of Areas Degraded by Gold Mining, through the Recovery of Gold and Mercury (Case Study: Córrego Rico/ Paracatu/MG) – CETEC financed by CNPq/FNMA.
- Preparation of charts on water-resources availability in association with geological and geomorphologic sphere of dominion information, for use in licensing procedures by IGAM – This will constitute a methodological basis for application in river basins and has, to date, only been applied on a small scale.
- Preparation of a register of water users and of water uses for the Paracatu River Basin – IGAM will develop a methodology to make it possible to apply mechanisms that allow constant updating in the light of changes taking place within the Basin.
- Pilot project for water use and soil conservation in the sub-basin of the Entre Ribeiros streams – IGAM will apply concepts that have already been applied and tested in micro-basin projects funded by the World Bank in states such as Paraná and Santa Catarina.
- Monitoring of Water Quality in the São Francisco River Basin in the State of Minas Gerais – This project will be executed by IGAM with funding provided under a Technical Cooperation Agreement with the National Water Agency (ANA).
- Geo-environmental study of part of the headwaters of the Rio das Velhas: Water and Soil Quality – This project will be funded and executed by IGAM under a Technical Cooperation Agreement with UFMG/FUNDEP
- Project for the Revitalization of the Gorutuba River
   This project will be executed by IGAM with funds from IGAM and the Municipal government of Janaúba.
- Revitalization of the Rio das Velhas sub-basin This project will be executed by the Secretariat of Environment of Minas Gerais (SEMAD) with funding from the Ministry of Environment (MMA), in terms of a Technical Cooperation Agreement with IBAMA.
- Detailed survey of quantitative environmental impacts caused by mining on the quality and availability of sur-

face water resources in the Alto Rio Lambari – IGAM, IEF, SEMAD, EMATER/MG, CODEMA, municipal governments, Rural Community Councils, companies and municipal schools propose to develop and implement corrective emergency solutions, enhance environmental management and establish a conservation plan for the sustainable management of natural resources, and stimulate the population to become involved in issues relating to water resources management through social mobilization.

 Pilot project for the preservation, revitalization and monitoring of the Bambuí River Basin, a tributary of the São Francisco River – FUNDAGRI and EAFB.

Programs carried out by Non-Government Organizations and private entities:

- Rehabilitation of an area contaminated by heavy metals: Companhia Mineira de Metais (CMM), a metallurgical company belonging to Grupo Votorantim, has an agreement with the Federal University of Lavras (UFLA) and FAPEMIG (a research foundation) to develop a solution for restoring an area surrounding its industrial plant at Três Marias. This project is deploying a "Technology for Restoration of Forests in Areas with Soils Contaminated by Heavy Metals".
- Management and rational exploitation of the Caatinga biome and Water Catchments – NGO Caatinga proposes to evaluate changing and inadequate land-use patterns.

As this list reflects, there is an enormous variety of actions taking place throughout the Basin. It can also be observed that there is some replication of efforts and some very local treatment of common themes; however, in view of the size of the São Francisco River Basin and the diversity of the players involved, this is perhaps inevitable. Within the scope of the GEF São Francisco Project, a number of meetings were held bringing together the various players, specialists, representatives of communities and of government, with a view to identifying problems, their causes and proposing actions and corrective measures to be applied. Based upon these meetings, eight critical problems were identified. Foremost among these was 'a lack of institutional networking,' followed by: water-use conflicts; insufficient water for multiple uses; changes and degradation of the aquatic ecosystem; point and non-point sources of pollution; modification of inadequate land-use patterns; unrestrained use of groundwater, without relation to surface water; and barriers to navigation.

It was recognized that institutional networking, acknowledged to be an essential feature for ensuring compliance with laws, regulations and concrete actions in the Basin, was lacking, and that no integrated development programs are currently being carried out in the Basin. This lack of institutional links encompasses weak institutional capacities, especially with respect to the definition of goals and setting of responsibilities among the various organizations in the Basin and the identification of skills needed to enable them to carry out their duties in a coordinated, articulated and integrated manner. This has resulted in overlapping activities and dispersion of human and financial resources. One of the actions foreseen under the SAP seeks to overcome these weaknesses by providing support to the work of the recently-installed São Francisco River Basin Committee (CBHSF), and providing it with the instruments it needs to function effectively.

### 5.2. Federal Government Multi-year Action Plan (PPA) 2004-2007

#### 5.2.1. Principal programs of interest to the SAP

The Multi-year Action Plan (PPA) is submitted by the Federal Government to Congress for approval every four years. In 2003, the PPA for the 2004-2007 period was submitted in August, and approved at the end of the year. Likewise, State level PPAs must be approved by the State Legislatures. Inevitably, this scheduling posed a difficulty for the drafting of the SAP, since only at the end of the year was a final version of the PPA approved by Congress available. Thus, the SAP was drawn up based upon drafts provided by state legislatures and the National Congress which, though reflecting the intentions of the Executive Branch, had not as yet been ratified by the Legislatures.

The premises underlying the PPA drawn up by federal public bodies and presented to Congress consist of a longterm development strategy based on: social inclusion and income deconcentration, with strong GDP growth and increased employment; environmentally sustainable growth, reduction of regional disparities, underpinned by a mass consumer market, by investments and by increased productivity; reduced vulnerability to external factors through expansion of competitive activities conducive to sustained growth, and strengthening of citizenship and democracy.

This strategy comprises three mega-objectives. The first of these relates to the social dimension, envisaging social inclusion and reduction of social inequalities. The second encompasses and articulates the economic, regional and environmental dimensions, with a view to stimulating environmentally-sustainable growth and the reduction of regional disparities, through increased income and employment. The third relates to the democratic dimension, and is targeted at promoting enhanced citizenship and strengthening democracy. These three mega-objectives are in turn subdivided into 30 challenges, which represent the principal goals for overcoming obstacles to the implementation of a development strategy. These challenges are to be faced by means of 374 programs, consisting of some 4,300 actions.

Of these programs, some are of special significance in terms of their interfaces with actions proposed within the scope of the SAP and, for this reason, are described below. Under mega-objective I—Social Inclusion and Reduction of Social Inequalities—Challenge number 6 calls for implementing urban reforms and improving living conditions, access and mobility, with emphasis on quality of life and the environment. Foremost among the actions proposed under Challenge number 6 are the environmental sanitation program, that aims to provide financial support for implementation, extension and improvement of water-supply and sewerage systems, urban drainage, and collection and final disposal of urban solid waste.

Under the PPA 2004-2007, the national goals for sanitation are: to benefit 9 million families, increasing coverage rates for urban water supply from 92.4% to 93.5%, and increase coverage of urban sewerage from 50.9% to 57.9%. In the case of solid wastes, the goal is to expand household garbage collection rates from 91.1% to 93.1%, and to incriasing the proportion of municipalities that have adequate waste-disposal from 29% to 43%. These investments are conditioned on studies, plans and projects targeted toward institutional and operational development of the sanitation sector, human-resources training, and reform of regulatory frameworks, social control and evaluation, underpinned by environmental education, and soil and land-use management.

The principal strategy underlying the PPA is promotion of sustainable long-term development. As the principal environmental problems and threats to Brazil's ecosystems have demonstrated, there is a close relationship between environmental and social degradation. Evidently, if solidwaste disposal and sewage treatment are inadequate, they end up compromising the quality of water in rivers. It is for this reason that the PPA states that competent waterresources management needs to be ensured by progressive implementation of the new Water Law, and that intensive investments are needed to ensure adequate basic sanitation and solid-waste collection in large cities.

Under mega-objective II—Environmentally-sustainable growth, job and income generation, and reduction of

regional disparities—Challenge number 17, 'Stimulating infrastructure investments in a coordinated and sustainable manner,' merits special attention. One of the most significant challenges over the coming years will be to ensure the basic requisites and infrastructure necessary to satisfy the demands of society and of the economy. The PPA aims to stimulate expansion and modernization of social and physical infrastructure, with a view to eliminating bottlenecks and fostering growth, improving systemic competitiveness and thereby reducing the so-called 'Brazil-cost,' while at the same time, fulfilling its commitment to improve social and regional income distribution, while preserving the quality of the environment. The PPA aims to stimulate public-private partnerships and to enhance the roles and services of regulatory agencies. Among the PPA investment priorities for the transport and waterresources sectors, which have a direct bearing upon the SAP, the drought, and problems stemming from adverse weather conditions that afflict certain areas of Brazil, are to receive priority treatment under the PPA.

Integrated and Sustainable Development of Semi-arid Areas "Conviver" - This program involves integration of a series of irrigation projects in semi-arid areas, and includes human-resources training, development of and access to new technologies, health, sanitation, and education components. Conviver also includes a portion of the PROÁGUA Semi-Árido program, targeted toward semi-arid areas, which encompasses medium-sized public engineering works, and a social-integration component targeted toward local populations (sertanejos) in this area where shortages of water are a fact of daily life. The program will benefit some 3.7 million people and 200 communities through the provision of good quality water, by December 2005. In a parallel effort, PROÁGUA Infra-estrutura aims to increase the quantity of water available for human consumption and for farming through execution of large-scale engineering works such as dams, reservoirs and aqueducts. Around 2,000 km of aqueducts are to be built and some 5 billion cubic meters of water impounded, to serve municipalities that currently lack

reliable and safe water supplies. The program also aims to generate some 80,000 jobs.

Irrigated Agriculture Efficiency – This program is predominantly targeted to the Northeast and aims to reduce current levels of water consumption in irrigated farming by at least 10%.

Development of Irrigated Agriculture – This Program's principal focus is directed toward areas in which adverse climactic conditions undermine sustainable agriculture. The aim for the four-year period is to incorporate 100,000 hectares into public irrigation projects, currently at different stages of implementation and operation. This will correspond to an 83% increase in the area currently under irrigation.

Integration of Hydrographic Basins – The aim is to build connections between river basins in the northern portion of Northeastern Brazil, in order to ensure perennial flows of 75 m<sup>3</sup>/s in the intermittent rivers of the region, using water taken from the São Francisco River. Aside from ensuring perennial flows in these rivers, the program will afford protection to municipalities most susceptible to drought.

Challenge number 19, "Improving environmental quality and management and promoting conservation and sustainable use of natural resources, with emphasis on promoting environmental education," seeks to enhance the recent focus of public policies water resources. The PPA seeks to introduce measures for the protection of waters, not only where they are under threat in urban centers and degraded areas, but also through regulations on the use of water sources. Springs and other water bodies continue to be subject to intense pressures, not only from irregular use, settlements in headwater areas and the destruction of riparian forest, but also from the discharge of domestic and industrial wastes.

It is for this reason that the PPA seeks, through the ProBacias program, to promote implementation of the National Water Resources Policy, with a view to instituting decentralized and participatory management under the auspices of Basin Committees. This entails promoting more effective integration and shared guidelines among local, regional, state and federal water authorities. Actions will seek to support Basin Committees in the performance of their roles of control and licensing, and in instituting water-use charges. The principal aim is implementation of integrated water-resources management in six hydrographic basins.

Conservation and Rational Water Use – This program seeks, in a complementary manner, to ensure water quality and foster conservation and efficient use of water resources, through the financing of projects targeted at reuse and increasing water availability, environmental monitoring of the quality of water resources, and stimulating demonstration projects in the area of rational water use. Almost 20% of the Planet's biological resources are in Brazil. A portion of this biological heritage has already been lost, and much of the remainder is in jeopardy owing to the threats posed to some of Brazil's principal biomes. The PPA addresses these issues by placing emphasis upon the consolidation of existing conservation units and establishing new sustainable-use and permanent-protection areas, especially in regions of Cerrado, Caatinga and Atlantic Rainforest vegetation.

In general terms, the foregoing are the principal programs of the PPA 2004-2007 that correspond with actions proposed in the SAP. The most important elements to be derived from this information are the interfaces between investments foreseen under the PPAs and the actions of the SAP, in terms of priorities. This large portfolio of investments represents the Brazilian counterpart to the resources pledged by GEF, and serves as an 'endorsement' of priority and guarantee of continuity for programs under execution by the various spheres of government.

The scope of activities covered by the SAP is huge, and the number of Government actions and programs that may potentially relate to actions under the SAP is also extensive, involving various Ministries, having significant affinities with the SAP. A detailed analysis of the crosscutting themes that affect PPA programs and the São Francisco River Basin is provided in section 1.2.2, which shows that programs and actions that relate or converge with the theme of integrated development of the Basin may amount to some R\$ 63.9 billion (US\$ 21.3 billion). A more detailed examination of the Multi-year Action Plan (PPA) provides a selection of around 154 Federal programs or actions that have some type of interface with the proposed SAP actions, totaling funding of around R\$ 9,166,824,860 (US\$ 3.06 billion) over four years. However, some of this funding is earmarked for more general and comprehensive programs and actions, to be undertaken throughout Brazil, portions of which will certainly be allocated to the São Francisco River Basin. On the basis of currently available data, however, it is not possible to specify which allocations will be spent specifically in the São Francisco River Basin.

Of these 154 programs and actions under the PPA, 67 can clearly be categorized as applicable to the São Francisco River Basin, totaling R\$ 2,866,218,563 (US\$ 955.4 million). However, of this funding, a major portion is earmarked for implementation (or management transfers) of irrigation projects; for studies, projects and engineering works aimed at integration of the São Francisco River with other river basins in Northeast Brazil. This leaves 23 actions that are more directly related to revitalization of the Basin and of water supply, totaling R\$ 605.2 million (US\$ 201.70 million), for the period 2004-2007:

- 001B: Support to Priority Projects of the São Francisco River Basin Committee, using revenues from water use charges, R\$ 3,000,000 (US\$ 1.00 million);
- 001E: Support to Priority Projects of the Basin Committee of the Rio Verde Grande, using revenues from water use charges, R\$ 3,250,000 (US\$ 1.08 million);
- 3042: Integrated Management Project for Land-based Activities in the São Francisco River Basin (in Partnership with the GEF), R\$ 800,000 (US\$ 0.27 million);

- 101S: Establishment of databases on low-cost and high social impact technologies for Environmental Restoration of Vulnerable Basins, R\$ 2,000,000 (US\$ 0.67 million);
- 101T: Dissemination of best practices for sustainable water conservation, use and management, R\$ 2,500,000 (US\$ 0.83 million);
- 2272: Management and administration of Program 1305: revitalization of river basins vulnerable to environmental degradation, R\$ 1,400,000 (US\$ 0.47 million);
- 101U: Establishment of an environmental database on the São Francisco River Basin, R\$ 1,800,000 (US\$ 0.60 million);
- 4538: Monitoring of water quality in the São Francisco River Basin, R\$ 4,000,000 (US\$ 1.33 million);
- 3429: Engineering works for the revitalization and recovery of the São Francisco River, R\$ 289,520,564 (US\$ 96.50 million);
- 5472: Recovery and control of erosion in the São Francisco River Basin, R\$ 70,000,000 (US\$ 23.03 million);
- 101P: Recovery and preservation of the São Francisco River Basin, R\$ 10,301,926 (US\$ 3.40 million);
- 4540: Reforesting of the headwaters, banks and degraded areas of the São Francisco, R\$ 20,000,000 (US\$ 6.67 million);
- 5859: Improvements to the navigation channel of the São Francisco River Waterway, R\$ 25,000,000 (US\$ 8.30 million);
- 0228: Inland Shipping: Provide freight and passenger transport services on the waterway of the São Francisco River, R\$ 28,073,723 (US\$ 9.36 million);
- 5910: Building of the São Francisco water main, 42.5 km in length, in the State of Sergipe, R\$ 23,000,000 (US\$ 7.67 million);
- 3536: Water resources infrastructure study for the Xingó Canal project in the State of Sergipe, R\$ 9,990,557 (US\$ 3.33 million);
- 7764: Study for the establishment of multiple-use reservoir systems in the Velhas, Urucuia and Paracatu

river basins in the State of Minas Gerais, R\$ 1,450,000 (US\$ 0.48 million);

- 5676: Expansion of water supply to the 3rd stage of the Feijó Aqueduct sub-system, 232 km in length, in the State of Bahia (PROÁGUA Semi-Árido), R\$ 10,125,000 (US\$ 3.37 million);
- 5896: Expansion, recovery and automation of irrigation systems in the Alto Sertão and Sertaneja districts of the State of Sergipe (PROÁGUA Semi-Árido), R\$ 49,286,059 (US\$ 16.40 million);
- 5808: Establishment of water supply systems in the São Francisco and Jequitinhonha Valleys of the State of Minas Gerais (PROÁGUA Semi-Árido), R\$ 17,200,000 (US\$ 5.70 million);
- 5334: Implementation of the Arco Íris canal in the State of Pernambuco, R\$ 60,000 (US\$ 0.02 million);
- 5336: Implementation of the Canal do Sertão Pernambuco in the State of Pernambuco, R\$ 32,360,000 (US\$ 10.80 million);

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• 5340: Implementation of the Canal Terra Nova in the State of Pernambuco, R\$ 60,000 (US\$ 20,000).

Brazilian projects that interface with the GEF goals identified by the National Water Agency (ANA) total R\$ 88,5 million (US\$ 29.50 million), representing an average of R\$ 22.1 million (US\$ 7.37 million) per year, to be disbursed through governmental programs prescribed in Multi-year Action Plan activities for the period 2004-2007 (see Table 1 35).

In parallel, estimated major expenditures of CHESF, that are to underwrite its proposed four-year development actions, are worth mentioning. The planned utilization of the Sobradinho-Itaparica drop is likely to absorb investments of approximately R\$ 3,000,000,000 (US\$ 1 billion). It must, however, be stressed that this proposal is not specifically addressed in the federal Multi-year Action Plan (PPA) and that, in accordance with Brazilian law, concessions for the installation and operation of hydroelectric power plants must be awarded through auctions, with the participation of the private sector.

Table 35. Selected PPA Programs with links to the SAP								
PPA Program 2004-2007	Action	In Charge	Value 2004-2007					
	3429. Engineering works for Revitalization and recu-	D.0.T	R\$ 289.5 million					
1305. Revitalization of	peration of the São Francisco River	IVI I	US\$ 96.5 million					
river basins in vulnerable	101P. Recuperation and preservation of the São	ΝΛΝΛΑ	R\$ 10.3 million					
situations and subject to	Francisco River Basin	WIWA	US\$ 3.4 million					
environmental degradation	5472. Recuperation and control of erosion in the São	CODEVASE	R\$ 70.0 million					
	Francisco River Basin	CODEVASE	US\$ 2.3 million					
0229. São Francisco Cor-	5859. Upgrading the shipping channel on the São	MT	R\$ 25.0 million					
ridor	Francisco River Waterway		US\$ 8.3 million					
1204 Water concernation	3042. Integrated Management Project for land-based		D¢ 0.9 million*					
1504. Water conservation,	activities in the São Francisco River Basin (in part-	MMA/ANA						
rational use and quality	nership with GEF)		039 0.27 minion					

US\$ 1 = R\$ 3 \*Includes only spending on GEF São Francisco Project coordination

Other proposals put forth by CHESF merit mention:

- Implementation of a real-time geo-referenced waterresources monitoring system, between Morpará and the river mouth;
- Restoration of riverside areas degraded by urban settlement or alterations in the river flow system;
- iii. Survey and registration of water uses along the stretch between Morpará and the river mouth;
- iv. Expansion and adaptation of sewage treatment systems in towns relocated after filling of reservoirs;
- v. Feasibility studies on generation of artificial floods designed to upgrade morphological and environmental conditions of the main river-bed;
- vi. Reforestation of degraded areas and rehabilitation/ recuperation of riparian forests; and
- vii.Reabilitation/recuperation of ichthyofauna in the Lower-middle and Lower São Francisco, including the expansion of the Fisheries Station at Paulo Afonso for producing of native-species fry for populating the river and reservoirs; amounting to a total of R\$ 12,000,000 (US\$ 4 million).

For research and development in 2004, CHESF is obliged by law to disburse some R\$ 40,000,000 (US\$ 13.3 million), of which half is to be invested directly by the company, and the other half credited to the Ministry of Science and Technology's National Science and Technology Development Fund (FDNCT/MCT), a significant proportion of which may be allocated to the São Francisco River Basin.

Merely for the purposes of illustration, there follows a list of the principal programs and actions that have an interface with the SAP, including those mentioned above. The complete list is to be found in section 1.2.2, that provides an examination of cross-cutting themes.

### a. Principal programs of the PPA 2004-2007 within the scope of the Ministry of Environment (MMA):

From an examination of the cross-cutting themes described in item 1.2.2, it can be seen that funding foreseen under the PPA 2004-2007 for the Ministry of Environment amounts to R\$ 932,596,393 (US\$ 310.8 million), of which R\$ 124,943,022 (US\$ 41.6 million) is for the 2004 period. Some Programs are specifically targeted at the São Francisco River Basin, whereas others are national or regional in scope, and it is not as yet clear whether any of this funding is to be targeted at any specific river basins. Of the Programs that comprise the PPA, the following stand out as having direct links with the SAP, or great potential for multiplication of results, in view of their compatibility with actions foreseen in the SAP:

Program 0497: Management of the National Water Resources Policy. This Program aims to coordinate the planning and formulation of sector-level policies and the evaluation and control of programs in the area of water resources, with funding foreseen of R\$ 39,390,708 (US\$ 13.1 million) for the four-year period, of which R\$ 7,400,927 is earmarked for 2004. The principal Action under this program is number 0718, Support for the Establishment of State Water Resources Management Systems, with funding foreseen of R\$ 10,423,472, of which R\$ 2,250,000 is earmarked for 2004.

Program 1107: ProBacias. This Program aims to implement the Integrated River Basins Management System, with funding foreseen of R\$ 67,160,000 (US\$ 22.4 million) for the period 2004-2007, of which R\$ 15,844,000 (US\$ 5.3 million) is for the year of 2004. Many of these Actions interface with the SAP, for example:

- Action 001B: Support to priority projects of the São Francisco River Basin Committee, using revenues from water-use charges, with foreseen funding for the fouryear period of R\$ 3,000,000 (US\$ 1.00 million).
- Action 001E: Support to priority projects of the Basin Committee of the Rio Verde Grande, using revenues from water-use charges, with foreseen funding for the four-year period of R\$ 3,250,000 (US\$ 1.08 million).

- Action 4925: Preparation of basin plans for rivers within the domain of the Federal Government, with foreseen funding for the four-year period of R\$ 21,310,000 (US\$ 7.10 million).
- Action 2977: Inspection of the use of water resources, with foreseen funding for the four-year period of R\$ 4,326,000 (US\$ 1.44 million).
- Action 4980: Support for the establishment of Basin Committees and Basin Agencies for rivers within the domain of the Federal Government, with foreseen funding for the four-year period of R\$ 9,750,000 (US\$ 3.25 million).
- Action 7270: Establishment of a system of charges for the use of water resources in river basins, with foreseen funding for the four-year period of R\$ 2,300,000 (US\$ 0.77 million).
- Action 7406: Implementation of a water quality warning system, with foreseen funding for the four-year period of R\$ 3,060,000 (US\$ 1.02 million).
- Action 7278: Implementation of the National Information System on Water Resources, with foreseen funding for the four-year period of R\$ 2,600,000 (US\$ 0.87 million).
- Action 4926: Issuing of licenses for the right to use water resources in the domain of the Federal Government, with foreseen funding for the four-year period of R\$ 3,200,000 (US\$ 1.06 million).
- Action 6251: National System for the Prevention of Critical Hydrological Events, with foreseen funding for the four-year period of R\$ 5,200,000 (US\$ 1.73 million).

Program 1304: Water Conservation, Rational Use and Quality. This Program aims to improve the efficiency of use of water resources, the conservation and quality of water, with funding foreseen of R\$ 41,078,173 (US\$ 13.70 million) for the period 2004-2007, of which R\$ 4,750,000 is earmarked for 2004. The principal actions that might have an interface with the SAP are:

 Action 2396: Evaluation of surface water, with foreseen funding for the four-year period of R\$ 1,800,000 (US\$ 0.60 million).

- Action 4937: Support to projects for the diffusion of scientific and technological research for the sustainable development and conservation of water resources, with foreseen funding for the four-year period of R\$ 7,350,000 (US\$ 2.45 million).
- Action 2957: Support to projects for recovery and conservation of river basins, with foreseen funding for the four-year period of R\$ 19,200,000 (US\$ 6.40 million).
- Action 4929: Support to demonstration projects for rational water use, with foreseen funding for the fouryear period of R\$ 5,900,000 (US\$ 1.97 million).
- Action 3042: Integrated Management Project for Land-based Activities in the São Francisco River Basin (in partnership with GEF), with foreseen funding for the four-year period of R\$ 800,000 (US\$ 0.27 million).

Program 1305: Revitalization of River Basins Vulnerable to Environmental Degradation. This Program aims to revitalize the São Francisco River Basin, and other Basins in situations of high environmental risk, and to promote the prevention and mitigation of potential impacts stemming from the establishment of high-priority national projects or of heightened anthropogenic activities causing a high degree of environmental damage in such Basins, with funding foreseen of R\$ 401,522,490 (US\$ 133.80 million) for the four-year period, and R\$ 28,000,000 for 2004. There follows a listing of the principal actions that have interfaces with the SAP and the funding foreseen for the period 2004-2007.

- Action 101S: Establishment of a database on low-cost and high social impact technological experiences, relating to environmental recovery of vulnerable basins, with foreseen funding for the four-year period of R\$ 2,000,000 (US\$ 0.67 million).
- Action 101T: Dissemination of best practices for conservation, use and sustainable management of water, with foreseen funding for the four-year period of R\$ 2,500,000 (US\$ 0.83 million).

- Action 101U: Establishment of an environmental database on the São Francisco River Basin, with foreseen funding for the four-year period of R\$ 1,800,000 (US\$ 0.60 million).
- Action 4538: Monitoring of water quality in the São Francisco River Basin, with foreseen funding for the four-year period of R\$ 4,000,000 (US\$ 1.33 million).
- Action 3429: Engineering works for the revitalization and recovery of the São Francisco River, with foreseen funding for the four-year period of R\$ 289,520,564 (US\$ 96.50 million).
- Action 5472: Recovery and control of erosion in the São Francisco River Basin, with foreseen funding for the four-year period of R\$ 70,000,000 (US\$ 23.30 million).
- Action 101P: Recovery and preservation of the São Francisco River Basin, with foreseen funding for the four-year period of R\$ 10,301,926 (US\$ 3.43 million).
- Action 4540: Reforestation of headwaters, riverbanks and degraded areas of the São Francisco, with foreseen funding for the four-year period of R\$ 20,000,000 (US\$ 6.67 million).

# b. Principal programs of the PPA 2004-2007, within the scope of Ministry of National Integration (MI):

From an examination of the cross-cutting themes, described in section 1.2.2, it can be seen that certain Programs of the Ministry of National Integration are specifically related to the project for revitalization or translolation of water from the São Francisco River, whereas others are of a more specific nature. From this set of Programs the following were identified as having the most direct interfaces with actions foreseen in the SAP:

Program 0379: Development of Irrigated Agriculture. This Program aims to expand the area under irrigation as a means of promoting regional development, with a view to creating jobs and improving the distribution of income, and has funding foreseen of R\$ 715,913,650 (US\$ 238.6 million) for the period 2004-2007, of which R\$ 119,795,000 (US\$ 39.9 million) is for 2004. Essentially, it comprises actions that aim to set up irrigation projects in the various states that share the semi-arid area, many of them to be located within the São Francisco River Basin. It also includes drainage, registration of irrigation, and studies for the planning and management of regional development and land use.

Program 1036: Integration of River Basins. This Program aims to integrate the water resources in Basins where little water is available and expand the supply of water in such Basins, with funding foreseen of R\$ 2,030,744,919 (US\$ 676.9 million) for the period 2004-2007, of which R\$ 40,500,000 (US\$ 13.5 million) is for 2004. There follows a listing of the principal actions that have interfaces with the SAP and the funding foreseen for the period 2004-2007.

- Action 101M: Integration of the São Francisco River with the Paraíba, Moxotó and Ipojuca River Basins (East Axis), with foreseen funding for the four-year period of R\$ 395,000,000 (US\$ 131.7 million).
- Action 5912: Study on the integration of the Paranaíba and Grande River Basins with the São Francisco River Basin in the State of Minas Gerais, with foreseen funding for the four-year period of R\$ 20,000,000 (US\$ 6.7 million).
- Action 5904: Study on the integration of the São Francisco River with the Vaza-Barris, Itapicuru and Jacuípe basins (South Axis), with foreseen funding for the four-year period of R\$ 145,000,000 (US\$ 48.3 million).
- Action 5906: Study on the Integration of the Tocantins and São Francisco River Basins, with foreseen funding for the four-year period of R\$ 13,000,000 (US\$ 4.3 million).
- Action 5900: Integration of the São Francisco River with the Jaguaribe, Piranhas-Açu and Apodi River Basins (North Axis), with foreseen funding for the four-year period of R\$ 1,355,000,000 (US\$ 451.7 million).

Program 0515: PROÁGUA Infra-Estrutura aims to increase the quantity of water available for human consumption and for farming through execution of largescale engineering works such as dams, reservoirs and aqueducts, with foreseen funding of R\$ 395,670,490 (US\$ 131.9 million) for the period 2004-2007, of which R\$ 54,850,000 (US\$ 18.3 million) is for 2004. The principal actions that have great potential for interface with actions foreseen in the SAP are:

- Action 4516: Registration of water-resources infrastructure in the Northeast, with funding foreseen for the fouryear period of R\$ 1,450,000 (US\$ 0.48 million).
- Action 5910: Construction of the São Francisco Water Main, 42.5 km in length, in the State of Sergipe, with foreseen funding for the four-year period of R\$ 23,000,000 (US\$ 7.67 million).
- Action 3536: Study of water-resources infrastructure of the Xingó Canal Project in the State of Sergipe, with foreseen funding for the four-year period of R\$ 9,950,557 (US\$ 3.32 million).
- Action 7764: Study for the establishment of a multiple-use reservoir system in the Velhas, Urucuia and Paracatu River Basins in the State of Minas Gerais, with foreseen funding for the four-year period of R\$ 1,450,000 (US\$ 0.48 million).
- Action 2822: Maintenance and conservation of engineering works for water-resources infrastructure, with foreseen funding for the four-year period of R\$ 13,391,000 (US\$ 4.46 million).

Program 1047: Integrated and Sustainable Development of Semi-Arid Areas – Conviver. This Program stems from PROÁGUA Semi-árido and aims to reduce the socioeconomic vulnerability of populations in semi-arid areas susceptible to drought, with resources amounting to R\$ 528,072,033 (US\$ 176.0 million) for the period 2004-2007, of which R\$ 97,744,410 (US\$ 32.6 million) is for 2004. These actions are spread throughout the semi-arid areas and foremost among them are: (i) Expansion of water supply through implementation of the 3rd Stage of the Feijão Water Main sub-system; (ii) Expansion, recovery and automation of integrated systems in Alto Sertão and Sertaneja in the State of Sergipe; (iii) Support to projects for technology innovation for family farming in semi-arid areas; (iv) Support to integrated sanitation projects in municipalities with populations of up to 20,000 people in semi-arid areas; (v) Sustainable development for land-reform settlements in semi-arid areas of the Northeast; (vi) State systems for water resources management in semiarid areas; (vii) Establishment of water supply systems in the São Francisco and Jequitinhonha Valleys of the State of Minas Gerais (PROÁGUA Semi-Árido); (viii) Implementation of the Canal do Sertão Pernambuco in the State of Pernambuco.

Program 1038: Transfer of Management of Public Irrigation Projects. This Program aims to transfer the management of commercially-feasible public irrigation projects to farmers, with funding foreseen of R\$ 187,068,557 (US\$ 62.4 million) for the period 2004-2007, of which R\$ 58,406,683 (US\$ 19.5 million) is for 2004. Many of these irrigation projects are located in the São Francisco River Basin and will have interfaces with the SAP, since users will need assistance and guidance on how to manage the systems, and technical training in rational use of water resources.

# c. Principal programs of the PPA 2004-2007 within the scope of The Ministry of Cities:

From an examination of the cross-cutting themes, described in section 1.2.2, it can be seen that the principal program of the Ministry of Cities is number 0122: Urban Environmental Sanitation, with the aim of expanding coverage and improving the quality of urban environmental sanitation services. With funding of R\$ 2,866,326,810 (US\$ 955.4 million) for the period 2004-2007, of which R\$ 579,300,000 (US\$ 193.1 million) is for 2004, the principal actions with potential interfaces with the SAP are:

 Action 0636: Support for implementation and expansion of water supply systems in municipalities with populations of over 15,000, with foreseen funding for the four-year period of R\$ 75,201,900 (US\$ 25.1 million).

- Action 002M: Support for implementation and expansion of water supply systems in municipalities with populations of over 30,000, with foreseen funding for the four-year period of R\$ 261,000,000 (US\$ 87.0 million).
- Action 0654: Support for implementation and expansion of sewage collection and treatment systems in municipalities with populations of over 15,000, with foreseen funding for the four-year period of R\$ 148,190,000 (US\$ 49.4 million).
- Action 002L: Support for implementation and expansion of sewage collection and treatment systems in municipalities with populations of over 30,000, with foreseen funding for the four-year period of R\$ 505,000,000 (US\$ 168.3 million).
- Action 7652: Establishment of household sanitation improvements for disease prevention and control, with foreseen funding for the four-year period of R\$ 294,292,000 (US\$ 98.1 million).
- Action 3861: Implementation, expansion or improvement of the public water supply systems for disease prevention and control in municipalities with populations of up to 30,000, with foreseen funding for the four-year period of R\$ 690,118,000 (US\$ 230.0 million).
- Action 7654: Implementation, expansion or improvement of the public sewage collection networks for disease prevention and control in municipalities with populations of up to 30,000, with foreseen funding for the four-year period of R\$ 423,728,000 (US\$ 141.2 million).
- Action 2905: Removal of pollution from river basins, with foreseen funding for the four-year period of r\$ 76,078,000 (US\$ 25.3 million).

### d. Principal programs of the PPA 2004-2007, within the scope of the Ministry of Mines and Energy:

From an examination of the cross-cutting themes, described in section 1.2.2, it can be seen that funding foreseen under the PPA 2004-2007 for the Ministry of Mines and Energy that has repercussions on the São Francisco River Basin is allocated under Program number 0294, Energy in the Northeast Region, that aims to meet the energy needs of the Northeast Region, with funding of R\$ 1,591,547,165 (US\$ 530.5 million) for the four-year period. The principal actions that have interfaces with the SAP and the sums foreseen for the period 2004-2007 are as follows:

- Action 3378: Establishment of a transmission system associated to the Xingó Hydroelectric Plant in Bahia, with foreseen funding for the four-year period of R\$ 2,904,149 (US\$ 0.97 million).
- Action 3370: Establishment of a transmission system for the Northeast, with foreseen funding for the fouryear period of R\$ 741,571,924 (US\$ 247.20 million).
- Action 3390: Irrigation of lots in the 20,599 ha resettlement area of the Itaparica plant in the state of Bahia, with foreseen funding for the four-year period of R\$ 265,231,409 (US\$ 88.40 million).

## e. Principal programs of the PPA 2004-2007, within the scope of Ministry of Science and Technology:

From an examination of the cross-cutting themes, described in section 1.2.2, it can be seen that funding foreseen under the PPA 2004-2007 for the Ministry of Science and Technology that has potential repercussions on the São Francisco River Basin is allocated under Program number 1122, Science, Nature and Society. This Program aims to expand scientific and technical knowledge on interactions between nature, science and society, and contribute to an understanding of processes of change and to improving the lives of the population. With funding foreseen of R\$ 168,276,883 (US\$ 56.1 million) for the period 2004-2007, R\$ 37,366,843 (US\$ 12.4 million) is for 2004. However, these actions are thinly spread throughout Brazil and it is not clear how they will affect the São Francisco River Basin. The principal actions that may have a potential interface with the SAP are:

- Action 2209: Training of human resources in research and development for the water-resources sector (CT-Hidro), with funding foreseen of R\$ 16,110,000 (US\$ 5.37 million) for the four-year period.
- Action 2223: Support for institutional projects for research in the water-resources sector (CT-Hidro), with funding foreseen of R\$ 63,450,000 (US\$ 21.10 million) for the four-year period.
- Action 0894: Support for the establishment and modernization of state weather, climate and water-resources monitoring centers, with funding foreseen of R\$ 4,475,500 (US\$ 1.49 million) for the four-year period.
- Action 2378: Gathering and sharing of hydro-meteorological data, with funding foreseen of R\$ 75,388,843 (US\$ 25.10 million) for the four-year period.

## f. Principal programs of the PPA 2004-2007, within the scope of the Special Secretariat of Aquaculture and Fisheries:

From an examination of the cross-cutting themes, described in section 1.2.2, it can be seen that resources under the PPA 2004-2007 for the Special Secretariat of Aquaculture and Fisheries that have repercussions in the São Francisco River Basin are those in Program number 1224, Aquaculture and Fisheries in Brazil. This Program aims to increase national fisheries production, with funding foreseen of R\$ 24,917,537 (US\$ 8.30 million) for the period 2004-2007, of which R\$ 5,340,040 (US\$ 1.78 million) is for 2004. The action with the principal interface with the SAP is number 5352, Intensive farming of fish in net tanks in rivers and large reservoirs, with resources foreseen over the four-year period of R\$ 18,685,971 (US\$ 6.23 million).

# g. Principal programs of the PPA 2004-2007 within the scope of Ministry of Transport:

From an examination of the cross-cutting themes, described in section 1.2.2, it can be seen that of the Programs that comprise the PPA 2004-2007 for the Ministry of Transport, the following have more direct interfaces with actions foreseen in the SAP: Program 0229: São Francisco Corridor, that aims to reduce freight costs in an area encompassing the States of Bahia, Sergipe and the north of Minas Gerais. Within this Program, Action 5589, Improvements to the Navigation Channel of the São Francisco River Waterway, merits attention, with funding foreseen of R\$ 25,000,000 (US\$ 8.30 million) for the period 2004-2007, of which R\$ 10,000,000 (US\$ 3.33 million) is for 2004.

Program 0223: Maintenance of Waterways, that aims to maintain the physical and operational features of inland waterways, with funding foreseen of R\$ 33,500,000 (US\$ 11.20 million) for 2004, and of R\$ 143,575,793 (US\$ 47.80 million) for the period 2004-2007.

Program 0228: Inland Navigation, that provides passenger and freight services on the São Francisco River waterway, with funding foreseen of R\$ 6,404,783 (US\$ 2.10 million) for 2004, and of R\$ 28,073,723 (US\$ 9.36 million) for the period 2004-2007.

# 5.2.2. Cross-cutting themes addressed by Programs of the PPA that affect the São Francisco River Basin

All of the Programs and Actions of the PPA 2004-2007 were examined and those with cross-cutting effects upon the actions of the SAP were identified, as were those with potential multiplying effects. The overall sum of all these actions amounts to R\$ 9,626,216,981 (US\$ 3.2 billion) for 2004. For the period 2004-2007, these actions under the PPA represent R\$ 63,921,411,216 (US\$ 21.3 billion).

There is no information in the PPA linking the programs with the agencies responsible. For this reason information linking Programs and actions of the PPA with the bodies responsible was based upon information provided by ANA, the results of which are presented in Tables 36 to 53. It should be noted that many of the programs are of a multi-sector nature, involving more than one agency. The distribution of programs among the various agencies, shown in Tables 36 to 53, should thus not be interpreted too rigidly, since allocations effected through one ministry may not necessarily, for example, mean that it is wholly responsible for the program.

Table 36 Dreakame of the Ministry of Environment (MMA)
Table Jo Frograms of the winnstry of Environment (wiwA)

		Sums exp	ressed in Reais (R\$)
Number	Agency/Program/Action	2004	2004 to 2007
44000	ENVIRONMENT	124,943,022	932,596,393
0052	Environmental Education for Sustainable Societies: Stimulate and support environmental education for the fostering of values and social relations, knowledge, skills, attitudes and competences that contribute to overall participation in the building of sustainable societies	6,244,940	26,368,849
4232	Training of human resources for environmental preservation and control in mariti- me and port areas		87,091
6270	Environmental education for water resources	600,000	3,250,000
2972	Education for the conservation of biodiversity	35,000	182,400
2965	Support for integrated environmental education projects	3,000,000	11,000,000
4932	Training of environmental educators	1,229,979	5,313,702
2272	Program management and administration	1,379,961	6,235,656
1997	Implantation of the Brazilian Information System on Environmental Education		300,000
0497	Management of the National Policy for Water Resources (Águas do Brasil): Co- ordinate the planning and formulation of sector-specific policies and the evaluation and control of programs in the area of water resources	7,400,927	39,390,708
718	Support for the Establishing of State Water Resources Management Systems	2,250,000	10,423,472
7728	Drafting of a National Water Resources Plan	1,200,159	6,676,345
2039	Formulation of a National Water Resources Policy	2,000,000	11,441,319
4999	Establishment of a National Water Resources Council	1,850,768	10,293,222
2272	Program Management and Administration	100,000	556,350
499	Protected Areas of Brazil (Parques do Brasil): Expand and consolidate the national system of conservation units and other protected areas, with a view to protecting Brazil's biodiversity and a fair sharing of the resulting benefits	27,073,515	133,411,795
500	Brazilian Ecotourism (Turismo Verde)	3,351,500	20,134,923
0506	National Forests (Florestas Sustentáveis): Promote sustainable management and multiple use of public and private native forests and the sustainable expansion of planted forestry	737,866	4,157,328
0786	Support for the recovery of ecosystems and degraded areas	737,866	4,157,328
512	Ecological and Economic Zoning: Promote ecological and economic zoning in order to plan and organize, sustainable land use, thereby providing inputs for terri-torial planning in Brazil	3,456,520	74,055,759
0516	Live without Pollution (Brasil Joga Limpo): Reduce pollution and control risks stemming from exposure to hazardous wastes and industrial residues	2,467,600	14,299,118
6083	Training for chemical safety	130,000	696,133
2979	Control of agrochemicals and of other chemical substances	1,500,000	8,900,000
7499	Establishment of an Information Network on Chemical Safety		217,744
7596	Implementation of the National Registration System for Emissions and Transfers of Pollutants	130,000	696,133
6085	Mapping of contaminated areas	357,600	1,914,902
6084	Laboratory support for inspection and control	350,000	1,874,206
0104	Sustainable Fisheries Resources: Promote sustainable use of fish stocks, reconci- ling commercial exploitation with conservation needs	6,246,000	28,648,253
2094	Licensing requirements for sports fishing	700,000	3,901,134
2946	Environmental control over activities in the fisheries sector	1,000,000	5,700,000
2963	Support for projects for the sustainable use of fish stocks	3,000,000	11,000,000

Continued			
3528	Evaluation of the sustainable potential of living resources in the exclusive econo-	120,000	642,546
	mic zone – REVIZEE	-,	
2272	Program management and administration	1,426,000	7,404,573
	Urban Solid Wastes: Encourage the reduction, reutilization and recycling of		
	urban solid wastes, expand coverage and increase efficiency and efficacy of public		
8007	cleaning services, collection, treatment and final disposal, and promote social	2,890,000	3,158,139
	enhancements and inclusion of garbage sorters through the elimination of dumps		
	and child labor		
1080	Combating Desertification: Reduce the rate of increase of desert areas or of areas	2 423 000	12 660 525
1000	undergoing desertification	2,429,000	12,000,929
4971	Training of local extension agents for combating desertification	100,000	556,350
7380	Preparation of a National Action Plan for Combating Desertification (PAN)	700,000	3,894,441
4984	Support for projects for combating desertification	1,500,000	7,500,000
2272	Program management and administration	123,000	709,734
	Environment and Climate Change: Promote control over polluting activities,		
1084	thereby contributing to improving the quality of the environment and reducing the	2,048,654	11,437,978
	effects of pollutants upon the global climate		
6451	Preparation of an inventory of air and water pollutants	406,154	2,174,901
6450	Preparation of an Annual Report on Environmental Quality within the scope of the Brown Agenda	142,500	763,077
6452	Support for development projects and studies on climate action	1,500,000	8,500,000
1107	ProBacias: Implement the Integrated Basin Management System	15,844,000	67,160,000
0010	Support to priority projects of the São Francisco River Basin Committee using		2 000 000
0018	revenues from water-use charges		3,000,000
001 E	Support to priority projects of the Basin Committee of the Rio Verde Grande using	250.000	2 250 000
UUIE	revenues from water-use charges	250,000	5,250,000
4936	National Register of Water Resources Users	1,000,000	530,000
4928	Training for management, participation and protection of water resources	750,000	3,800,000
4925	Preparation of Basin Plans for rivers within the Federal Domain	7,035,000	21,310,000
2977	Control of the use of water resources	600,000	4,326,000
4980	Support for the establishment of Basin Committees and Basin Agencies for rivers	2.250.000	9,750,000
	within the Federal Domain	_//	,,,
2272	Program management and administration	459,000	4,834,000
7270	Establishment of a System of Charges for the Use of Water Resources in River Basins	600,000	2,300,000
7406	Implementation of a Water Quality Warning System	500,000	3,060,000
7278	Implementation of the National Information System on Water Resources	800,000	2,600,000
4926	Issuing of licenses for the right to use water resources within the Federal Domain	900,000	3,200,000
( ) 5 1	Support for projects for the prevention of impacts of droughts and National floods	700.000	E 200.000
6251	System for the Prevention of Critical Hydrological Events:	700,000	5,200,000
	(Action 3857 - Preparation of Brazil's Agenda 21) Agenda 21: Promote the		
	internal absorption of the principles and strategies of Brazil's Agenda 21 in the		
1102	formulation and implementation of national and local public policies, by means	4 184 000	16 886 501
1102	of strategic decentralized and participatory planning, to establish the priorities	4,104,000	10,000,001
	defined and executed through government-society partnerships, from a sustainable		
	development perspective		
4921	Preparation and implementation of local Agenda 21 Projects	381,500	1,963,991
4913	Support for local Agenda 21 Projects	3,000,000	10,500,000
4910	Continuous training for local Agenda 21 Projects	262,000	906,448

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Continued			
2272	Program management and administration	310,000	2,732,909
4911	Implementation of Brazil's Agenda 21	230,500	783,153
1210	Risk Prevention and Combating Environmental Emergencies: Prevent risks and combat environmental emergencies	6,500,000	29,576,665
7549	Preparation of a National Plan for Prevention and Response to Emergencies and Environmental Accidents	500,000	2,400,000
6062	Facing up to environmental emergencies	500,000	2,250,000
6124	Control of degradation, pollutants and contaminants	2,500,000	11,600,000
4989	Mapping of areas at risk from oil spills		1,985,822
7567	Implementation of the Environmental Monitoring Center	500,000	950,000
6080	Environmental Licensing of Activities in the Electric Power and Transport Sectors	2,500,000	10,314,936
4246	Prevention of water pollution and response to oil spills		75,907
1304	Conservation, Rational Use and Water Quality: Improve efficiency of the use of water resources, conservation and water quality	4,750,000	41,078,173
2396	Evaluation of surface water resources		1,800,000
4937	Support for projects for the diffusion of scientific and technological research for the sustainable development and conservation of water resources	1,000,000	7,350,000
2957	Support for projects for the recovery and conservation of river basins	2,700,000	19,200,000
4929	Support for demonstration projects for rational water use	500,000	5,900,000
2272	Program management and administration	350,000	6,028,173
3042	Integrated Management Project for Land-based Activities in the São Francisco River Basin (in partnership with GEE)	200,000	800,000
1305	Revitalization of River Basins Vulnerable to Environmental Degradation: Revitalize the São Francisco River Basin, and other basins in situations of high en- vironmental risk, and promote the prevention and mitigation of potential impacts stemming from the establishment of national priority projects or of increased and concentrated atrophic action that can cause severe damages to such basins	28,000,000	401,522,490
101S	Establishment of a database on low cost and high social impact technological experiences relating to the restoration of environmentally vulnerable basins	500,000	2,000,000
101T	Dissemination of best practices of conservation, use and sustainable management of water	500,000	2,500,000
2272	Program management and administration	200,000	1,400,000
101U	Establishment of an Environmental Database on the São Francisco River Basin	300,000	1,800,000
4538	Monitor water quality in the São Francisco River Basin	1,000,000	4,000,000
3429	Engineering works for the revitalization and recovery of the São Francisco River	10,000,000	289,520,564
5472	Recovery and control of erosion in the São Francisco River Basin	10,000,000	70,000,000
101P	Recovery and preservation of the São Francisco River Basin	500,000	10,301,926
4540	Reforestation of headwaters, banks and degraded areas of the São Francisco	5,000,000	20,000,000
1332	<b>Conservation and Recovery of Brazil's Biomes:</b> Conserve and restore such Brazilian biomes as the Atlantic Forest and the grasslands of the South (Campos Sulinos), the Cerrado and Caatinga and the Coastal and Maritime Zones	1,324,500	8,649,189

Note: Some programs of a multi-sector nature involve two or more agencies. The resources may not necessarily be under the responsibility of the same body.

Table 37. Pr	ograms of the Ministry of National Integration (MI)		
		Sums e	xpressed in Reais (R\$)
Number	Agency/Program/Action	2004	2004 to 2007
53000	NATIONAL INTEGRATION	539,033,256	4,768,734,334
0379	<b>Development of Irrigated Agriculture</b> (Irrigation and Drainage): Expand the area under irrigation as a means of promoting regional development, with a view to creating jobs and improving the distribution of income	119,795,000	715,913,650
5248	Building of the Serra da Batateira Water Main, 18.8 km in length, in the State of Bahia		3,300,000
2272	Program management and administration	7,725,000	39,512,964
5314	Installation of the Baixio de Irecê Irrigation Project with 59,375 ha in the State of Bahia	15,020,000	166,991,950
5902	Installation of the Bananeiras Irrigation Project with 400 ha in the State of Alagoas		12,100,000
1654	Installation of the Canal do Sertão Alagoano Irrigation Project with 40,000 ha in the State of Alagoas	10,300,000	117,300,000
5252	Installation of the Flores de Goiás Irrigation Project with 26,500 ha in the State of Goiás	5,000,000	16,000,000
1622	Installation of the Jacaré-Curituba Irrigation Project with 3,150 ha in the State of Sergipe	5,250,000	19,250,000
5320	Installation of the Jaíba Irrigation Project – 1st Stage- with 4,678 ha in the State of Minas Gerais	18,000,000	18,000,000
5322	Installation of the Jaíba Irrigation Project – 3rd stage - with 12,000 ha in the State of Minas Gerais	1,000,000	62,700,000
3770	Installation of the Luiz Alves do Araguaia Irrigation Project with 10,790 ha in the State of Goiás	10,000,000	53,480,000
1686	Installation of the Marituba Irrigation Project with 3,136 ha in the State of Alagoas	1,000,000	1,040,000
5242	Installation of the Piau Irrigation Project with 2,000 ha in the State of Alagoas		3,300,000
5262	Installation of the Platôs de Guadalupe Irrigation Project with 13,639 ha in the State of Piauí	5,500,000	5,560,000
5260	Installation of the Pontal Irrigation Project with 7,862 ha in the State of Pernambuco	14,000,000	43,601,917
5316	Installation of the Pontal Sobradinho Irrigation Project with 27,930 ha in the State of Pernambuco	1,000,000	12,600,000
1666	Installation of the Rio Bálsamo Irrigation Project - 1st Stage- with 700 ha in the State of Alagoas	7,000,000	32,000,000
5250	Installation of the Rio Preto Irrigation Project with 7,600 ha in the Federal District		300,000
1692	Installation of the Salitre Irrigation Project with 31,305 ha in the State of Bahia	15,000,000	99,776,819
1608	Installation of the Três Barras Irrigation Project with 1,456 ha in the State of Goiás	4,000,000	9,100,000
1138	Sustainable Urban Drainage: Promote sustainable management of urban drainage through structural and non-structural measurers aimed at prevention, control and minimization of the impacts of urban and river-bank flooding	15,040,000	81,865,984
580	Support to states and municipalities in preparation of sustainable urban drainage projects		3,500,000

Table 37. Progra	ams of the Minis	trv of Nationa	l Integration (N

Continued				
570	Support for implementation and expansion of sustainable urban drainage		10 200 55/	
5/8	systems		18,300,556	
1662	Drainage works	15,040,000	60,065,428	
1037	Efficiency of Irrigated Farming: Increase the efficiency of resources used in irrigated farming	1,575,000	10,134,242	
7016	National Register of Irrigated Agriculture	150,000	450,000	
4811	Train agents for the diffusion of technologies for the development of irrigation	250,000	1,700,000	
4712	Train human resources for irrigated farming	250,000	1,750,000	
4845	Train users of irrigation projects in the efficient use of water	250,000	1,800,000	
2272	Program management and administration	575,000	3,134,242	
5858	Modernization of technologies for allotment systems	100,000	1,300,000	
	Regional Development and Land Use Policy Management (Management of			
0757	the National Integration Policy): Coordinate the planning and formulation of sector-specific policies and the evaluation and control of Programs in the areas of regional development and land use	1,752,000	19,545,722	
4550	Training for the irrigated farming sub-sector		360,000	
	Studies for the planning and management of regional			
4534	development and land use	745,474	11,367,500	
	Establishment, promotion and coordination of the network for regional			
6421	development of public policies, programs and relevant actions for regional	1,006,526	7,818,222	
	development and land use at each sphere of government			
1036	Integration of River Basins: Integrate water resources in basins with little	40,500,000	2,030,744,919	
101M	Water available, and increase the volume of supply			
	Moveté and Indiues Divers (East Avis)	5,000,000	395,000,000	
	Study on the integration of the Paranaíba and Grande River Basins with the			
5912	São Francisco River Basin in the State of Minas Gerais	6,000,000	20,000,000	
	Study on the integration of the Tocantins and Parnaíba River Basins with those			
5908	of the Jaguaribe Poti Acaraú and Piranhas Rivers	4,000,000	38,000,000	
	Study on the integration of the São Francisco River Basin with the Basins of			
5904	the Vaza-Barris. Itapecuru and Jacuíne Rivers (South Axis)	7,000,000	145,000,000	
	Study on the integration of the Basins of the Tocantins and			
5906	São Francisco Rivers	4,000,000	13,000,000	
2272	Program management and administration	1,500,000	6,744,919	
	Integration of the Jaguaribe/Poti/Longá, Acaraú/Coreaú, Mamanguape/	, ,	, ,	
101N	Gramame/Apodi/Piranhas Acu River Basins in the northern part of	8,000,000	58,000,000	
	the Northeast			
	Integration of the São Francisco River with the Jaguaribe, Piranhas-Açu and			
5900	Apodi River Basins (North Axis)	5,000,000	1,355,000,000	
	Productive Organization of Poor Communities- Pronager: Promote training			
	and organization of production for poor communities, with a view to promoting		-/	
8009	their participation in the labor market, through the use of their own resources	6,500,000	36,580,500	
	and economic vocations			
	Prevention and Preparation for Emergencies and Disasters: Reduce damage			
1027	and losses caused by natural and man-made disasters	5,055,000	34,230,000	
678	Support to engineering works for prevention of disasters	92,000	1,636,000	
662	Support to specialized bodies in accident prevention	1,500,000	13,000,000	
4848	Train Civil Defense Agents	738,000	5,438,000	
2272	Program management and administration	675,000	5,106,000	
5476	Implementation of the National Disaster Management Center	2,000,000	4,000,000	
4641	Public interest advertising	50,000	3,550,000	
4634	Conduct disaster simulation exercises	,	1,500,000	

Continued			
	PROÁGUA Infra-Estrutura; Increase the supply of high-quality water for		
0515	human consumption and for production by means of execution of strategic	54,850,000	395,670,490
	engineering works: dams, reservoirs and water mains		
4516	Register of Water Use Infrastructure in the Northeast	300,000	1,450,000
	Building of the São Francisco Water Main with 42.5 km in the State of		
5910	Sergipe		23,000,000
1716	Building of the Oeste Water Main with 721 km in the State of Pernambuco	500,000	84,459,000
2/ 17	Building of the Jucazinho Water Main with 243 km in the State	4 500 000	15 250 000
2047	of Pernambuco	4,500,000	15,350,000
3715	Building of the Berizal Dam in the State of Minas Gerais	23,000,000	32,936,000
3735	Building of the Congonhas Dam in the State of Minas Gerais	500,000	8,522,000
3521	Building of the São Pedro Dam in the State of Pernambuco		8,014,000
3445	Building of the Córrego João Leite Dam in the State of Goiás		21,000,000
5924	Building of the do Peão Dam in the State of Minas Gerais		4,500,000
5308	Building of the Jequitaí Dam in the State of Minas Gerais	14,000,000	137,825,283
1674	Building of the Dam in the Rio Poxim Basin in the State of Sergipe		1,158,692
3327	Building of the Vacaria Dam in the State of Minas Gerais		4,500,000
101K	Building of the Frei Damião Water Main System with 435.5 km in the State		8.000.000
	of Pernambuco		
3536	Building of the Water Supply System of the Leiteira Basin with 118 km in the		300.000
	State of Alagoas		
	Study of the water-resources infrastructure of the Xingó Canal Project in the	5.000.000	9.990.557
	State of Sergipe	-,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
7764	Study for the Establishment of Reservoir Systems for Multiple Uses Velhas,		1,450,000
	Urucuia and Paracatu River Basins in the State of Minas Gerais		,,
2272	Program management and administration	3,350,000	16,855,220
2822	Maintenance and conservation of engineering works for	3,600,000	13,391,000
	water-resources infrastructure	, ,	, ,
4512	Operation and maintenance of dams		2,568,738
4641	Public service advertising	100,000	400,000
1047	Integrated and Sustainable Development of Semi-Arid Areas - Conviver:	07 744 430	500 070 000
1047	Reduce socioeconomic vulnerabilities of populations in semi-arid	97,744,410	528,072,033
	areas subject to drought		
	Expansion of the water supply through implementation of the 3rd Stage of		
5676	the Feijão Water Main - with 232 km in the State of Bahia (PROAGUA Semi-	10,125,000	10,125,000
	Arido)		
5670	Expansion of the Caetité Water Supply System in the State of Bahia (PROA-		7,813,600
	GUA Semi-Arido)		
5896	Expansion, recovery and automation of irrigated systems in Alto Sertão and	3,192,614	49,286,059
	Sertaneja in the State of Sergipe (PROAGUA Semi-Arido)		
566	Support to projects for technology innovation for family farming	2,500,000	19,600,000
	in semi-arid areas		
582	Support to integrated sanitation projects in municipalities with populations of	4,000,000	142,799,241
4/50	up to 20,000 in semi-arid areas	7 ( 00 000	0.073.050
4652	Iraining for integrated and sustainable development in semi-arid areas	1,600,000	9,871,250
4514	raining for the installation of small-scale community hydroelectric plants	800,000	4,800,000
3//4	Construction water-storage units	500,000	1,000,000
5160	of the Northeast	9,000,000	68,306,400
1852	Desalinization of water - Projeto Água Boa	700,000	2,500,000

Continued			
2020	Establishment of state water resources management systems in semi-arid	0.000.000	28 000 000
5028	areas	9,000,000	28,000,000
4532	Support for productive projects in Brejos da Barra	200,000	2,319,421
4650	Strengthening of associations and cooperatives in semi-arid areas	500,000	2,706,250
2272	Program management and administration	1,325,000	41,092,230
7766	Establishment of public wells	1,820,000	4,320,000
5700	Establishment of a water supply and sewage system in Diamantina in the State	0.07/.000	0.07/.000
5782	of Minas Gerais (PROÁGUA Semi-Árido)	2,916,000	2,916,000
503.4	Establishment of a water supply system in Araçuaí in the State of Minas	( ] = = 0.00	30355.000
5814	Gerais (PROÁGUA Semi-Árido)	6,155,000	13,155,000
5/50	Establishment and integration of the water supply system of Santana with the	5 000 000	70.050.00/
5658	145 km water main system in the State of Bahia (PROÁGUA Semi-Árido)	5,000,000	12,352,386
	Establishment of water supply systems in the São Francisco and Jequitinhonha		
5808	Basins in the State of Minas Gerais (PROÁGUA Semi-Árido)		17,200,000
	Establishment of simplified water supply systems for small localities using a		
5666	central standard in the State of Bahia (PROÁGUA Semi-Árido)	4,800,000	4,800,000
5334	Implementation of the Arco Íris Canal in the State of Pernambuco		60,000
5336	Implementation of the Canal do Sertão in the State of Pernambuco	5,000,000	32,360,000
5340	Implementation of the Terra Nova Canal in the State of Pernambuco		60,000
	Cleansing of storage units, wells, pumps, pipelines and production facilities		,
4885	(Água para quem tem Sede)		1,950,000
4656	Maintenance of small-scale community hydroelectric plants	85,000	4,526,250
4654	Social organization and participatory management in semi-arid areas	500,000	2,706,250
6277	Production of micro-algae as an alternative food in semi-arid areas	100,000	400,000
	The Luís Gonzaga Water Main System with 118 km in the State	,	,
5822	of Pernambuco (PROÁGUA Semi-Árido)		13,120,900
	The Agreste Integrated Water Main System in the State of Sergipe		
5898	(PROÁGUA Semi-Árido)	10,510,000	10,510,000
	The Piauitinga Integrated Water Main System in the State of Sergipe		
5894	(PROÁGUA Semi-Árido)	9,876,000	9,876,000
	Integration of the Water Supply System of Planalto and Barra do Choça with		
5892	a 21 km Water Main in the State of Bahia (PROÁGUA Semi-Árido)	7,539,796	7,539,796
	Promote Sustainability of Sub-Regional Spaces - Promeso: Expand the		
	autonomy and sustainability of sub-regional spaces, by means of social orga-		
1025	nization, the development of endogenous potential and strengthening of the	49,355,000	270,776,527
	productive base, with a view to reducing inter- and intra-regional disparities		
	Promotion and Economic Insertion of Sub-Regions - Promoter: Promote, in		
	dynamic sub-regional spaces competitive development of activities with econo-		
1022	mic potential in local economies within a regional national and international	52,085,163	399,143,710
	context		
	Transfer of Management of Public Irrigation Projects: Transfer the manage-		
1038	ment of nublic irrigation projects that can be managed by the users	58,406,683	187,068,557
2272	Program management and administration	1 675 000	7 954 242
	Transfer the Management of the Baixio de Irecê Irrigation Project with	1,075,000	1,754,242
5324	13 057 ha in the State of Rahia	262,358	5,690,057
	Transfer the Management of the Barreiras Norte Irrigation Project with		
5328	2 093 ha in the State of Rahia	1,000,550	2,511,370
	Transfer the Management of the Rebedouro Irrigation Project with 2 001 ba		
5330	in the State of Pernambuco	185,000	990,380

Continued			
5332	Transfer the Management of the Betume Irrigation Project with 2,865 ha in	655,000	2,498,897
	the State of Sergipe		
5990	the State of Pernambuco	154,500	953,180
5338	Transfer the Management of the Boacica Irrigation Project with 3,334 ha in	535,000	2,951,140
	the State of Alagoas		
5956	Transfer the Management of the Brumado Irrigation Project with 2,470 ha in the State of Bahia	304,250	703,590
5094	Transfer the Management of the Cachoeira II Irrigation Project with 230 ha	161 750	551 000
2960	in the State of Pernambuco	151,750	551,090
5346	Transfer the Management of the Ceraíma Irrigation Project with 408 ha in the		192,236
	State of Bahia		1,1,2,2,0
5364	Transfer the Management of the Cotinguiba/Pindoba Irrigation Project with	375,000	2,070,536
	2,237 ha in the State of Sergipe		
5378	Transfer the Management of the Curaça Irrigation Project with 4,350 ha in	563,000	3,203,798
	Transfer the Management of the Custódia Irrigation Project with 262 ha in		
5988	the State of Demambuco	115,875	715,385
	Transfer the Management of the Estreito I/III Irrigation Project in the State		
5446	of Bahia	356,000	1,886,222
	Transfer the Management of the Estreito IV Irrigation Project with 646 ha in		
5456	the State of Bahia	366,000	2,044,581
	Transfer the Management of the Formosinho Irrigation Project with 448 ha in		
5458	the State of Bahia	65,000	340,525
52/0	Transfer the Management of the Formoso Irrigation Project with 12,048 ha in	2 ( ( ( , 0.2.0)	15 000 025
5368	the State of Bahia	2,666,020	15,992,935
5370	Transfer the Management of the Gorutuba Irrigation Project with 5,286 ha in	400.000	2 005 536
570	the State of Minas Gerais	400,000	2,075,550
5436	Transfer the Management of the Itiúba Irrigation Project with 894 ha in the	300 000	1 571 653
5150	State of Alagoas	500,000	1,571,055
5664	Transfer the Management of the Jacarecica II Irrigation Project with 1,592		900,000
	ha in the State of Sergipe		,
5954	Transfer the Management of the Jacurici Irrigation Project with 305 ha in the	77,250	1,504,354
	State of Bania		
7758	the State of Minac Corais	2,776,776	19,861,545
	Transfer the Management of the Lagoa Grande Irrigation Project with 1 538		
5438	ha in the State of Minas Gerais		211,942
	Transfer the Management of the Luís Alves Irrigation Project do Araguaia		
5652	- 1st Stage- with 1.884 ha in the State of Goiás	200,000	1,070,000
	Transfer the Management of the Mandacaru Irrigation Project with 419 ha in		
5440	the State of Bahia	180,000	631,437
	Transfer the Management of the Maniçoba Irrigation Project with 4,293 ha in	_/	
5442	the State of Bahia	561,000	3,150,931
54(0	Transfer the Management of the Marituba Irrigation Project with 3,136 ha in	154150	2 5 4 2 0 1 7
5460	the State of Alagoas	154,159	2,543,017
5348	Transfer the Management of the Mirorós Irrigation Project with 2,145 ha in	865.000	5 803 250
0+0	the State of Bahia	005,000	5,005,250
5984	Transfer the Management of the Moxotó Irrigation Project with 7,202 ha in	1,131,250	11.114.690
J704	the State of Pernambuco		

Continued			
E2E4	Transfer the Management of the Nilo Coelho Irrigation Project with 18,857	1 407 020	0 114 022
5354	ha in the State of Pernambuco	1,487,039	9,114,833
6250	Transfer the Management of the Nupeba/Riacho Grande with Irrigation	1 666 000	0 5 2 4 0 2 3
5556	Project 4,770 ha in the State of Bahia	1,555,000	9,524,021
5630	Transfer the Management of the Pindorama Irrigation Project with 1,005 ha	800.000	800.000
	in the State of Alagoas	800,000	800,000
5360	Transfer the Management of the Pirapora Irrigation Project with 1,236 ha in		172 521
5500	the State of Minas Gerais		172,521
5376	Transfer the Management of the Pontal Sul Irrigation Project with 3,958 ha	116.240	2 70/ 110
5770	in the State of Pernambuco	110,240	2,794,110
5380	Transfer the Management of the Propriá Irrigation Project with 1,177 ha in	520.000	1 876 429
5500	the State of Sergipe	520,000	1,070,427
5976	Transfer the Management of the Quixabinha Irrigation Project with 293 ha in	194 670	79/ 180
5770	the State of Ceará	174,070	774,100
5382	Transfer the Management of the Salitre Irrigation Project - 1st Stage- with	262 996	913 793
5502	5,104 ha in the State of Bahia	202,770	/10,770
5386	Transfer the Management of the Irrigation Project São Desidério/Barreiras	455 000	1 747 847
	Sul with 2,238 ha in the State of Bahia	433,000	1,747,047
5410	Transfer the Management of the Tourão Irrigation Project with 10,710 ha in	350.000	1 833 594
5410	the State of Bahia	550,000	1,000,000
5648	Transfer the Management of the Três Barras Irrigation Project with 1,456 ha	600.000	2 1 3 1 0 0 0
5040	in the State of Goiás	000,000	2,191,000
5970	Transfer the Management of the Várzea do Boi Irrigation Project with 326 ha	154 500	953 180
5710	in the State of Ceará	134,500	755,100
5952	Transfer the Management of the Vaza-Barris Irrigation Project with 1,796 ha	363 500	2 759 530
	in the State of Bahia	000,000	2,137,350
5374	Transfer the Management of the Complexo Itaparica Irrigation projects do	10.932.000	15.876.000
	with 5,286 ha in the State of Bahia	10,792,000	13,010,000
5434	Transfer the Management of the Complexo Itaparica Irrigation projects with	24.540.000	33.069.000
5151	9,136,5 ha in the State of Pernambuco	2 1/3 10/000	3370077000
	Disaster Relief: Promote rescue and assistance for people affected by disas-		
1029	ters, reestablishment of essential services and recovery of losses and damages,	30 300 000	30 720 000
IULY	especially when a state of emergency has been declared and acknowledged by	50,500,000	50,720,000
	the Federal Government		
4578	Creation of a Disaster Relief Group	200,000	440,000
4568	Rehabilitation after disasters	5,040,000	5,100,000
4570	Recovery of damages caused by disasters	20,040,000	20,100,000
4564	Rescue and assistance to people affected by disasters	5,020,000	5,080,000
	Integrated Development of the Region of the Federal District and surroun-		
1028	ding areas (RIDE) (0094 - Development of the region surrounding the Federal	6 075 000	28 268 000
1020	District): Institute a management model for the sustainable development of	0,019,000	20,200,000
	the Federal District and surrounding areas		
4854	Train agents for management of the development of the RIDE	850,000	4,547,000
7849	Preparation of a Plan for the Physical and Territorial Organization of the	500 000	2 670 000
,,,,,	Federal District and surrounding areas	300,000	2,070,000
7968	Management of Implementation of Projects for the Sustainable Development	1,350,000	3,250,000
/ 700	of RIDE-DF	1,230,000	5,250,000
2272	Program management and administration	1,675,000	8,737,000
4853	Mobilization of communities thought associations and cooperatives in the	1 700 000	9 064 000
4853	RIDE	1,100,000	7,004,000

Note: Some programs of a multi-sector nature involve two or more agencies. The resources may not necessarily be under the responsibility of the same body.

		Sums expressed in Reais (R\$)		
Number	Agency/Program/Action	2004	2004 to 2007	
56000	CITIES	688,810,000	3,880,951,567	
	Strengthening of Municipal Urban Management: Strengthen technical and			
1136	institutional capacities of Municipalities in the areas of planning, urban services	12,550,000	181,824,597	
	and territorial management			
612	Support for training of municipalities and social agents for urban development	250,000	4,255,000	
500	Support for metropolitan management municipal consortia	300.000	9 603 722	
500	for urban development	300,000	0,005,722	
	3965 – Studies for the formulation of municipal urban sustainable development	5,000,000		
642	Support plans for implementation of instruments foreseen under the Statute of		25,743,932	
	Cities and the preparation of master plans:			
652	Support for institutional modernization of municipalities to enable them to provi-	7.000.000	143.221.943	
002	de better housing conditions for low income families (Habitat-Brasil)	.,	1.0/221/7.0	
	Management of the Urban Development Policy: Coordinate the planning and for-			
0310	mulation of sector-specific policies and the evaluation and control of programs	0	3,000,000	
	in the areas of urban development, housing, basic and environmental sanitation,			
	urban transport and traffic			
2400	(Information surveys for territorial Survey) management of information on physi-		3,000,000	
	cal infrastructure, urban and territorial planning:		- / /	
0122	Urban Environmental Sanitation: Expanding coverage and improving the quality	579,300,000	2,866,326,810	
	of service for urban environmental sanitation		, , ,	
800	Support for management of basic sanitation systems in municipalities with popu-	7,000,000	31,691,000	
	lations of up to 30,000			
636	Support for implementation and expansion of water supply systems in municipali-	3,510,000	75,201,900	
	ties with populations of over 15,000			
002M	Support for implementation and expansion of water supply systems in municipali-	90,000,000	261,000,000	
	Lies with populations of over 30,000			
654	support for implementation and expansion of sewage conection and treatment	8,190,000	148,190,000	
	Systems in multicipanties with populations of over 15,000 (5959)			
002L	systems in municipalities with populations of over 30 000 (5876)	175,000,000	505,000,000	
586	Support for Social Action Projects in Sanitation (PASS) (3970)	3 300 000	50 824 815	
640	Support for Projects to Combat Waste of Water (3964)	300.000	3,300,000	
798	Support for Control of Water Quality for Human Consumption	15,000,000	67,913,000	
. , .	Support for Institutional Development of Public Operators of Environmental		,	
002K	Sanitation systems in Municipalities with populations of over 30,000	10,000,000	31,000,000	
	Training for managers and technical staff in health education for sanitation			
6136	actions	5,000,000	22,637,000	
2272	Program management and administration	40,000,000	185,353,095	
7/ 50	Establishment of household sanitation improvements for disease prevention and	( 5 000 000	204 202 000	
7652	control	65,000,000	294,292,000	
00/7	Implementation, expansion or improvement of public water supply systems for	05 000 000	(00 110 000	
1000	disease prevention and control in municipalities with populations of up to 30,000	95,000,000	030,110,000	
	Implementation, expansion or improvement of the public sewage collection			
7654	network for disease prevention and control in municipalities with populations of	60,000,000	423,728,000	
	up to 30,000			

Table 38. Programs of the Ministry of Cities

Continued			
2905	Removal of pollution from river basins	2,000,000	76,078,000
	Quality and Productivity of Habitat (PBQP-H) (PBQP-Habitat - Brazilian Habi-		
	tat Quality and Productivity Program): Raise quality and productivity standards		
0810	in the building trade, by means of creation and establishment of mechanisms for	40,000	1,102,000
	technological and management modernization, thereby contributing to increase		
	the supply of housing for the low-income population		
1222	Improve the quality and productivity of materials, components, services and	40.000	1 102 000
4332	works (3961)	40,000	1,102,000
	Urbanization, Regularization and Integration	95,670,000	
1120	of Precarious Settlements: Improve living conditions in precarious human settle-		91/ 0/9 920
1120	ments, reduce risks by providing urban infrastructure and resolving land tenure		014,040,009
	issues, integrating them into the urban fabric		
616	Support to environmental sanitation projects in precarious settlements (PAT/	F 470 000	97 021 200
646	Prosanear) (0122 - 3980)	5,670,000	87,921,500
611	Support for urbanization of precarious settlements (Habitat-Brasil) (0122	00 000 000	726 127 520
044	- 3979)	90,000,000	120,121,009
	Refurbishing of inner-city areas: Promote urban renewal and increase populations		
1137	in abandoned inner-city areas, with a view to optimizing installed infrastructure,	1,250,000	14 640 221
	recovering the housing stocks and stimulating the economy, conserving property		14,049,521
	values and culture		
602	Support for preparation of plans for refurbishing of inner-city areas	1,250,000	14,649,321

	ograms of the ministry of mines and Energy	Sume ovnre	scod in Popis (P\$)
Number	Agency/Program/Action	2004 2004 to 2	
32000		031 004 644	2 027 520 216
52000	Flactric Dowar Supply: Encure conditions for the provision of electric power to	<sup>7</sup> ,074,044	2,721,527,510
0274		19,824,600	90,652,272
4697	Authorization and concessions for electric power generation	3,924,600	13.359.413
4699	Authorization and concessions for electric power transmission	3,200,000	10,892,859
2407	Surveys of potential hydroelectric sites in river basins	12,700,000	66,400,000
-	Electric Power for Small Communities - Energia Cidadã: Promote access to electric	, ,	
	power for low-income families in rural areas and attend to demand from communities.		
0273	schools, health clinics, and water-pumping stations, either by extending power lines or	444,048	2,169,884
	by decentralized service		
5914	Rural electrification	444.048	2,169,884
	Quality of Electric Power Services: Ensure provision of electric power services with	/	· · · · · · · ·
0272	adequate conditions and a reasonable price	61,694,630	228,353,652
4880	Control of electric power services	35,338,354	128,425,803
4703	Regulation of electric power services	26,356,276	99,927,849
	Management of the Energy Policy: Coordinate the planning and formulation of sec-		
276	tor-specific policies and the evaluation and control of Programs in the energy area	126,894,508	764,403,835
4896	National energy balance	1,105,000	4,255,000
4897	Preparation of a Ten-year Plan for Expansion of the Electricity Sector	5,800,000	23,800,000
	Inventory and project feasibility studies for the establishment of a generation and	27,000,000	132,000,000
3427	transmission system in the Amazon Region		
6508	Studies for expansion of electric power generation	90,089,508	591,648,835
4859	Socio-environmental studies for the energy sector	2,000,000	9,400,000
4895	Long and medium-term planning (national energy matrix)	900,000	3,300,000
	Geology of Brazil: Generate and disseminate geological and hydro-geological infor-		
1115	mation as inputs for planning of the land and subsoil and to stimulate an increase in	22,000,000	52,114,927
	investment in the mining sector		
2398	Geological surveys	10,000,000	29,875,000
4872	Geophysical surveys	7,000,000	9,759,961
4873	Geo-chemical surveys	1,000,000	2,500,000
2397	Hydro-geological surveys	3,500,000	6,500,000
7058	Modernization and improvement of the Mineral Analyses Laboratory - Lamin	500,000	3,479,966
0204	Energy in the Northeast Region (Energy in the Northeast Axes): Serve the electric	674 076 499	1 501 547 145
0274	power needs of the Northeast Region	074,970,400	1,391,347,105
5103	Expansion of the capacity of the Bongi Thermoelectric Plant to up to 430 MW	1,183,028	4,183,028
5105	Expansion of the capacity of the Camaçari Thermoelectric Plant from 174 to 350	148 936 007	201 850 815
5105	MW	140,790,007	201,050,015
3409	Expansion of the urban electric power distribution network in Alagoas	12,000,000	60,415,000
3378	Establishment of a Transmission System for the Xingó Hydroelectric Plant in Bahia	2,075,823	2,904,149
3375	Establishment of a Transmission System in the State of Alagoas (69 kV)	6,400,000	29,190,000
3370	Establishment of a Transmission System in the Northeast	301,341,545	741,571,924
3390	Irrigation of lots in the 20.599 ha re-settlement area of the Itaparica Plant in the	116,265,276	265,231,409
	State of Bahia	110,200,210	200,291,107
4476	Maintenance of the electric power generation system	47,812,651	102,953,171
5107	Transmission system of the Northeast (Establishment of 4 sectioned 230 kV sub-	38,962,158	183,247.669
5107	stations)		

#### Table 39. Programs of the Ministry of Mines and Energy

Continued			
1069	Management of the Mineral Policy: Coordinate the planning and formulation of sec-	8 460 000	64 843 000
1007	tor-specific policies and the evaluation and control of Programs in the mining area	0,400,000	04,049,000
4887	Studies for planning of the mining sector	8,460,000	64,843,000
0201	Mining and Sustainable Development (Development of Mining): Promote develop-	2 170 000	11,746,310
0591	ment of mining in Brazil	2,170,000	
2402	Environmental monitoring of mining	370,000	2,002,830
4874	Monitoring and control of aquifers, mineral and thermal water	150,000	811,960
2377	Licensing of mineral rights	1,650,000	8,931,520
	Technological Development of the Energy Sector (Applied Research in the Energy	14,530,370	115,108,271
0476	Area): Develop technologies relating to the energy sector at research institutes and		
0476	transfer them to the productive sector, with a view to expansion and modernization of		
	Brazil's industrial capabilities		
2765	Technological research and development for the generation of electric power	14,530,370	115,108,271
1044	Alternative Renewable Energy: Expand the supply of electric power from renewable	100.000	6,600,000
1044	sources, on a sustainable basis, minimizing environmental impacts	100,000	
4903	Feasibility Study of Projects for Small-scale Hydroelectric Plants and the use of	100,000	( ( 00 000
4893	alternative energy sources (wind and biomass)		6,600,000

Note: Some programs of a multi-sector nature involve two or more agencies. The resources may not necessarily be under the responsibility of the same body.

		Sums expressed in Rea	
Number	Agency/Program/Action	2004	2004 to 2007
24000	SCIENCE AND TECHNOLOGY	541,605,329	2,427,878,027
1122	Science, Nature and Society (0462 - Climatology, Meteorology and Hydrology): Expand scientific and technical knowledge on interactions between nature, science and society, that contribute to an understanding of processes of change and to improving the lives of the population	37,366,843	168,276,883
2209	Training of human resources in research and development for the water-resources sector – CT-Hidro: Training of human resources in research and development for the water-resources sector (CT-Hidro)	3,600,000	16,110,000
2223	Support for research and technological innovation for the water-resources sector – CT-Hidro: Support for Institutional projects for research in the water-resources sector (CT-Hidro)	13,400,000	63,450,000
894	Implementation and modernization of state weather, climate and water-resources monitoring centers: Support for the establishment and modernization of state weather, climate and water-resources monitoring centers	1,000,000	4,475,500
4659	Development of imaging applications and data for meteorology and environment: Research and development imaging applications and data for meteorology and environment	450,000	1,318,875
2378	Gathering and sharing of hydro-metrological data	17,388,843	75,388,843
7682	Implementation of the Meteorology and Climate Network	1,293,000	5,786,822
7316	Establishment of a hydro-meteorological and environmental information system for prediction and mitigation of environmental disasters		695,100
4943	Research and technological innovation for the meteorology and climatology sectors	235,000	1,051,743
0460	Qualification and Training of Human Resources for Research (Training of Human Resources for Research ): Expand the capacity of the National Science and Tech- nology System to respond to demands for knowledge and technical and scientific services for society, through education and training of researchers	496,009,000	2,220,188,280
900	Granting of scholarships to stimulate research	170,650,000	763,744,075
901	Granting of scholarships for the education and training of researchers	228,832,000	1,024,137,616
902	Granting of scholarships on introduction to research	56,427,000	252,839,039
903	Granting of research scholarships on technological and entrepreneurial development	29,100,000	130,237,050
2272	Program management and administration	11,000,000	49,230,500
0461	Promotion of Research and Scientific and Technological Development (Expan- sion and Consolidation of Scientific and Technological Knowledge): Expand and improve the technical-scientific infrastructure and support execution of scientific and technological research that may contribute to Brazil's social and economic development	3,800,000	20,316,900
7302	Implementation of a Study Center for Strategic Technologies for the Northeast – CETENE	800,000	6,890,400
1257	Implementation of the National Institute of Semi-Arid Areas	3,000,000	13,426,500
1112	Diffusion and Popularization of Science: Promote democratization of access to knowledge and its benefits, through diffusion of knowledge and popularization of science	4,429,486	19,095,964
100P	Establishment of an information system on technologies for social development	900,000	3,299.750
4148	Support to entities and promotion of events for popular science	2,629,486	11,768,264
6021	Support for the diffusion of appropriate technologies	900,000	4,027,950

Table 40. Programs of the Ministry of Science and Technology

Note: Some programs of a multi-sector nature involve two or more agencies. The resources may not necessarily be under the responsibility of the same body.

Table. 41 Programs of the Ministry of Justice				
		Sums expressed in Reais (R\$)		
Number	Agency/Program/Action	2004	2004 to 2007	
30000	JUSTICE	1,160,000	5,144,600	
	Protection of Indian Lands, Territorial Management and Ethnic Development			
0151	(Indigenous Territories and Culture): Ensure and protect the integrity of the	1,160,000	5,144,600	
	territorial and environmental heritage of indigenous societies			
2544	Conservation and restoration of biodiversity on Indian Lands (Promotion of events	1 160 000	5 144 600	
2000	on environmental education on Indian Lands)	1,100,000	5,144,600	

#### Table. 42 Programs of the Ministry of Planning, Budget and Management

		Sums expressed in Reais (R\$	
Number	Agency/Program/Action	2004	2004 to 2007
47000	PLANNING AND MANAGEMENT	2,000,000	15,125,533
	Statistical and Geographic Information: Prepare and publicize statistical informa-		
796	tion; of a demographic and socioeconomic nature; of geo-scientific information and	2,000,000	15,125,533
	of a geographic, cartographic, geodesic and environmental nature.		
2665	Geographic and environmental surveys and research	1,000,000	5,060,000
3596	Implementation of the geo-processing system and modernization of cartography	1,000,000	8,752,000
7097	National Basic Sanitation Survey		1,313,533

Note: Some programs of a multi-sector nature involve two or more agencies. The resources may not necessarily be under the responsibility of the same body.

#### Table. 43 Programs of the Special Ministry for Food Security and Combating Hunger

		Sums express	sed in Reais (R\$)
Number	Agency/Program/Action	2004	2004 to 2007
20123	FOOD SECURITY AND COMBATING HUNGER	227,388,457	832,795,257
	Access to Food (0071 - Comunidade Ativa): Guarantee populations living in situ-		
1049	ations of food insecurity, dignified, regular and adequate access to food for the	227,388,457	832,795,257
	maintenance of human health.		

#### Table. 44 Programs of the Ministry of Welfare and Social Promotion Sums expressed in Reais (R\$) Number Agency/Program/Action 2004 2004 to 2007 55000 SOCIAL WELFARE 8,000,000 32,000,000 Evaluation of Federal Government Social Policies: Contribute to expansion of 1096 8,000,000 effectiveness of the social policies of the Federal Government, identifying ethnic 32,000,000 and gender disparities 4924 Training in social policies for state and municipal technical staff and managers 2,000,000 8,000,000 National System for the Identification and Selection of Target Publics for Income 6414 6,000,000 24,000,000 Transfer Programs - Unified Register

Table. 45 Pro	grams of the Ministry of Health		
		Sums expressed in R	
Number	Agency/Program/Action	2004	2004 to 2007
36000	HEALTH	5,385,500,000	25,389,448,000
	Popular Participation and Inter-sectoral Aspects of Healthcare Reform on the		
1314	Unified Health System: Promote popular participation and inter-sector aspects	7,000,000	31,696,000
	of health	, ,	- ,,
2272	Program management and administration	7,000,000	31,696,000
	Continuing Education and Professional Training in the Unified Health System:		
1311	Promote training and continuous education for health professionals of the Uni-	50,900,000	216,698,000
	fied Health System		
6200	Promote the principles of popular education in health	12,000,000	47,276,000
947	Support the training of policy makers in specific technical areas of interest to	22 000 000	101 504 000
847	states and municipalities	23,900,000	101,504,000
851	Support for continual training of agents for social control	12,000,000	54,335,000
6195	Distance training for health professionals and social agents	3,000,000	13,583,000
	Healthy Diet (0008): Stimulate and strengthen actions for promoting healthy		
1215	diet in the life cycle with a view to prevention and control of nutritional disor-	14,800,000	67,005,000
	ders and diseases relating to food and nutrition		
1186	Prevention and Control of Vaccine-preventable Diseases (0006): Prevent and	458 000 000	2 073 714 000
1100	maintain control over vaccine-preventable diseases	190,000,000	2,079,711,000
6031	Imuno-biological responses to disease prevention and control	450,000,000	2,037,492,000
4383	Vaccination of the Population	8,000,000	36,222,000
	Surveillance, Prevention and Control of Diseases Transmitted by Vectors and	8,000,000	36,224,000
1187	Zoonoses: Reduce deaths and morbidity from diseases transmitted by animal		
	vectors		
6042	Surveillance, prevention and control of diseases transmitted by vectors and	8,000,000	36,224,000
	zoonoses	- / /	
	Primary Healthcare: Expand the Family Health Program and the primary		19,015,475,000
1214	healthcare network, through implementation of a resolute, integral and humane	3,974,700,000	
	Primary Healthcare Policy		
589	Financial incentives for Municipalities accredited to receive the variable part of	1,800,000,000	8,749,961,000
	the Primary Healthcare Rate (PAB) for Family Health		
442	Financial incentives for the expansion and consolidation of a Family Health	94,700,000	328,782,000
507	Strategy in Municipalities with population of over 100,000	2 080 000 000	0.02/ 722.000
567	Endomiological and Environmental Health Surveillance (0013): Prevent and	2,080,000,000	9,936,732,000
1203	epidemiological and Environmental Health Survemance (0015). Prevent and	700 600 000	3 172 150 000
1205	control diseases, outbreaks, epidemics, public calamities and epidemiological	700,000,000	5,172,150,000
	Control of outbreaks enidemics public calamities and		
6160	enidemiological emergencies	2,800,000	12,680,000
	Financial incentives for states the Federal District and municipalities certified		
829	for enidemiology and disease control	687,000,000	3,110,571,000
4382	National Environmental Health Surveillance System	10 800 000	48 899 000
	Rural Sanitation (0119 - Basic Sanitation): Expanding coverage and improving	20,000,000	,.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
1287	the quality of environmental sanitation services in rural areas	80,000,000	362,204,000
7684	Expansion of basic sanitation actions in indigenous villages	31,000.000	140,354.000
2272	Program management and administration	3,000,000	13,583,000

Table, 45 Programs of the Ministry of Hea

Continued			
3921	Home improvements for the control of chagas disease	16,000,000	72,441,000
7656	Implementation, expansion or improvement of sanitation services in localities	30,000,000	135,826,000
	with population of less than 2,500 and in rural areas	30,000,000	
1308	Surveillance, Prevention and Control of Malaria and Dengue: Reduce inci-	76 500 000	246 260 000
	dences of malaria and dengue through control of vectors	76,500,000	240,209,000
1312	Attention to the Health of Strategic Populations in Special Situations and		
	Emergencies: Guarantee healthcare for strategic population groups in special	15,000,000	67,913,000
	situations and emergencies in an equitable, integral, humane manner with quality		
6176	Children's healthcare	8,000,000	36,222,000
6175	Women's healthcare	7,000,000	31,691,000

Note: Some programs of a multi-sector nature involve two or more agencies. The resources may not necessarily be under the responsibility of the same body.

Table. 46 Programs of the Ministry of Agrarian Development					
		Sums expressed in Reais (R\$)			
Number	Agency/Program/Action	2004	2004 to 2007		
49000	LAND TENURE DEVELOPMENT	109,656,884	1,225,810,598		
0351	Family Farming - Pronaf: Strengthen Family Farming, promoting competitive	90.300.000	1.016.400.000		
	participation in markets		=/0=0/ .00/000		
620	Support for municipal infrastructure projects and services for family farming	80.000.000	920,000,000		
	(Financial assistance for municipal infrastructure projects and services)	80,000,000			
4448	Training for farming families	10,000,000	95,200,000		
6276	Training for family farmers participating in public irrigation projects	300,000	1,200,000		
	Sustainable Settlements for Rural Workers (Novo Mundo Rural: Settlement of				
0135	Rural Workers): Promote democratic access to the land, ensuring food sovereignty	10,716,800	142,584,532		
	and the generation of jobs and income				
4464	Technical assistance and training for people living in settlements	10,716,800	142,584,532		
0137	Sustainable Development in Land Reform (Emancipation of Rural Settlements):				
	Provide the population of settlements with training and management tools and				
	establish processes of organization and production, with the aim of promoting	8,640,084	66,826,066		
	economic, social, cultural and political, integration, respecting regional diversities				
	while improving the quality of life and of citizenship				
4470	Technical assistance and training for people living in settlements - recovery (Techni-	0 ( 40 004	(/ 0)/ 0//		
	cal assistance and training for families settled in projects established prior to 1998)	8,640,084	66,826,066		

Table. 47	' Programs	of	the	Ministry	of	Cultu	re
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		Sums expressed in Reais (R\$)		
Number	Agency/Program/Action	2004	2004 to 2007	
42000	CULTURE	44,915,167	192,617,958	
0167	Brazil's Cultural Heritage	20,674,767	89,944,156	
1648	Refurbishing of protected historical sites (Revitalization of historical sites - Urbis)	3,116,295	13,082,016	
4013	Preservation of historical, administrative and artistic collections (Northeast)	433,972	2,016,469	
2636	Preservation of the landscape, archeological sites and of historical and artistic	17,124,500	74,845,671	
	neritage buildings			
813	Monumenta: Preservation of historical heritage: Revitalization of cultural heritage	24 240 400	102 673 802	
	in urban centers, creating conditions for sustainability	2 .72 .07 100	102,019,002	
Table. 48 Programs of the Ministry of Education				
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		Sums exp	ressed in Reais (R\$)	
Number	Agency/Program/Action	2004	2004 to 2007	
26000	EDUCATION	368,311,162	15,648,449,750	
1060	Brazil Alfabetizado: Create opportunities for literacy for all youths and adults	184,155,581	822,696,343	

184,155,581

60,000,000

33,500,000

6,404,783

35,891,529

1,285,966,265

143,575,793

28,073,723

200,785,734

14,825,753,407

Brasil Escolarizado: Guarantee, with enhanced quality, school access and atten-

dance for all children, adolescents, youths and adults in Primary Education

Table. 49 Pro	grams of the Ministry of Transport			
		Sums expressed in Reais (R\$)		
Number	Agency/Program/Action	2004	2004 to 2007	
9000	TRANSPORT	295,200,672	3,889,480,747	
229	São Francisco Corridor: Reduce freight transport and costs in an area that encom- passes the States of Bahia, Sergipe and the north of Minas Gerais	66,904,360	669,269,421	
7334	Refurbish the Conveyor Belt System at the Port of Aratu	1,500,000	1,500,000	
105S	Refurbish Stretches of the BR-101 Highway in the State of Bahia	4,400,000	157,520,000	
1212	Refurbishf Stretches of the BR-101 Highway in the State of Sergipe	5,600,000	200,480,000	
1226	Construction of Railway Bypasses in the State of Bahia	10,000,000	10,000,000	
7326	Construction of Two Docking Berths with Backup area Lengthening of the Água de Meninos Quay of the Port of Salvador		50,000,000	
7350	Construction of a Docking Platform on the Quay of the Port of Ilhéus	1,980,000	15,449,607	
107Q	Construction of Stretches of the BR-116 Highway in the State of Bahia	25,000,000	25,000,000	
7144	Construction of Stretches of the BR-135 Highway in the State of Bahia		133,000,000	
7762	Removal of rocks in the Maneuvering Basin of the Port of Aratu		6,000,000	
7354	Removal of rocks in the Port of Ilhéus		1,645,710	
7322	Dredging and deepening of the Água de Meninos Quay of the Port of Salvador		2,734,200	
100V	Dredging and deepening of the Port of Ilhéus	2,100,000	7,426,990	
4953	Dredging and maintenance of the Port of Aratu		500,000	
4956	Dredging and maintenance of the Port of Ilhéus	5,324,360	13,338,200	
7330	Installation of a Treatment Station for Toxic Residues at the Port of Aratu		6,566,084	
5859	Improvements to the Navigation Channel of the São Francisco River Waterway	10,000,000	25,000,000	
7318	Engineering works for the Água de Meninos Quay of the Port of Salvador		10,582,981	
7328	Engineering Works for Stabilization of Cliffs at the Port of Aratu		1,525,649	
7324	Project for Construction of Three Docking Berths and the Lengthening of the Break- water, on the Northern end of the Água de Meninos Quay of the Port of Salvador	1,000,000	1,000,000	
230	<b>East Corridor</b> : Reduce the cost of freight transport in an area that encompasses the States of Minas Gerais, Espírito Santo and Rio de Janeiro	82,500,000	1,421,809,811	
232	Southeast Corridor: Reduce the cost of freight transport in an area that encompasses the States of Mato Grosso and Mato Grosso do Sul, the south of the State of Goiás and part of the Southeast Region	10,000,000	140,000,000	

Note: Some programs of a multi-sector nature involve two or more agencies. The resources may not necessarily be under the responsibility of the same body.

Northeast Corridor: Reduce the cost of freight transport in an area that encompasses

the States of Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco and Alagoas Maintenance of Waterways: Maintain the physical and operational characteristics of

Inland Navigation: Provide freight and passenger transport services on the São Fran-

Shipping: Guarantee quality in the provision of inland navigation, coastal shipping and

1061

235

223

228

221

inland waterways

cisco River Waterway

long-distance transport services

		Sums expressed in Reais (R\$)	
Number	Agency/Program/Action	2004	2004 to 2007
22000	AGRICULTURE, LIVESTOCK AND SUPPLY	204,286,984	992,728,313
1225	Development of Organic Farming – Pró-Orgânico: Increase the supply of	440.000	2 150 102
1225	organic produce and stimulate exports	440,000	2,150,105
	Development of Poultry Farming (Productivity of Poultry Farming):		
0371	Increase productivity of poultry farms by reducing the incidence of disease	2,017,000	9,856,267
	and improving productive functions and reproductive capabilities		
	Development of Cattle Raising (Productivity of Cattle Raising): Increase the		
0359	productivity of cattle and buffalo herds by reducing the incidence of disease	23,052,550	116,802,886
	and improving productive functions and reproductive capabilities		
	Development of Goat, Horse and Sheep Raising: Increase the productivity of		
0377	goats, sheep and horses and of small and medium sized animals by reducing	4,038,816	19,736,070
	the incidence of disease and improving productive functions and reproductive	, ,	
	capabilities		
00/0	Development of Horticulture (Productivity of Vegetables): Increase the pro-	0.077.040	0 743 503
0369	ductivity of vegetables, medicinal herbs and spice gardens so that they meet	2,077,043	9,741,581
	the standards required by the national and international market		
0367	Development of Pig Raising (Productivity of Pig Raising): Increase the	1 920 000	0 382 268
10207	productivity of pig farms by reducing the incluence of disease and improving	1,720,000	7,202,200
	Development of Cereal Root Crops and of other Vegetable Species (Pro-		
0361	ductivity of Cereals). Increase the productivity of cereals and of forages	6 850 195	25 664 928
0001	through pest control and incorporation of new technologies	0,000,170	23,001,720
	Research and Development of Livestock and Farming and Agro-industries		
	for Social Development: Construct bases of scientific and technological		
1161	knowledge on farming and livestock and on agro-industries targeted at small-	12,685,550	61,406,192
	scale ventures		
	Research and Development for the Competitiveness and Sustainability of		
	Agribusiness: Increase the base of scientific and technological knowledge		
1156	necessary to maintain development of the competitiveness of production	135,915,150	663,268,627
	networks in Brazilian agribusiness, emphasizing dimensions relating to envi-		
	ronmental sustainability, quality and security of products and processes		
	Development of Fruit Farming - Profruta: Raise the standards of quality		
0354	of Brazilian horticulture to the levels of excellence required by the	1,000,000	4,886,599
	international market		
4810	Organization and training of agents engaged in horticulture (1102 - Training	700.000	3,420,619
	of fruit farmers)		
4713	Technology transfer for the development of horticulture	300,000	1,465,980
	Management and Conservation of Soils in Agriculture (Soil Conservation in		
0368	Agriculture): Ensure adequate soil management and use and promote the re-	5,640,680	27,563,736
	covery of degraded areas with a view to ensuring sustainable food production		
	And availability of high-quality water for human and animal consumption		
	Quality of Envertices and reduction and productivity of forming and livesteels by		
0375	ensuring adequate levels of compliance and quality of basic inputs and	3,250,000	15,881,441
	making adequate revers of compliance and quality of basic inputs and		
	making them available to farmers		

Table. 50 Programs of the Ministry of Agriculture, Livestock and Supply

Continued...

2141	Control of fertilizers, lime and vaccines (Control of production and marketing of fertilizers, lime and vaccines)	2,050,000	10,017,524
2909	Control of Agrochemicals (Control of the production of pesticides and herbicides)	1,200,000	5,863,917
0365	Minimization of Risks in Agribusiness: Minimize the risks to farm production stemming from the action of biological agents and climate	5,400,000	26,387,615
3989	Establishment of Automatic Stations for the collection of Meteoro- logical Data	2,500,000	12,216,494
3658	Establishment of a Telecommunications Network for Meteorological Data	1,300,000	6,352,565
2161	Production and dissemination of meteorological and climatologic information	1,600,000	7,818,556

Table. 51 Programs of the Special Secretariat of Aquaculture and Fisheries

		Sums expressed in Reais (R\$	
Number	Agency/Program/Action	2004	2004 to 2007
20124	FISHERIES	5,340,040	24,917,537
1224	Aquaculture and Fisheries in Brazil: Increase national fisheries production	5,340,040	24,917,537
5356	Utilization of irrigation channels in fish farming projects		1,511,566
7958	Establishment of an aquaculture station		120,000
5464	Establishment of fish farming stations	4,600,000	4,600,000
5352	Implementation of intensive fish breeding in tank nets in rivers and large reservoirs	740,040	18,685,971

Number     Agency/Program/Action     Sums expressed in Reais (R       2004 to 2007	Table. 52 Programs of the Ministry of Tourism					
NumberAgency/Program/Action20042004 to 2007				Sums expressed in Reais (R\$)		
	Agency/Prog	ion		20	04	2004 to 2007
54000 TOURISM 148,971,364 735,193,286	TOURISM			148,9	71,364	735,193,286
1166Tourism in Brazil: Uma Viagem para Todos: Increase the flows of tourists by improving the structure and supply of tourist services in Brazil145,971,364722,201,362	Tourism in Br by improving	a Viagem para Todos ture and supply of to	s: Increase the flows of tourists ourist services in Brazil	145,9	71,364	722,201,362
1001Tourism Policy Management: Coordinate the planning and formulation of sector- specific policies and the evaluation and control of Programs in the tourism area3,000,00012,991,924	Tourism Polic specific polici	ement: Coordinate t e evaluation and con	the planning and formulation of sect ntrol of Programs in the tourism are	or- a <b>3,00</b>	0,000	12,991,924
4092Preparation of municipal plans for the development of tourism3,000,00012,991,924	Preparation o	oal plans for the deve	elopment of tourism	3,00	0,000	12,991,924

# 5.3. Multi-year Action Plans - PPAs 2004-2007 of the States

Within the scope of the various States that share the São Francisco River Basin there are a large number of programs. Although final versions of the State PPAs for the period 2004-2007, approved by their respective State Legislatures, were not available, the following information was collected on the States that share the São Francisco River Basin. It is worth noting that a significant portion of the resources earmarked in the State PPAs originates from Federal Government transfers, and, thus, has already been included under Programs of the Federal Government. The data provided by the majority of the States, however, do not clearly state the origin of these resources, thereby making it difficult correctly to discriminate the state resources from the federal resources earmarked for investments in the Basin. Moreover, a substantial portion of the investments are targeted at water-resources infrastructure, which does not necessar-

Continued....

ily mean that they are to be used for revitalization of the Basin. Despite this lack of information, Table 53 provides a good indication of the volume of investments foreseen in the Basin.

Table. 53. Investments foreseen for the Basin, under the PPA2004-2007, by State				
State	R\$ million	US\$ million		
Alagoas - AL	477,758,000	159,252,667		
Bahia - BA	213,538,000	71,179,333		
Federal District - DF	264,074,000	88,024,667		
Minas Gerais - MG	563,231,000	187,743,667		
Pernambuco - PE	9,070,000	3,023,333		
Sergipe - SE	219,668,000	73,222,667		
Goiás - GO	(*)	(*)		
	1,747,339,000	582,446,333		
(*) - No significant investment forescen in the São Europisco Pasin				

(\*) = No significant investment foreseen in the São Francisco Basin In most cases, the sums presented include federal transfers.

(1 US\$ = R\$ 3).

There follows an account of the information collected in the various States that share the Basin.

## 5.3.1. PPA 2004-2007 for the State of Minas Gerais

Information provided by the Management and Planning Information System of Minas Gerais shows an array of actions with interfaces in the São Francisco River Basin. The principal Program is number 0172, Program for the Revitalization and Sustainable Development of the São Francisco River Basin, that aims to ensure the sustainability of anthropogenic activities, by establishing priority actions targeted at environmental recovery, conservation and preservation, and increasing the quantity and quality of water available, thereby improving the quality of life of users. The principal projects and actions under this Program, described below, amount to a total of R\$ 58,386,661 (US\$ 19.5 million) for 2004, and of R\$ 563,231,000 (US\$ 187.7 million) for the period 2004-2007:

(P261) Technical and economic feasibility studies for the implementation of a waterway in the main channel of the São Francisco River and its tributaries, in Minas Gerais, Fundação Rural Mineira-RURALMINAS: Enable shipping on the principal navigation channel and establish new shipping routes on the principal tributaries. R\$ 800,000 (US\$ 0.27 million) for 2004 and a total of R\$ 30,000,000 (US\$ 10.00 million).

(P338) Environmental education, Secretariat of Environment and Sustainable Development: awareness building for users of the São Francisco River Basin with respect to its revitalization and environmental protection. R\$ 200,000 (US\$ 0.07 million) for 2004, and a total of R\$ 4,000,000 (US\$ 1.33 million).

(P345) Generation, diffusion and transfer of knowledge and technology, Farming and Livestock Research Company of Minas Gerais: Generate new technologies, facilitate access for all users of the Basin to knowledge and technology. R\$ 1,273,000 (US\$ 0.42 million) for 2004, and a total of R\$ 21,247,000 (US\$ 7.08 million).

(P449) Establishment of hydraulic engineering works, Fundação Rural Mineira-RURALMINAS: Improve the quantity and quality of the water supply. R\$ 239,661 (US\$ 0.08 million) for 2004, and a total of tR\$ 210,000,000 (US\$ 70.00 million).

(P577) Management of biodiversity and expansion of forestry in the São Francisco River Basin, State Forest Institute (Instituto Estadual de Florestas): Promote an expansion of forestry in the São Francisco River Basin, by encouraging farmers to maintain nurseries and to collect seeds of native species for the restoration of riparian vegetation, gallery forests and reforestation of hill tops. R\$ 1,000,000 (US\$ 0.33 million) for 2004, and a total of R\$ 7,000,000 (US\$ 2.33 million).

(P632) Land management, Secretariat of Agriculture, Livestock and Supply: Soil management and conservation involving technical staff trained in agriculture and ecology, no-till agriculture and recov(P659) Monitoring of water quality and water pollution control, Minas Gerais Water Management Institute (Instituto Mineiro de Gestão das Águas): Monitor water quality in the principal tributaries of the São Francisco River periodically determining the "WQI", with a total investment in 2004 of R\$ 2,020,000,000 (US\$ 0.67 million), of which R\$ 412,000 (US\$ 0.14 million) is State counterpart funding. The total sum for the 2004-2007 period is R\$ 63,360,000 (US\$ 21.10 million).

(P661) Water Resources Management, Fund for Recovery, Protection and Sustainable Development of River Basins of Minas Gerais: Implement and consolidate participatory water-resources management in the São Francisco River Basin with a strategy for qualitative and quantitative recovery and preservation. R\$ 5,330,000 (US\$ 1.78 million) for 2004, and a total of R\$ 30,030,000 (US\$ 10.00 million).

(P718) Integrated sub-basin management, Minas Gerais Technical Assistance and Rural Extension Company (Empresa de Assistência Técnica e Extensão Rural for the State of Minas Gerais): Implement 200 projects for the recovery and preservation of small river basins on the tributaries of the São Francisco River in Minas Gerais. R\$ 2,000,000 (US\$ 0.67 million) for 2004, and a total of R\$ 40,000,000 (US\$ 13.30 million).

(P904) Control of the trade in agrochemicals, Minas Gerais Farming and Livestock Institute: Control and inhibit the indiscriminate trade in agricultural chemicals in the principal farming regions of the São Francisco River Basin. R\$ 200,000 (US\$ 0.07 million) for 2004, and a total of R\$ 3,900,000 (US\$ 1.30 million).

(P910) Construction of Biodigesters, Fund for the Recovery, Protection and Sustainable Development of River Basins of Minas Gerais: recycling and reuse of wastes from farming and livestock for the generation of household electricity. R\$ 1,000,000 (US\$ 0.33 million) for 2004, and a total of R\$ 3,000,000 (US\$ 1.00 million).

(P932) Treatment of urban wastes, Secretariat of Environment and Sustainable Development: Treatment of household and industrial wastes for 241 Municipalities in the São Francisco River Basin. Total investment in 2004 of R\$ 8,000,000 (US\$ 2.67 million), of which R\$ 500,000 (US\$ 0.17 million) is State counterpart funding. The total sum for the 2004-2007 period is R\$ 48,000,000 (US\$ 16.00 million).

(P941) Management of farming and livestock residues and wastes, Minas Gerais Farming and Livestock Institute: Control widespread pollution in rural areas. R\$ 100,000 (US\$ 0.03 million) for 2004 and a total of R\$ 8,100,000 (US\$ 2.70 million).

(P445) Restoration of the vegetation, Minas Gerais Water Management Institute (Instituto Mineiro de Gestão das Águas): Increase infiltration of water into the soil avoiding excessive erosion and silting, with a view to replenishing aquifers. R\$ 28,000,000 (US\$ 9.33 million) for 2004, and a total of R\$ 50,000,000 (US\$ 16.70 million).

(P664) Support for the instillation and work of Basin Committees and Basin Agencies, Minas Gerais Water Management Institute (Instituto Mineiro de Gestão das Águas): Consolidation of the installed Basin Committees and inauguration of new ones; creation of Basin Agencies. R\$ 5,044,000 (US\$ 1.68 million) for 2004, and a total of R\$ 28,444,000 (US\$ 9.48 million).

(P672) Expansion of forestry in the São Francisco River Basin, State Forestry Institute: Promote the expansion forestry in the São Francisco River Basin, by encouraging farmers to establish nurseries for the production of saplings suitable for reforestation of forested areas in aquiferreplenishment areas, riparian forests, gallery forests and hill tops. R\$ 1,500,000 (US\$ 0.50 million) for 2004, and a total of R\$ 4,500,000 (US\$ 1.50 million).

(P733) Advisory Services for the Technical Chambers of the River Basin Committees, Minas Gerais Water Management Institute (Instituto Mineiro de Gestão das Águas): Deployment of technical staff for advisory and structuring of the work of the Technical Chambers of River Basin Committees. R\$ 430,000 (US\$ 0.14 million) for 2004, and a total of R\$ 1,400,000 (US\$ 0.47 million).

### 5.3.2. PPA 2004-2007 for the State of Bahia

The information that follows was taken from a listing of activities that comprise the PPA 2004-2007 for State of Bahia. The principal programs, in the area of water resources, relate to expansion of the water supply system and the construction of water mains to serve semi-arid areas. Among the various activities foreseen, the following have interfaces with the São Francisco River Basin. They represent an investment of roughly R\$ 73,198,000 (US\$ 24.4 million) for 2004, and of R\$ 213,538,000 (US\$ 71.2 million) for the 2004-2007 period.

Program 204: 'Sanitation is Life': Expansion and quality of service:

Project 3919 - Expansion of the supply of water in semiarid areas: PROÁGUA

- Activity 1529 Expansion of the water supply system in the Northeast, Secretariat of Urban Development/ Embasa: The sum of R\$ 34,560,000 (US\$ 11.5 million) has been earmarked for 2004, and a total of R\$ 114,700,000 (US\$ 38.2 million) for the 2004-2007 period.
- Activity 1758 Construction of Water Mains, Secretariat of Urban Development/Embasa: The sum of R\$ 15,000,000 (US\$ 5.0 million) has been earmarked for

2004, and a total of R\$ 50,000,000 (US\$ 16.7 million) for the 2004-2007 period.

 Activity 1844 - Institutional Development Program, SMARH/SRH: The sum of R\$ 240,000 (US\$ 0.08 million) has been earmarked for 2004, and a total of R\$ 800,000 (US\$ 0.27 million) for the period 2004-2007.

Program 223: De olho na natureza: watching out for nature:

Project 3505 - Water Resources Management – PGRH, SMARH/SRH: The sum of R\$ 19,600,000 (US\$ 6.53 million) has been earmarked for 2004, and a total of R\$ 19,600,000 (US\$ 6.53 million) for the period 2004-2007.

Program 218: Frutos da Terra: Fruits of the Earth:

Project 3917 – Infrastructure for Water Resources Management - PGRH:

 Activity 2109 - Operation of Dams – Northeast, SRH: The sum of R\$ 1,400,000 (US\$ 0.47 million) has been earmarked for 2004, and a total of R\$ 1,400,000 (US\$ 0.47 million) for the period 2004-2007.

Program 222: Reviver nossas águas e renascer nossa terra: Reviving our water and rebirth of the earth:

Project 3363 - Restoration of riparian forests:

- Activity 1655 Technical assistance to farmers, the planting of riparian forests, SFC. The sum of R\$ 36,000 (US\$ 0.012 million) has been earmarked for 2004 and a total of R\$ 235,000 (US\$ 0.078 million) for the period 2004-2007.
- Activity 2178 Restoration of riparian forests, SFC. The sum of R\$ 36,000 (US\$ 0.012 million) has been earmarked for 2004 and a total of R\$ 1,321,000 (US\$ 0.440 million) for the period 2004-2007.

Project 3629 - Environmental restoration of river basins:

- Activity 2552 Restoration of degraded areas in river basins

   Northeast, SPA: The sum of R\$ 134,000 (US\$ 0.045 million) has been earmarked for 2004 and a total of R\$ 3,679,000 (US\$ 1.23 million) for the period 2004-2007.
- Activity 2552 Restoration of degraded areas in river basins - Central high plains, SPA: The sum of R\$ 136,000 (US\$ 0.045 million) has been earmarked for 2004 and a total of R\$ 3,681,000 (US\$ 1.23 million) for the period 2004-2007.

Project 3646 - Integrated and Sustainable Development the region surrounding the Sobradinho Lake:

- Activity 1871 Preparation of a study and project for the region surrounding the Sobradinho Lake, SPA: The sum of R\$ 160,000 (US\$ 0.05 million) has been earmarked for 2004 and a total of R\$ 2,860,000 (US\$ 0.95 million) for the period 2004-2007.
- Activity 2093 Environmental Monitoring for the region surrounding the Sobradinho Lake, SPA: The sum of R\$ 240,000 (US\$ 0.08 million) has been earmarked for 2004 and a total of R\$ 4,840,000 (US\$ 1.61 million) for the period 2004-2007.
- Activity 2472 Community health and environmental education, SPA: The sum of R\$ 210,000 (US\$ 0.07 million) has been earmarked for 2004 and a total of R\$ 4,230,000 (US\$ 1.41 million) for the period 2004-2007.

Project 3743 - Revitalization of São Francisco River Basin:

- Activity 1829 Development of educational activities through community mobilization, SFC: The sum of R\$ 143,000 (US\$ 0.05 million) has been earmarked for 2004, and a total of R\$ 286,000 (US\$ 0.09 million) for the period 2004-2007.
- Activity 2171 Signing of an agreement for restoration of riparian forests, SFC: The sum of R\$ 143,000 (US\$ 0.05 million) has been earmarked for 2004, and a total of R\$ 286,000 (US\$ 0.09 million) for the period 2004-2007.

 Activity 2178 - Restoration of riparian forests, SFC: The sum of R\$ 400,000 (US\$ 0.13 million) has been earmarked for 2004, and a total of R\$ 2,010,000 (US\$ 0.67 million) for the period 2004-2007.

Project 3896 – Combat desertification:

- Activity 1873 Preparation of a plan for combating and preventing desertification in the Northeast region, SPA: The sum of R\$ 330,000 (US\$ 0.11 million) has been earmarked for 2004, and a total of R\$ 660,000 (US\$ 0.22 million) for the period 2004-2007.
- Activity 3896 Preparation of a plan to combat and prevent desertification in the Lower-middle São Francisco region, SPA: The sum of R\$ 220,000 (US\$ 0.07 million) has been earmarked for 2004, and a total of R\$ 440,000 (US\$ 0.15 million) for the period 2004-2007.

Program 226: Environmental awareness:

Project 3654 - Environmental education:

 Activity 2171 - Signing of an agreement for the training of agents in the São Francisco River Basin, SPA: The sum of R\$ 180,000 (US\$ 0.06 million) has been earmarked for 2004, and a total of R\$ 1,830,000 (US\$ 0.61 million) for the period 2004-2007.

Program 234: Public Management Models:

Project 3656 - Institutional Strengthening for entities that comprise the State environment and water resources system:

 Activity 1565 – Support for the Environment and Water Resources Council with a view to strengthening these boards, SPA: The sum of R\$ 30,000 (US\$ 0.01 million) has been earmarked for 2004, and a total of R\$ 680,000 (US\$ 0.23 million) for the period 2004-2007.

### 5.3.3. PPA 2004-2007 for the State of Sergipe

The information that follows was taken from a listing of activities that comprise the PPA 2004-2007 for the State of Sergipe. As in the case of Bahia, the principal programs in the area of water resources in Sergipe are related to water supply, construction of water mains and irrigation works in semi-arid areas. Investments in these programs in Sergipe amount to R\$ 219,668,000 (US\$ 73.2 million) for the period 2004-2007. The list that follows is a selection of programs that have an interface with the São Francisco River Basin.

- Integrated System for the Treatment of Solid Wastes

   Municipalities of the 'Costa dos Coqueirais' area,
   Prodetur, Seinfra: Ensure conservation of environmental resources, adoption of a policy that enables
   maintenance of balanced ecosystems, R\$11,928,000 (US\$ 3.98 million).
- Urbanization of Salomé Lake in Cedro de São João, Seinfra: Ensure conservation of environmental resources, adoption of a policy that enables maintenance of balanced ecosystems, R\$ 1,325,000 (US\$ 0.44 million).
- Jacaré-Curituba Project, Seinfra: Raise living standards of rural populations by means of providing water for human consumption and for livestock, and through promoting sustainable development of current and potential irrigated areas, R\$ 22,000,000 (US\$ 7.33 million).
- Xingó Canal, Seinfra: Raise living standards of rural populations by means of providing water for human consumption and for livestock, and through promoting sustainable development of current and potential irrigated areas, R\$ 90,000,000 (US\$ 30.00 million).
- Complementary studies on the availability of water in river basins of the State of Sergipe, SEPLANTEC: Ensure, for current and future generations, water supplies in sufficient quantities and with quality standards adequate for their various uses by means of integrated management, planning and regulation, preserving and restoring water resources in the State, R\$ 6,000\* (US\$ 2,000).

- Support for the organization of bulk water users in the State's River Basins, SEPLANTEC: Ensure water supplies in sufficient quantities and with quality standards adequate for their various uses, for current and future generations, by means of integrated management, planning and regulation, preserving and restoring water resources in the State, R\$ 6,000,\* (US\$ 2,000).
- Revitalization of River basins, SEPLANTEC: Ensure water supplies in sufficient quantities and with quality standards adequate for their various uses, for current and future generations, by means of integrated management, planning and regulation, preserving and restoring water resources in the State, R\$ 100,000\* (US\$ 33,333).
- Support for the Basin to Committees, SEPLANTEC: Ensure water supplies in sufficient quantities and with quality standards adequate for their various uses, for current and future generations, by means of integrated management, planning and regulation, preserving and restoring water resources in the State, R\$ 6,000\* (US\$ 2,000).
- Nossos Rios Our rivers Program: São Francisco, SEPLANTEC: Apply the pilot model for sustainable integrated water resources management, R\$ 200,000 (US\$ 66,667).
- Preparation of a Master Plan for the Sergipe portion of the São Francisco River Basin, SEPLANTEC: Ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 40,000 (US\$ 13,333).
- Complementary socioeconomic feasibility studies for the Project for improvement, automation and expansion of integrated systems of water mains in Alto Sertão and Sertaneja, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 50,000 (US\$ 16,667).

- Preparation of the State Plan for refurbishing of hydraulic infrastructure, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 6,000\* (US\$ 2,000).
- State Plan for Training in Water Resources Management, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 50,000\* (US\$ 16,667).
- Implementation of the State water resources information system, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of highquality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 50,000\* (US\$ 16,667).
- Decentralized Actions in support of Citizen Management of water resources, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 50,000\* (US\$ 16,667).
- Implementation of water quality monitoring in the hydro-meteorological network for the State of Sergipe, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 84,000\* (US\$ 28,000).

- Updating and complementation of Mapping of the State of Sergipe on a 1:100.000 scale, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 84,000\* (US\$ 28,000).
- Preparation of a digital atlas of water resources, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 9,000\* (US\$ 3,000).
- Improvement, automation and expansion of integrated systems of water mains in Alto Sertão and Sertaneja, SEPLANTEC: This Action is part of the PROÁGUA Program, the objective of which is to ensure the availability of sufficient quantities of high-quality water supplies in semi-arid areas, by promoting the rational use of water resources and the implementation of structural and priority engineering works, R\$ 75,000,000 (US\$ 25.00 million).
- Preparation of Ecological and Economic Zoning for the State of Sergipe, Adema: Support for planning, drafting and monitoring of environmental policies, R\$ 30,000\* (US\$ 10,000).
- Rehabilitation of Degraded Areas and of riparian forests in the sub-basins of the Jacaré and Cadoz Rivers, Adema: Ensure conservation of environmental resources, adoption of a policy that enables maintenance of balanced ecosystems, R\$ 632,000 (US\$ 0.21 million).
- Expansion of the integrated systems of water mains of Alto Sertão and Sertaneja, Deso: Promote improvements in the quality of life of the population, by means of implementation of actions relating to water supply, sewage drains and solid waste disposal, R\$ 8,637,000 (US\$ 2.88 million).

- Duplication of the Water Mains System of the São Francisco, Deso: Promote improvements in the quality of life of the population by means of actions relating to water supply, sewage drains and solid waste disposal, R\$ 7,621,000 (US\$ 2.54 million).
- Procurement of equipment for the automation operating systems, Deso: Promote improvements in the quality of life of the population by means of actions relating to water supply, sewage drains and solid waste disposal, R\$ 656,000\* (US\$ 0.22 million).
- Drilling and installation of wells, Cohidro: Raise living standards of rural populations by means of providing water for human consumption and for livestock, and promoting sustainable development in current and potential irrigated areas, R\$ 123,000\* (US\$ 0.04 million).
- Establishment of irrigation projects, Cohidro: Raise living standards of rural populations by means of providing water for human consumption and for livestock, and promoting sustainable development in current and potential irrigated areas, R\$ 500,000\* (US\$ 0.17 million).
- Maintenance of irrigation projects, Cohidro: Raise living standards of rural populations by means of providing water for human consumption and for livestock, and promoting sustainable development in current and potential irrigated areas, R\$ 475,000\* (US\$ 0.16 million).

Note: (\*) Sums estimated for the São Francisco River Basin.

#### 5.3.4. PPA 2004-2007 for the State of Pernambuco

The principal programs for the State of Pernambuco and the respective sums foreseen are as follows:

- Review/Updating of Master Plans for water resources in tributary river basins of the São Francisco, R\$ 2,400,000 (US\$ 0.80 million);
- Plan for the integrated use of water resources in tributary river basins of the São Francisco – PARH- São Francisco, R\$ 1,300,000 (US\$ 0.43 million);

- Project for the establishment of an integrated hydrometeorological network in tributary river basins of the São Francisco, R\$ 900,000 (US\$ 0.30 million);
- Support for the creation of the Basin Committees of the Pontal, Garças, Brígida and Terra Nova Rivers, reestablishment of the Basin Committees of the Moxotó and Pajeú Rivers, and establishment of Associations of Water Users, R\$ 1,970,000 (US\$ 0.66 million);
- Hydro-geological Studies on the sedimentary Basins of Araripe, Jatobá, Cedro, Mirandiba and Tupanaci, R\$ 2,500,000 (US\$ 0.83 million).

The State of Pernambuco's investments in these Programs amount to R\$ 2,830,000 (US\$ 0.94 million) for 2004, and to R\$ 9,070,000 (US\$ 3.00 million) for the 2004-2007 period.

#### 5.3.5. PPA 2004-2007 for the State of Alagoas

The Principal programs for Alagoas and their respective values are listed below:

- Strengthening of the São Francisco Basin Committee, SEMARHN, R\$ 120,000 (US\$ 40,000);
- Environmental prevention, protection and rehabilitation, Semarhn/IMA, R\$ 90,000 (US\$ 30,000);
- Environmental training and education, SEMARHN, R\$ 161,000 (US\$ 53,667);
- Canal do Sertão, SEINFRA, R\$ 312,037,000 (US\$ 104.00 million);
- Establishment of small-scale engineering works for water catchment in semi-arid areas/sertão, Semarhn, R\$ 1,750,000 (US\$ 0.58 million);
- Drafting of soil, water and vegetation conservation plans, SEMARHN, R\$ 1,000 (US\$ 333);
- Training of technical staff in combating desertification, SEMARHN, R\$ 26,000 (US\$ 8,667);
- Implementation of a sewage collection system in the São Francisco River Basin, SEINFRA, R\$ 163,573,000 (US\$ 54.50 million);

The investments of the State of Alagoas in these Programs amount to R\$ 477,758,000 (US\$ 159.20 million) for the period 2004-2007.

## 5.3.6. PPA 2004-2007 for the Federal District

The principal programs of the PPA 2004-2007 for the Federal District (DF), and the respective sums foreseen are as follows:

- Water Resources Management, R\$ 265,000 (US\$ 88,333)
- The Cities Program R\$ 2,150,000 (US\$ 16,667)
- Installation of the Federal District Water Agency, R\$ 375,000 (US\$ 0.13 million)
- Recovery of degraded areas, R\$ 246,750,000 (US\$ 82.20 million)
- Federal District Plan for environmental protection, R\$ 8,625,000 (US\$ 2.87 million)
- Eco-tourism Project in the DF, R\$ 30,000 (US\$ 10,000)
- Procurement of equipment for the strengthening of environmental control and licensing of the use of water resources, R\$ 100,000 (US\$ 33,333)
- Strengthening of the water resources management policy, R\$ 6,625,000 (US\$ 2.21 million)

- Strengthening and restructuring of the system of environmental monitoring, control and licensing of the use of water resources, R\$ 100,000 (US\$ 33,333)
- Implementation of the Program for protection of headwaters, R\$ 150,000 (US\$ 50,000)
- Implementation of a Program for the recovery and management of river basins, R\$ 50,000 (US\$ 16,667)
- Reforestation using native species, R\$ 7,000 (US\$ 2,333)
- Modernization of the DF hydro-meteorological network, R\$ 255,000 (US\$ 85,000)
- Mapping of ecosystems, R\$ 7,000 (US\$ 2,333)
- Environmental Information System, R\$ 525,000 (US\$ 0.18 million)
- Maintenance of the environmental information system and the geo-referenced water resources database, R\$ 60,000 (US\$ 20,000)
- Ecological and economic zoning, R\$ 100,000 (US\$ 33,333)

The investments of the Federal District in these Programs amount to R\$ 264,074,000 (US\$ 88.00 million) for the 2004-2007 period.

## 5.3.7. PPA 2004-2007 for the State of Goiás

No significant investments are foreseen in the State of Goiás, in the area corresponding to the São Francisco River Basin.

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