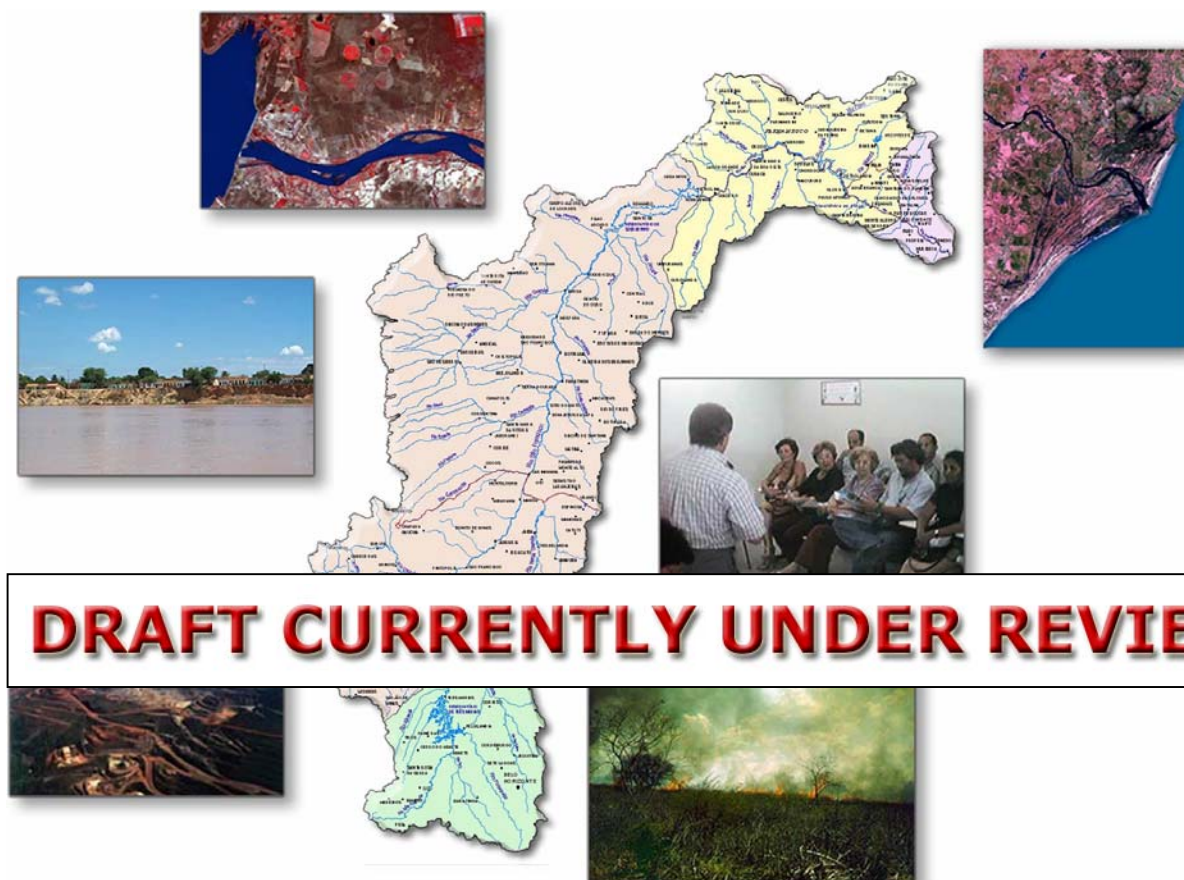




INTEGRATED MANAGEMENT OF LAND BASED ACTIVITIES IN THE SÃO FRANCISCO RIVER BASIN PROJECT ANA/GEF/UNEP/OAS

Activity 4.5A - Diagnostic Analysis of the Basin and its Coastal Zone



DRAFT CURRENTLY UNDER REVIEW

Final Report

Preliminary Version of the Executive Summary

DIAGNOSTIC ANALYSIS OF THE SÃO FRANCISCO RIVER BASIN AND ITS COASTAL ZONE

Brasilia-DF

**INTEGRATED MANAGEMENT OF LAND BASED ACTIVITIES
IN THE SÃO FRANCISCO RIVER BASIN PROJECT
ANA/GEF/UNEP/OAS**

Activity 4.5A - Diagnostic Analysis of the Basin and its Coastal Zone

Final Report
Preliminary Version of the Executive Summary

**DIAGNOSTIC ANALYSIS OF THE SÃO FRANCISCO
RIVER BASIN AND ITS COASTAL ZONE**

National Director
Antônio Felix Domingues
Brazilian National Water Agency - ANA

International Coordinator
Nelson da Franca Ribeiro dos Anjos
Organization of American States – OAS

Technical Coordinator
José Luiz de Souza
Brazilian National Water Agency - ANA

Consultants
Fernando Antonio Rodriguez
Guilherme Pimentel Holtz

Collaborators
Wanderley Sílvio de Farias
Albano Henrique de Araújo
Maria Angélica Valério

June 2003

DIAGNOSTIC ANALYSIS OF THE SÃO FRANCISCO RIVER BASIN AND ITS COASTAL ZONE - DAB

EXECUTIVE SUMMARY

INTRODUCTION

The São Francisco river Basin possesses a **strategic location** because it constitutes a territory which makes a natural connection between the Southwest, the most developed region of Brazil, and the Northeast, considered to be in a less advanced state of development.

It is also a Basin of **great social economic importance** because of its multiple uses, full of energy, cattle-raising and agro-industrial potential, besides that of the tourist industry, which is just beginning to be exploited. These intense activities in the use of water are exercising a great pressure upon the base of its natural resources, particularly water resources, especially due to the intense irrigation in more than 333,310 hectares, about 11% of the irrigated area of Brazil, as well as to pollution.

With a **population of 13,297,955 inhabitants**, about 8% of the Brazilian population in the year 2000 and important urban centers, with emphasis on the metropolitan region of Belo Horizonte –RMBH, the Basin still has enormous spaces, which are economic lacunas.

The Basin has been suffering **strong environmental aggression** since the middle of the 19th Century, with the greatest impacts having occurred during the second half of the last century. One of the sub-basins most affected by the environmental aggression to the São Francisco is the Velhas river, where the iron-bearing Quadrilateral and the Metropolitan Region of Belo Horizonte are located, areas which are highly industrialized, generating the most diverse products, but having pollution as one of their pernicious sub-products.

The activity of the Federal Government in the Basin is significant although the **lack of institutional articulation has made the execution of integrated actions difficult**. The activities executed at the federal level in the Basin by the **Company for the Development of the Valleys of the São Francisco and of the Parnaíba – CODEVASF**, in the area of irrigation, and by the **Hydroelectric Company of the São Francisco – CHESF**, in the energy area, deserve to be emphasized, besides the other organs and ministries.

Considering the importance, potentialities and problems existing in the Basin, the Brazilian Government, through the Secretariat of Water Resources of the **Ministry of the Environment - SRH/MMA**, solicited in 1996 the cooperation of the **Global Environment Facility – GEF**, of the **United Nations Environment Program - UNEP** and of the **Organization of the American States – OAS**, to elaborate, in concert with national, governmental and non-governmental organisms, the **Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone – PAE**. In 2001 the **Brazilian National Water Agency - ANA**, substituted the SRH/MMA as national executor of the project.

The Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone – DAB, presents a consolidation of the diverse Activities or Subprojects begun in January of 2000, developed in the range of the **Integrated Management of Land-based Activities in the São Francisco River Basin Project (ANA/GEF/UNEP/OAS)**, known as the **GEF São**

Francisco Project. The DAB constitutes the stage which precedes the PAE, according to the process and methodology presented in Figure 1.

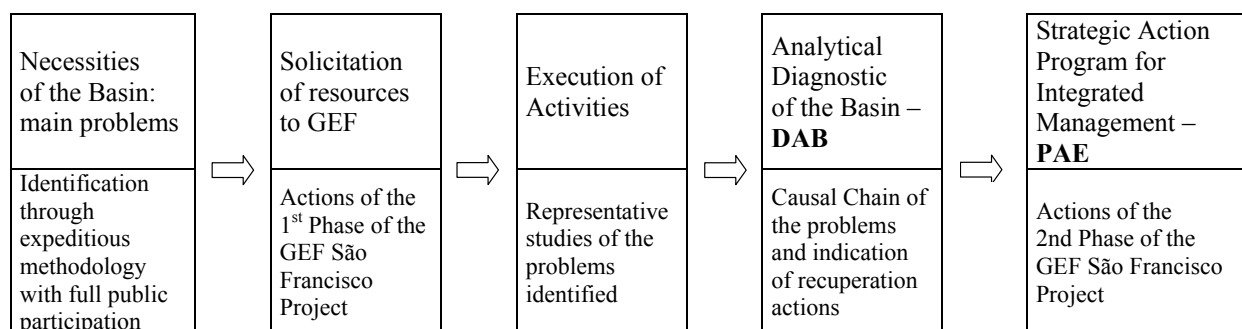


Figure 1. Diagram indicative of the methodology of the GEF São Francisco Project

Chapter 1 of the Executive Summary of DAB presents the **characteristics of the Diagnostic and the information available** in the Basin and a **summary of the Activities** of the GEF São Francisco Project.

The DAB presents the result of more than 2 years of research and actions developed in 28 Activities, which totaled 210 public events with the participation of 190 consultants, 1,248 collaborators and 11,503 attendants. Moreover, directly or indirectly, 41 Federal Organizations, 65 State Organizations, 66 Municipal Organizations, 59 Non-Governmental Organizations, 42 private businesses, and 7 International Institutions have taken part.

Chapter 2 synthesizes the **current knowledge of the Basin**, from the **physiographic and socio-economic** point of view, according to the new physiographical division, where the new limits are: Upper, the springs and the coming confluence of the river Jeiquitaí-MG to the Sobradinho dam; Middle, from the confluence of the river Jeiquitaí to the Sobradinho dam – Pernambuco-BA; Lower-middle, from the Sobradinho dam to the area of Belo Monte-AL-SE and the Lower, from Belo Monte to the Delta-AL/SE.

Chapter 3 treats of the knowledge of the **main uses of water** and of the **problems and conflicts** related to water resources of the Basin.

The **institutional and legal framework** is presented in Chapter 4 and **the existing and planned projects in the Basin**, which could be identified by the GEF São Francisco, are indicated in Chapter 5.

The **critical problems and actions identified** to turn back these problems, including the analysis of the **causal chain** are presented in Chapter 6. The eight critical problems identified in the Basin form the lack of institutional articulation; The conflicts about the use of water; the insufficiency of water for multiple uses; the degrading modification of the aquatic ecosystem; the sources of point and diffuse pollution; the modification of the use and inadequate occupation of the land; the disorderly exploitation of groundwater, dissociated from the surface water and the restrictions for navigation.

The result of this whole process, presented in Chapter 7 was a **preliminary identification of 16 Activities** considered to be priorities in order to implement the actions defined in the

analysis of the Causal Chain and recommendations, also preliminary, of activities to be considered in the Elaboration of the PAE of the Basin and its Coastal Zone.

These projects were divided into four large components: I. **Institutional Strengthening and Public Participation**; II. **Sustainable Development of Water Resources**; III. **Prevention, Protection and Environmental Rehabilitation** and IV. **Environmental Qualification and Education**, at an indicated total cost, to be **solicited to GEF of US\$ 12,000,000**.

Two appendices accompany the Executive Summary. The first presents the institutions and personnel involved in the GEF São Francisco Project, by Activity. The second, the directing and coordinating of the Activity.

Finally, the Summary of the basic text of the Final Report of the DAB is presented, where some chapters have a different sequence from the Executive Summary, due only to a decision to make the comprehension of the actions in the Summary easier.

One concludes that for a real, sustainable development of the Basin and its Coastal Zone, one should have a institutional and ministerial transversal interconnection of the question of water resources and of the environmental question, where the **São Francisco River Basin Committee – CBHSF**, and the governmental and state organisms responsible should act in a harmonious and integrated way.

CHARACTERISTICS AND ANTECEDENTS OF THE DAB

1.1. Characteristics of the DAB

The Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone – DAB is a document based on technical, scientific studies and has as its basis the results obtained by the Activities developed in the range of the GEF São Francisco Project, besides the other projects and actions undertaken by diverse institutions acting in the São Francisco River Basin.

Its principle to identify the cause-effect relation for every significant hydro-environmental problem chosen as a priority; this constitutes a basis of information for the formulation of a wide range PAE with a multisectorial and holistic approach and identifies critical problems as well as the root causes of environmental degradation and of the critical problems of the Basin in their physical, socio-economic, legal and politico-institutional aspects.

1.2. Available Information

The São Francisco river basin has performed an important role in the economic and social development of Brazil. The knowledge of its potentialities on a technical and scientific basis began to become real, right from the times of Imperial Brazil, and this knowledge has been accumulating ever since.

Among the governmental and institutional actions and more inclusive studies, one can cite the following:

- **1945** – Creation of the Hydroelectric Company of the São Francisco - **CHESF**
- **1948** – Creation of the Commission of the Valley of the São Francisco - **CVSF**
- **1950** – **General Plan for the Economic Exploitation of the São Francisco Valley**, of CVSF

- **1961** – Forming of the lake of **Três Marias*** and the beginning of the operation of the hydroelectric plant
- **1964** – Convenium between the CVSF, the Superintendent's Office of Development of the Northeast - SUDENE and the United States Agency for International Development - USAID, for the execution by the United States Bureau of Reclamation - **USBR** of the **Reconnoitering of Soils and Water Resources in the São Francisco River Basin**
- **1969** – Beginning of the work of the Committee of Energetic Studies of the Northeast **ENENORDE**
- **1974** – Conclusion of the **Integrated Development Plan of the São Francisco Valley** by the Development and Resources Corporation – **DRC**
 - Creation of the Company of Development of the Valley of the São Francisco - **CODEVASF**, substituting the **SUVALE** which in 1967 substituted the CVSF
- **1978** – Formation of **Sobradinho*** lake and the beginning of the operation of the hydroelectric plant
- **1979** – Creation of **CEEIVASF** – Special Committee of Integrated Studies of the São Francisco which remained until 2000 as a forum of discussion of the governmental organisms of the Basin
- **1982** – Beginning of the **Studies** by the Federal Government for the **transposition** of the waters of the São Francisco to various States of the Northeast located outside the Basin
- **1988** – Formation of the lake of **Itaparica*** and beginning of the operation of the hydroelectric plant
- **1989** – Conclusion of the **Directing Plan for the Development of the São Francisco Valley - PLANVASF**, coordinated by the Ministry of the Interior, CODEVASF and SUDENE, with the collaboration of the OEA and afterwards approved by Law 8.851/94
- **1993** – Beginning of the Elaboration of the **Directing Plans of Water Resources of 15 Sub-basins** of the tributary rivers of the São Francisco, elaborated by diverse consulting companies for **SRH/MMA** but not yet approved
- **1996** – Solicitation of the Brazilian Government through the Secretary of Water Resources of the Ministry of the Environment **SRH/MMA** for the **Cooperation of the GEF, PNUMA and OAS to elaborate a Plan of Strategic Actions for the São Francisco River Basin and its Coastal Zone.**
- **2000** – Beginning of the **Studies of Water-Environmental Revitalization of the Basin** by the Ministry of National Integration - **MI**
- **2001** – **Transference** of the National Execution of the **GEF São Francisco Project to ANA**
 - Creation, by Decree of 5/6/2001, of the **Project of Revitalization and Conservation of the São Francisco River Basin**, ordered by **MMA**. This same Decree creates the **São Francisco River Basin Committee - CBHSF**
 - Beginning of the work of the **Special Commission to Accompany the Project of Revitalization of the São Francisco River of the Federal Senate**

* The great reservoirs formed by the dams of Três Marias, Sobradinho and Itaparica have a decisive influence on the hydrological system of the Basin.

- **2002** – Presentation of the **proposal of the Directing Plan of Water Resources of the São Francisco River Basin**, prepared by the Getúlio Vargas Foundation - **GVF**, for the SRH/MMA
- **2003** – Review of the plans and programs referring to the revitalization of the Basin by the Ministries of the Integration and of the Environment and their companies and agencies
 - Beginning of the activities of the **CBHSF** with the **election of its first Board of Directors**
 - Elaboration of the **Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone - DAB** by ANA/GEF/PNUMA/OAS
 - Elaboration of the **Pluriannual Action Plan - PPA** for 2004-2007

1.3. Activities of the GEF São Francisco Project

For the preparation of the proposal of the Project of Integrated Management of the Activities Developed on the Land in the São Francisco River Basin, the SRH/MMA, the OAS and the PNUMA made a broad consultation of public participation to identify the main problems of the Basin and its Coastal Zone and proposals of solutions to be transformed into Activities.

In this phase, known as the *Project Development Facility – PDF Block B*, three seminars were held in three cities of different physiographic regions of the Basin and its coastal zone. Belo Horizonte, in November of 1997; Penedo, in February of 1998, and Petrolina in December of 1998, with the participation of more than 270 persons, representing more than 110 organisms of the Federal, State, and Prefectures' governments, Universities, Non-Governmental Organisms, Associations, Unions, and private businesses.

As a result, diverse proposals presented and debated were selected and divided in Activities comprised of four large components, which were executed between 2000 and 2002.

During the execution of the Activities, various aspects emerged which contributed significantly to increase the technical and scientific knowledge and explain some affirmations, which had never been proved or confirmed, thus permitting one to break some myths. Among these were the existence of the desertification in the regions of Cabrobó and the increase of saline intrusion in the bed of the São Francisco River, after the construction of Xingó.

The location of the Basin and the localization in space of the Activities of GEF São Francisco are presented in Figures 2 and 3, respectively and the Executive Summaries of the Final Reports of the Activities of GEF São Francisco, are available in Portuguese and English, on the *web* page of the National Agency of Waters - ANA the access of which is <http://www.ana.gov.br/gefsf/>.

The Components and the Corresponding Activities are presented as follows:

Component I – Environmental Analysis of the Basin and of its Coastal Zone – has the objective of providing a solid technical and scientific basis, for the strategic corrective actions of obtaining knowledge for the sustainable development of the Basin and the protection of the marine environment, beginning with the activities in the Basin which are identified during the process of the preparation of the Project.

Upper São Francisco

- Environmental Assessment of Mining Activities in the Water Resources at the Alto Rio das Velhas River Basin-MG (Activity 1.2)
- Determination of Land Use in the Upper São Francisco (Activity 2.1)

Middle São Francisco

- Multitemporal Analysis of Riverbed Shape Alteration Dynamics in the Middle São Francisco-BA (Activity 2.2C)
- Conjunctive Use of Surface and Groundwater in the Fêmeas River Basin-BA (Activity 3.2)
- Impact of Agriculture on Groundwater Resources in the Verde/Jacaré Rivers-BA (Activity 1.5)

Lower-Middle São Francisco

- Determination of Land Use in the Lower-middle São Francisco (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 at its Estuary and Adjacent Coastal Zone-AL/SE (Activity 1.1A)
- River Banks Erosion Process Evaluation Studies and its Effects in the River Sedimentation Dynamics-AL/SE (Activity 2.4)
- Estuary Nutrient Load Sediment Determination in the Delta of the São Francisco (Activity 1.1B)
- Recomposition of the Rheophilic Ictiofauna 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 – seeks to promote the involvement of the communities in the identification of the problems and in the studies for corrective measures, as well as in the establishment of a dialogue between persons and institutions with economic and social interests in the Basin. The purpose was to take advantage of the understanding and appropriate the experiences of the community for the formulation of the actions to be developed, an essential condition for interventions to be efficacious and sustainable environmentally.

- Promotion of Public Participation in the São Francisco River Basin (Activity 4.1)
- Partnership for the Improvement of Water Quality in the São Pedro Stream-MG (Activity 2.2A)
- Recovering Our Forests – Pilot Project in the Municipality of Luz-MG (Activity 2.2B)
- Citizen Training for the Management of Basin Committees and Environmental Education (Activity 3.3A)

Component III – Development of Organizational Structure – has as its main objective to raise the institutional qualifications and the human resources, with the creation of the São Francisco River Basin Committee - CBHSF, contributing to the strengthening of the

institutions, with the objective of assuring the continuity of the measures for the management of the Basin, identified in the preparation of the **PAE**.

- Support to the Creation of the Integrated Water Basin Committee (Activity 3.4/ Support to the Strengthening of the Integrated Water Basin Committee of the São Francisco Basin (Activity 3.5)-AL/BA/MG/PE/SE
- Evaluation of Water Resources National Policy Instruments Implementation for the Maranhão River Pilot Basin-MG (Activity 3.1)
- Development of a Water Basin Integrated Management Plan for the Salitre River-BA (Activity 3.3B)

Component IV – Formulation of the Strategic Action Program for the Integrated Management of the São Francisco River Basin – PAE - the objective of this component is to complement the information developed in the three previous components and to prepare the DAB and the PAE, based upon a multi-sectorial and holistic approach of environmental management and of economic development of the São Francisco River Basin and its Coastal Zone.

- Evaluation of the Contribution of the Lower São Francisco River's Navigational Route to the Agriculture Competitive Enhancement in the Basin-AL/SE (Activity 1.1C)
- Evaluation of Economic Instruments for the Sustainable Management of Water Resources in the Sub-basin of the Verde Grande-MG/BA (Activity 4.2A)
- Quantification and Assessment of the Efficiency of Water Usage by Agriculture in the São Francisco River Basin (Activity 4.3)
- Subsidies for the Formulation of Operational Policies for the Great Reservoirs in the São Francisco River Basin (Activity 4.4)
- Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone - DAB (Activity 4.5A)
- Proposal for Complementation of the Hydrometeorologic Network in the São Francisco Basin (Activity 4.7A)
- Plan for a Piezometric Monitoring Network in the Basin of the Rio Verde Grande-MG (Activity 4.7B)
- Meta-data Based Reference Information System (Activity 4.7C)

2. THE SÃO FRANCISCO RIVER BASIN AND THE NEW PHYSIOGRAPHICAL DIVISION

2.1. The São Francisco river basin

The São Francisco river basin has an area of **639,219 km²**, which corresponds to about **7.5%** of the **national territory**. Its longest linear length is **2,863 km**, with its springs in the Samburá River.

The Basin includes areas of six states of the Federative Republic of Brazil, besides a small part of the Federal District. These federated units, with their areas, population and number of municipalities, are indicated in Chart 1.

Chart 1. Area, population and number of municipalities, by federated unit, in the São Francisco river basin

Federated Unit	Area		Population		Municipalities	
	km ²	%	Inhabitants	%	Nº	%
MG	235,417	36.8	7,595,274	57.2	240	47.7
GO	3,142	0.5	107,858	0.8	3	0.6
DF	1,336	0.2	2,000	-	1	0.2
BA	307,941	48.2	2,663,527	20.1	114	22.7
PE	69,518	10.8	1,614,565	12.2	69	13.7
AL	14,338	2.2	1,002,900	7.5	49	9.7
SE	7,473	1.3	291,831	2.2	27	5.4
Total	639,219	100	13,297,955	100	503	100

Source: IBGE-Census 2000/ANA/GEF/PNUMA/OEA

The São Francisco basin is vast and complex. It drains regions of pluviometric precipitation greater than 2.000mm at its headwaters, in Minas Gerais, up to the semi-arid/arid zone of Bahia and Pernambuco, with less than 350mm, increasing from there in the direction of the delta or mouth, where the annual medium values are about 1,300 mm, (Figure 3).

The medium drainage on a long-term basis at the delta is of approximately **2.810 m³/s**, according to the ANA and of 2.850 m³/s according to CHESF. The **rivers** of the state of **Minas Gerais** contribute with about 2.042 m³/s corresponding to **72%**.

The **rivers of Bahia**, with approximately 610m³/s are equivalent to **22%**. The rest 158m³/s, or 6% are distributed between Pernambuco, Alagoas and Sergipe. The contributions of the rivers that rise in the Federal District and in Goiás are reduced, their waters being incorporated to those of Minas Gerais, where these rivers encounter the São Francisco. The **regularized flow** starting at Sobradinho is of **2,060 m³/s**.

About 343.784 km² of the São Francisco river basin, that is, 53,85% are included in the Drought Polygon, which includes 251 municipalities and more than 5.680.000 inhabitants.

2.2. The new physiographic division

The **first subdivision** of the limits of the great physiographic regions of the São Francisco River Basin was presented in **1967**, by USBR. In **2002**, the Commission of the Federal Senate of The Accompanying of the Project of Revitalization of the São Francisco river, in what it called the **New Geography of the São Francisco**, recommended a revision of the limits established thirty five years before. The proposal of a new division presented is seen in Figure 4. The new limits are:

- **Upper, from the springs to the confluence with the Jeiquitaí river-MG**
- **Middle, from the confluence with the Jeiquitaí river to the Sobradinho dam-PE/BA**
- **Lower-middle, from the Sobradinho dam to Belo Monte-AL**
- **Lower, from Belo Monte to the Delta-AL/SE**

The charts 2, 3, and 4 summarize by physiographical region the general and political characteristics of the Basin, and the physical and natural characteristics and socio-economic characteristics respectively. The Figures of 5 to 11 present the information about water resources, climate, pluviometric precipitation, main tributaries, location of existing dams and proposed ones, location of the irrigation projects, of the agro-industrial poles and the Index of Human Development of the Basin, by municipality.

Location of the São Francisco River Basin

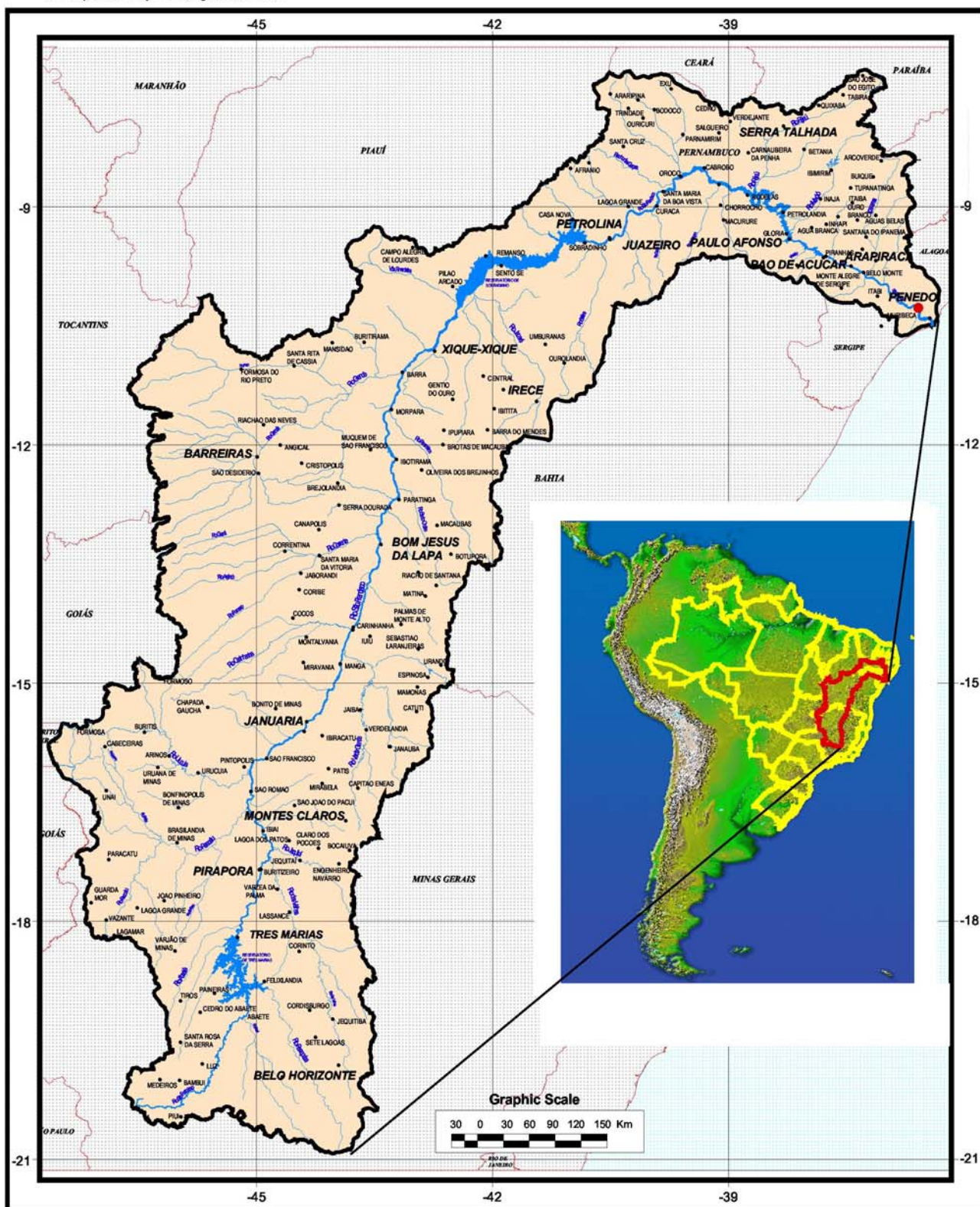


Figure 2 - Location of the São Francisco River Basin

São Francisco River Basin

Location of the Activities of the GEF São Francisco Project

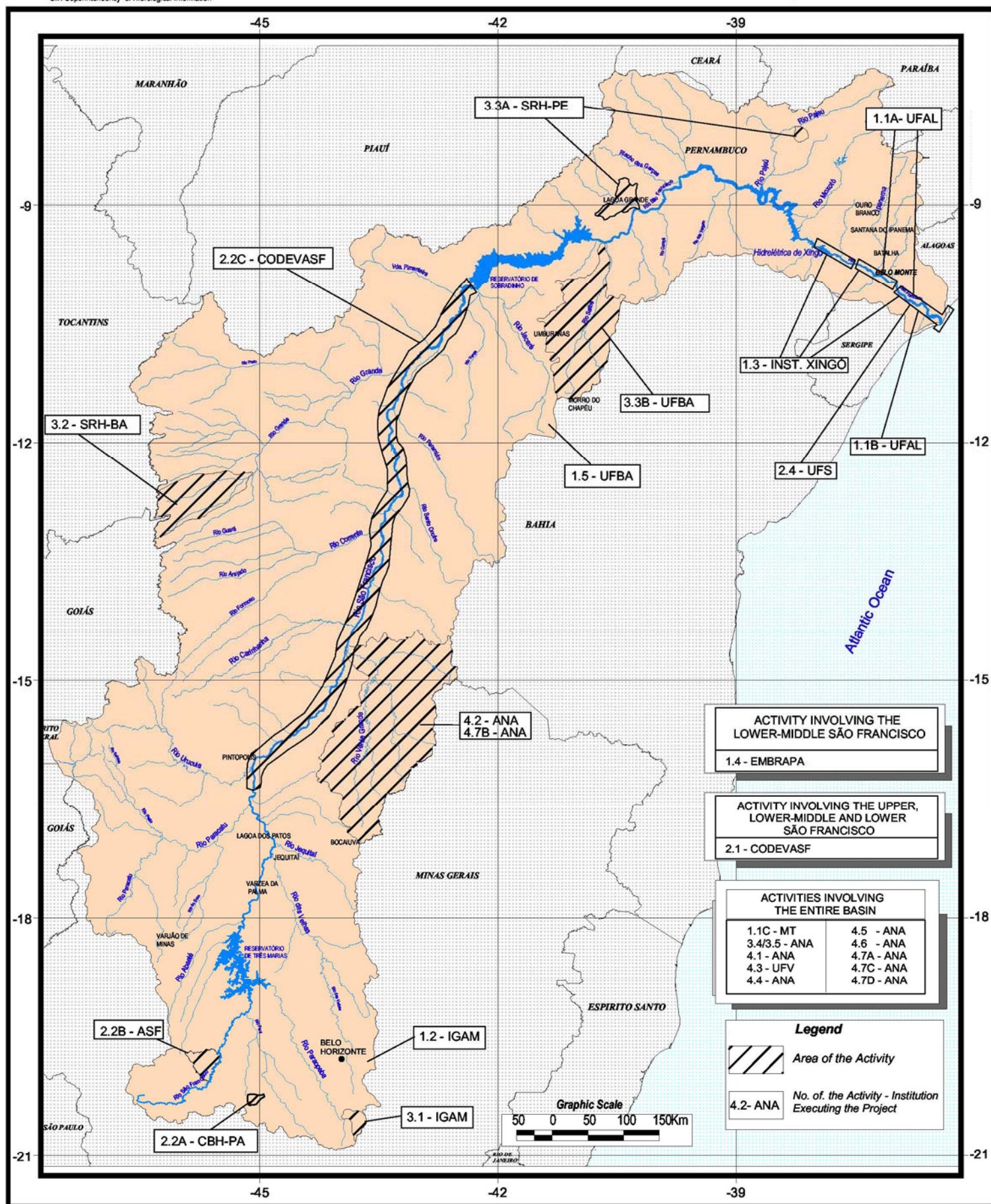


Figure 3 - Location of the Activities of the GEF São Francisco Project

São Francisco River Basin Physiographic Regions - New Limits 2003

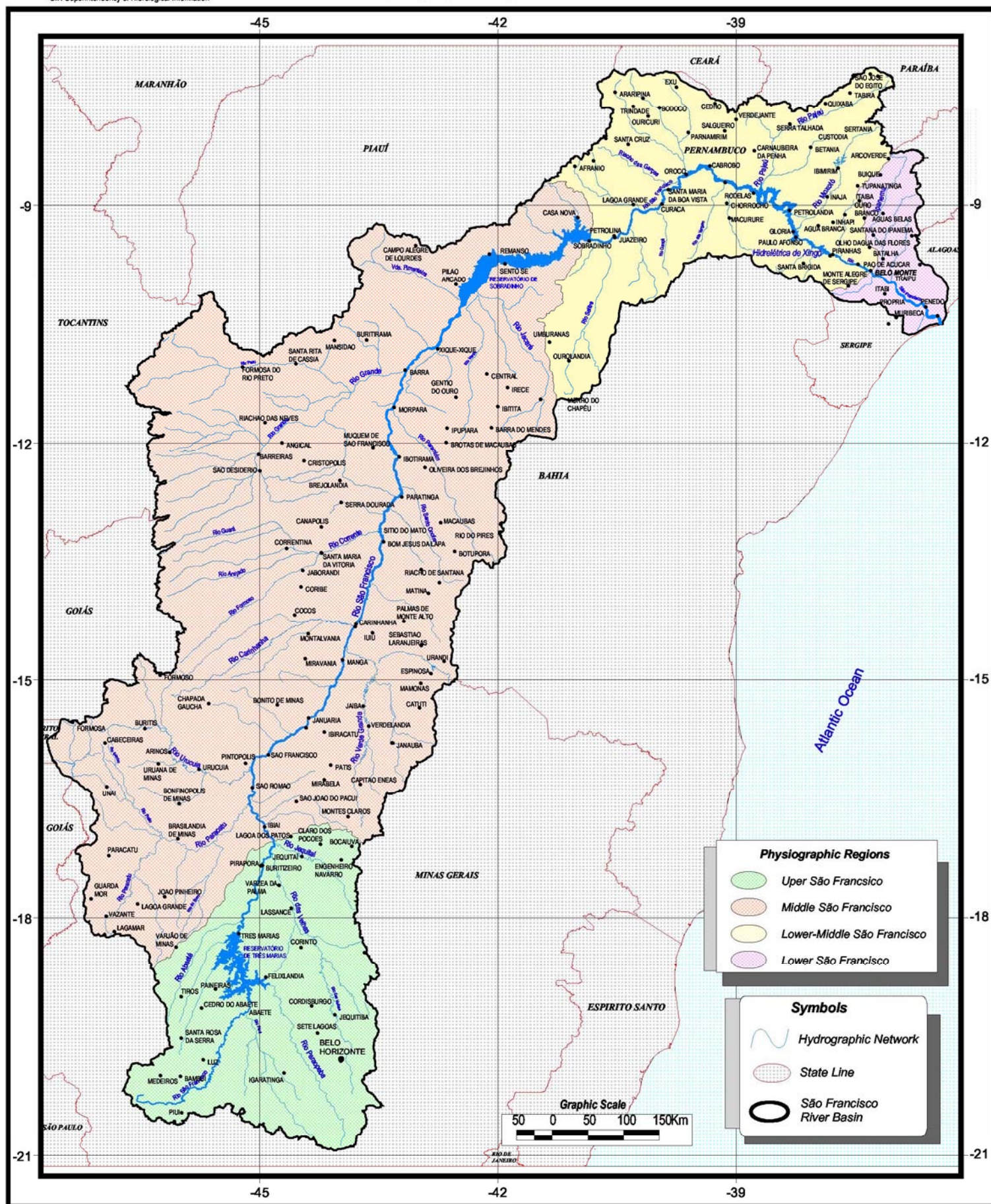


Figure 4. Physiographic Regions - New Limits 2003

Chart 2. General and political characteristics of the São Francisco river basin, by physiographical region

Characterstics	Upper	Middle	Lower-middle	Lower and Adjacent Coastal Zone
• Limits	Springs of the rivers Samburá/São Francisco up to the confluence with the Jequitai river-MG	Confluence with the Jequitai river up to the Sobradinho Dam - BA/PE	Sobradinho dam up to Belo Monte-AL	Belo Monte to the delta on the Atlantic - AL/SE
• Area, km²	99,774	402,402	117,351	19,692
• Area, %	15,6	62.9	18.4	3.1
• Length in km of the section of the main river	1,003	1,152	568	140
• States included	Minas Gerais-MG	Minas Gerais-MG, Federal District-DF, Goiás-GO and Bahia-BA	Bahia-BA, Pernambuco-PE, Alagoas-AL and Sergipe-SE	Pernambuco-PE, Alagoas-AL and Sergipe-SE
• Regions of Brazil included	Southeast	Southeast, Central West and Northeast	Northeast	Northeast
• Main cities (n° of inhabitants)	Metropolitan region of Belo Horizonte, including Contagem, Betim, Santa Luzia, Sabará and Conselheiro Lafayette (3.286.667), Divinópolis (183.707), Patos de Minas (123.708) and Sete Lagoas (184.286)-MG	Montes Claros (306.258), Januária-MG; Formosa-GO, Barreiras (131.335) Guanambi, Irecê, Bom Jesus da Lapa, Remanso-BA	Petrolina (218.336), Juazeiro (174.101) Serra Talhada, Salgueiro-PE	Arapiraca (186.150), Penedo-AL, Propriá, Nossa Senhora da Glória-SE
• Number of municipalities ¹	194	173	93	78
• Population, n° inhabitants	4,108,562	5,110,328 ²	2,475,322	1,603,743
• Population, %	30.9	38.4	18.6	12.1
• Urbanization, %	96	55	56	49

¹ This total amounts to 538 municipalities instead of 503, and some are computed twice because they are in two physiographical regions.

² About 70% of these inhabitants are in the State of Minas Gerais.

Chart 3. Physical land natural characteristics of the São Francisco river basin, by physiographical region

Characteristics	Upper	Middle	Lower-middle	Lower and Adjacent Coastal Zone
• Altitudes, m	1,600 to 600	1,400 to 500	800 to 200	480 at sea level
• Main topographical accidents	Sierras of the Canastra and Espinhaço	Sierra Geral of Goiás, Chapada Diamantina, Chapada das Mangabeiras and the Serra da Tabatinga	Plateau of Araripe and Sierras of the Cariris Velho and Cágados	Sierras Redonda and Negra
• Inclination of the main river, m/km	0.70 a 0.20	0.10	0.10 a 3.10	0.10
• Predominant Climate	Humid tropical and temperate of high altitude	Semi-arid tropical and dry sub-humid	Semi-arid and arid	Sub-humid
• Annual mean precipitation, mm	2,000 a 1,100	1,400 a 600	800 a 350	350 a 1,500
• Rainiest quarter	Nov-Dec-Jan	Jan-Feb-Mar	Jan-Feb-Mar	May-Jun-Jul
• Least rainy quarter	Jun-Jul-Ago	Jun-Jul-Ago	Jul-Ago-Set	Set-Out-Nov
• Mean temperatureC°	23	24	27	25
• Annual mean hours of sunlight	2,400	2,600 a 3,300	2,800	2,800
• Annual mean Evapo-transpiration, mm	1,000	1,300	1,550	1,500
• Main tributaries	ME: Indaiá, Borrachudo and Abaeté MD: Pará, Paraopeba, Velhas and Jequitai	ME: Paracatu, Urucuia, Pardo, Pandeiros, Carinhanha, Corrente and Grande MD: Pacui, Verde Grande, Caraíba, Paramirim and Verde Jacaré	ME: Pontal, Garças, Brígida, Terra Nova, Pajeu e Moxotó MD: Salitre, Poço, Curaçá, Vargem and Macururé	ME: Ipanema, Traipu and Marituba MD: Capivara, Gararu and Betume
• Number of 1st class tributaries	48 perennial	25 perennial e 8 intermittent	19 intermittent	7 perennial starting from Traipu

Characteristics	Upper	Middle	Lower-middle	Lower and Adjacent Coastal Zone
• Average flow rate of main tributaries m³/s (area, km²)	Pará, 124 (12,220); Paraopeba, 115 (13,160); Abaeté, 68 (5,790); Velhas, 283 (29,000); Jequitaí, 46 (8,700)	Paracatu, 444 (45,600); Urucuia, 255 (26,000); Pandeiros, 29 (4,170); Verde Grande, 32 (30,000); Carinhanha, 156 (18,000); Corrente 238, (35,000); Verde Grande, 272 (76,000)		
• Contributing average flow rate, m³/s (area, km²)	Pirapora (61,880) + Velhas and Jequitaí (36,520) = 1,184	Juazeiro, 2,630 (510,800) contribution = 1,446	Pão de Açúcar, 2,790 (608,900) contribution = 160	Delta, 2,810 (639,219) contribution = 20
• Contribution of flow rate, %	42.2	51.4	5.7	0.7
• Maximum monthly average flow rate, m³/s	Pirapora, 1,303 in February	Juazeiro, 4,393 in February	Pão de Açúcar, 4,660 in February	Delta, 4,680 In March
• Minimum monthly mean flow rate, m³/s	Pirapora, 637 in August	Juazeiro, 1,419 in September	Pão de Açúcar, 1,507 in September	Delta, 1,536, in September
• Greatest flow rate quarter	Dec-Jan-Feb	Jan-Feb-Mar	Jan-Feb-Mar	Feb-Mar-Abr
• Least flow rate quarter	Jul-Aug-Sept	Aug-Sept-Oct	Aug-Sept-Oct	Aug-Sept-Oct
• Sediments, 10⁶T/year (area, km²)	Pirapora, 8.3 (61,880)	Morpará, 21.5 (344,800)	Juazeiro, 12.9 (510,800)	Própria, 0.41 (620,170)
• Main sedimentary basins	São Francisco	São Francisco and Jacaré	Araripe, Tucano and Jatobá	Alagoas Coast and Sergipe
• Predominant covering of vegetation	Heath and forest fragments	Heath, bushlands, and small mountain forests	Bushlands	Semi deciduous, seasonal forest, mangroves and shoreline vegetation

Chart 4. Socio-economical characteristics of the São Francisco river basin by physiographical region

Characteristics	Upper	Middle	Lower-middle	Lower and adjacent Coastal Zone
<ul style="list-style-type: none"> • Basic Sanitation, % of homes • Supply • Sewage system • Treated sewage 	<p>84</p> <p>52</p> <p>6</p>	<p>68</p> <p>12</p> <p>1</p>	<p>61</p> <p>26</p> <p>17</p>	<p>54</p> <p>19</p> <p>1</p>
<ul style="list-style-type: none"> • Navigable waterways, km 		<p>1,243 between Pirapora and Petrolina/Juazeiro</p> <p>104 in Paracatu</p> <p>155 in Corrente</p> <p>351 in Grande</p>	<p>60 between Piranhas e Belo Monte</p>	<p>148 from Belo Monte to the delta</p>
<ul style="list-style-type: none"> • Mineral reserves, as % of national reserves 	<p>100% of algamatolite and cadmium</p> <p>60% of lead</p> <p>75% de sulphur and zinc</p> <p>30% de dolomite, gold, iron, limestone, marble and uranium</p>	<p>60% de copper</p> <p>30% de cromite</p>		
<ul style="list-style-type: none"> • Main hydroelectric dams (potential production of energy, MW) 	<p>Três Marias (396)</p> <p>Rio das Pedras (9.3)</p> <p>Cajuru (7.2)</p> <p>Queimados (10.5)</p> <p>Parauna (4.1)</p>	<p>Sobradinho (1,050)</p> <p>Panderos (4.2)</p> <p>Correntina (9.0)</p> <p>Fêmeas (10.0)</p>	<p>Paulo Afonso I, II, III and IV (3,986)</p> <p>Moxotó (440)</p> <p>Itaparica (1,500)</p> <p>Xingó (3,000)</p>	
<ul style="list-style-type: none"> • Irrigated area, ha 		<p>162,407</p>	<p>156,504</p>	<p>14,399</p>
<ul style="list-style-type: none"> • Irrigated area, % 		<p>48.9</p>	<p>46.9</p>	<p>4.2</p>
<ul style="list-style-type: none"> • Main economic activities 	<p>Industry, mining and cattle-raising</p>	<p>Agriculture, cattle-raising, industry and fish-farming</p>	<p>Agriculture, cattle-raising, agro-industry, energy generation and mining</p>	<p>Agriculture, cattle-raising and fishing/fish-Farming</p>
<ul style="list-style-type: none"> • Index of Human Development – IDH 	<p>0.549 a 0.802</p>	<p>0.343 a 0.724</p>	<p>0.438 a 0.664</p>	<p>0.364 a 0.534</p>

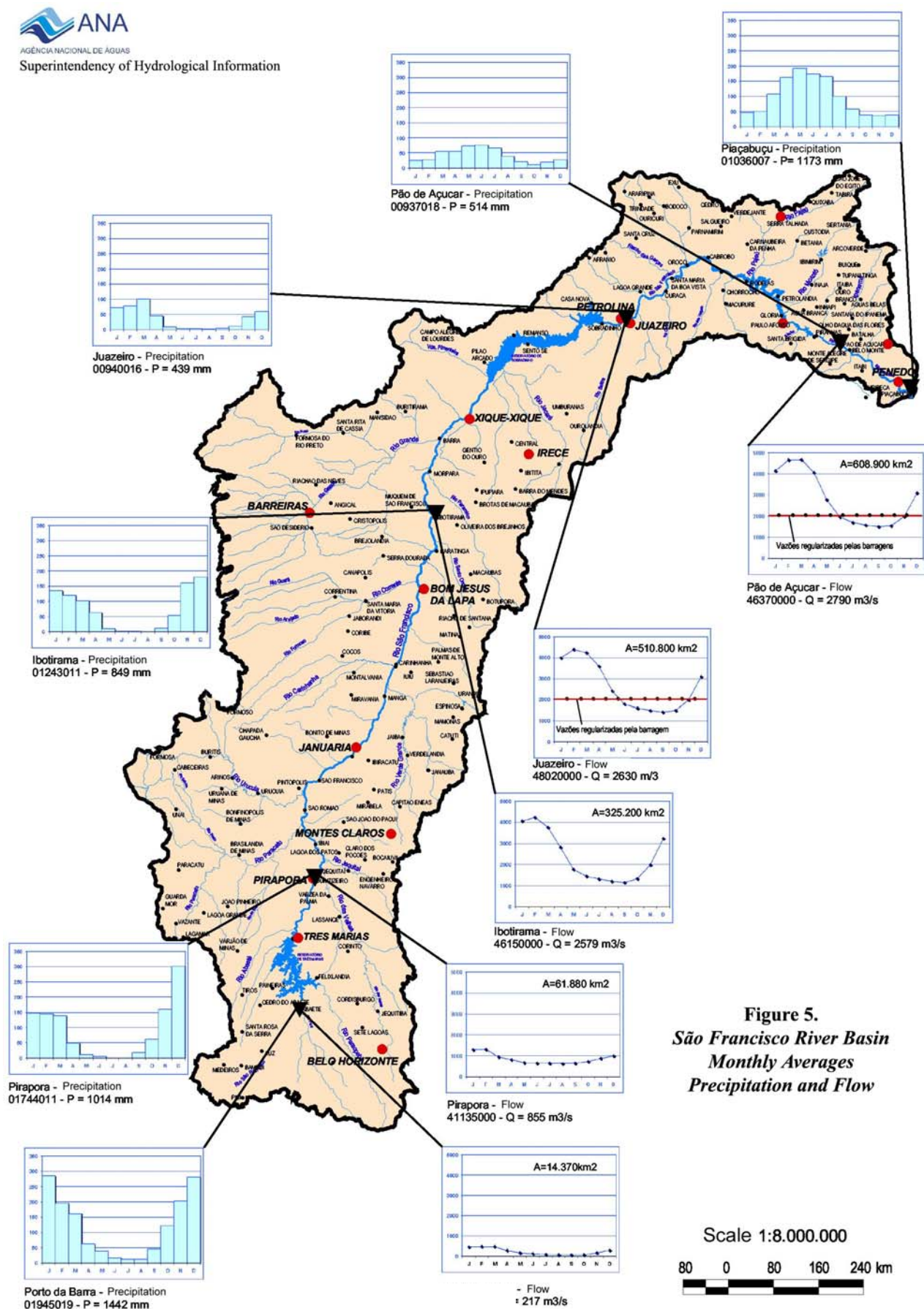


Figure 5.
São Francisco River Basin
Monthly Averages
Precipitation and Flow



Ministério da Integração Nacional
Companhia de Desenvolvimento dos vales do São Francisco e do Parnaíba
Área de Planejamento
Coordenadoria de Projetos Especiais
Supervisão de Geoprocessamento

CLIMATE AND PLUVIOMETRIC PRECIPITATION SÃO FRANCISCO RIVER BASIN

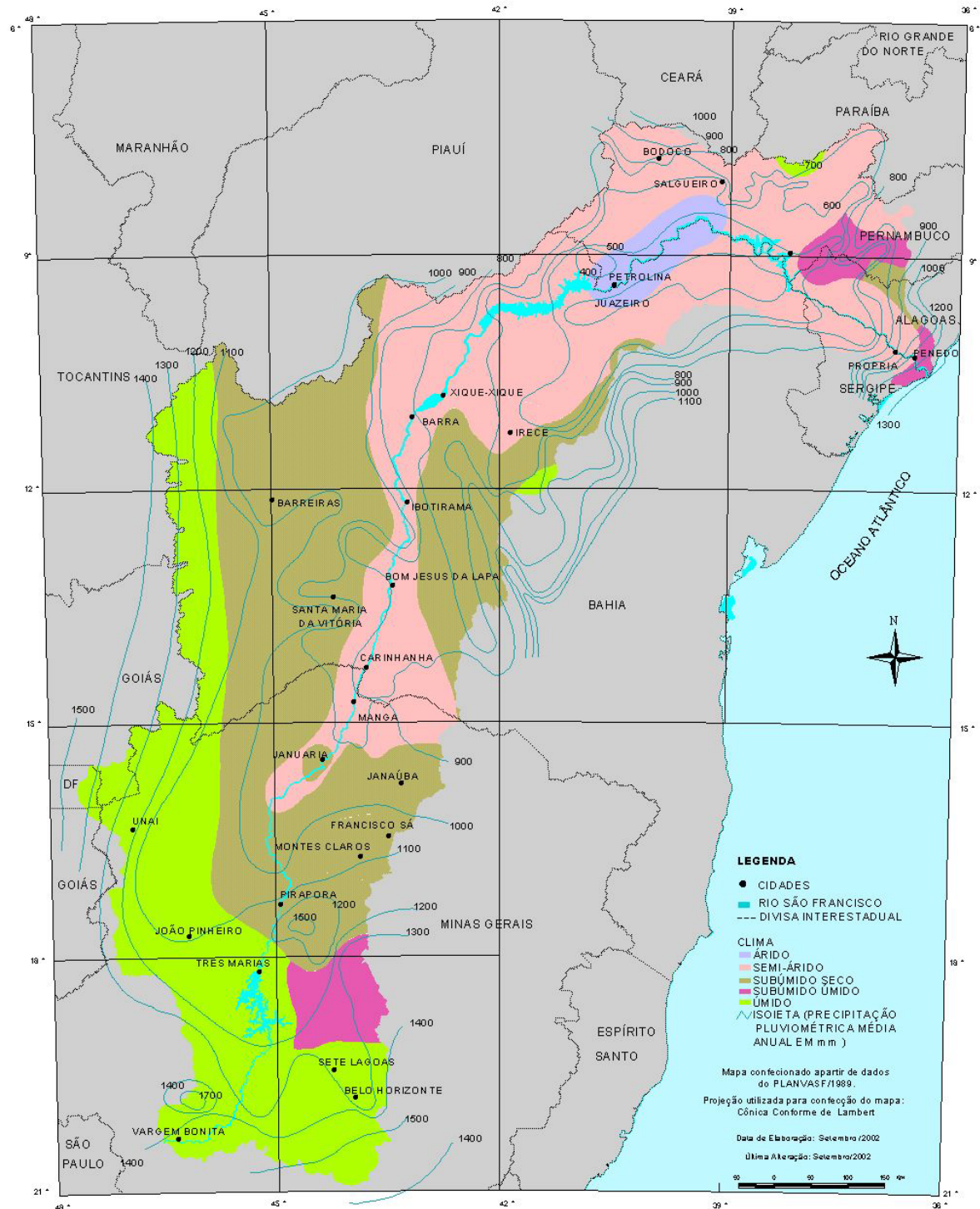


Figure 6. Climate and pluviometric precipitation



BASIN OF MAIN PERMANENT TRIBUTARIES SÃO FRANCISCO RIVER BASIN

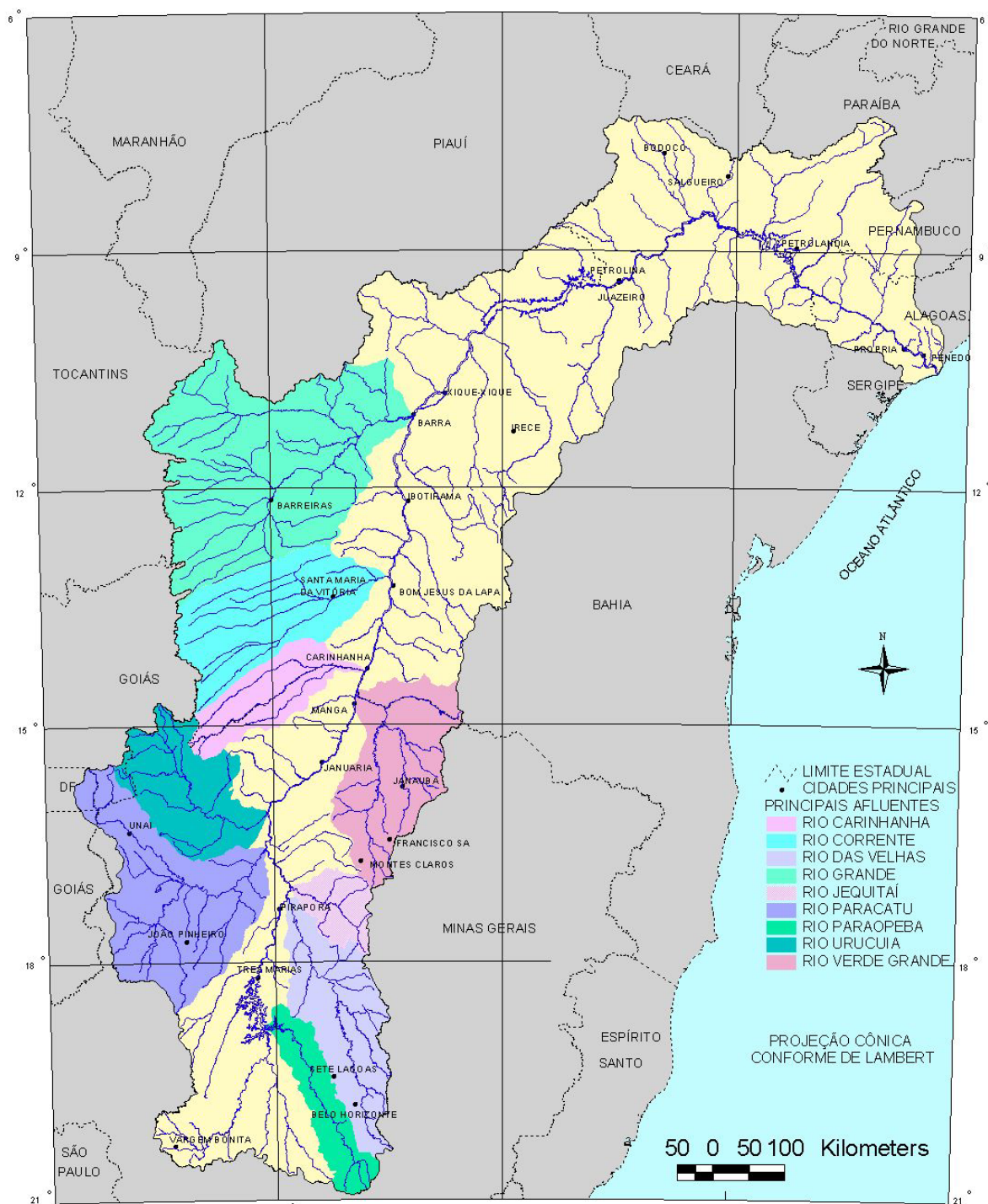


Figure 7. Main permanent tributaries



REVITALIZATION OF THE SÃO FRANCISCO RIVER

PRELIMINARY LIST OF PRIORITY REGULATING DAMS TO BE CONSTRUCTED IN THE SÃO FRANCISCO RIVER BASIN

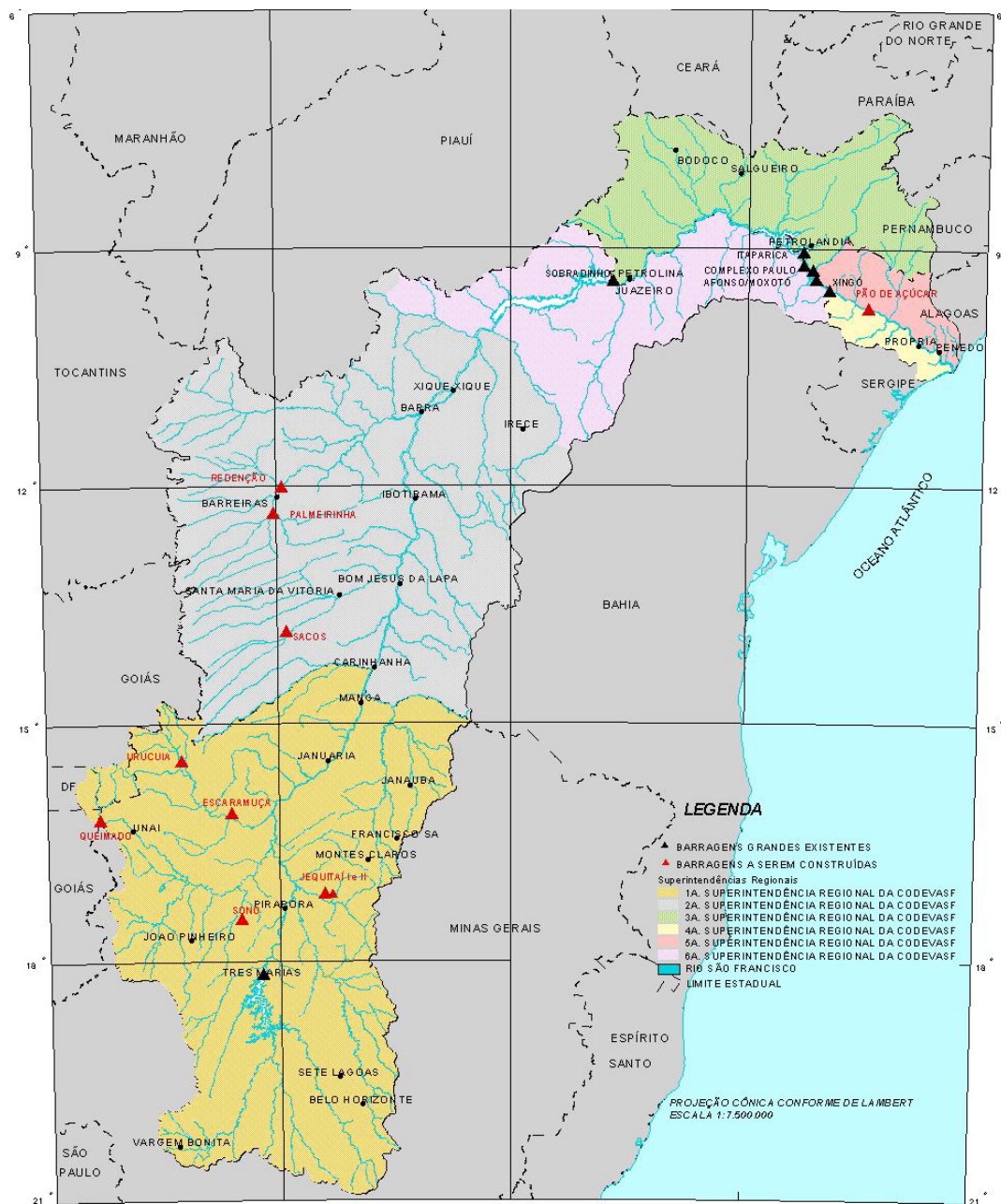


Figure 8. Main existing and programmed dams



Ministério da Integração Nacional
Companhia de Desenvolvimento dos vales do São Francisco e do Parnaíba
Área de Planejamento
Coordenação de Projetos Especiais
Supervisão da Geoprocessamento

IRRIGATION PROJECTS SÃO FRANCISCO RIVER BASIN

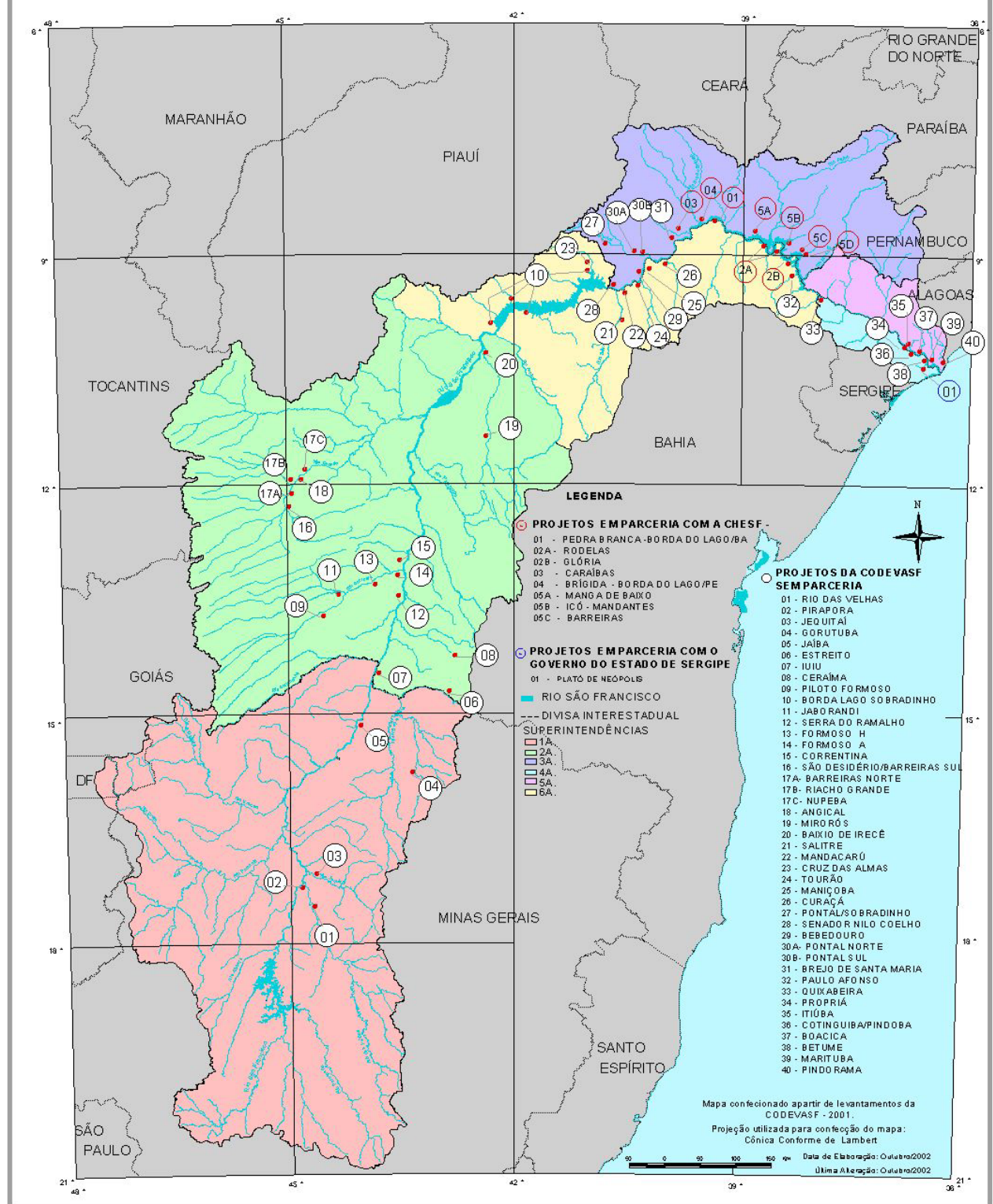


Figure 9. Irrigation projects



Ministério da Integração Nacional
Companhia de Desenvolvimento dos vales do São Francisco e do Parnaíba
Área de Planejamento
Coordenadoria de Projetos Especiais
Supervisão de

AGRO-INDUSTRIAL POLES SÃO FRANCISCO RIVER BASIN

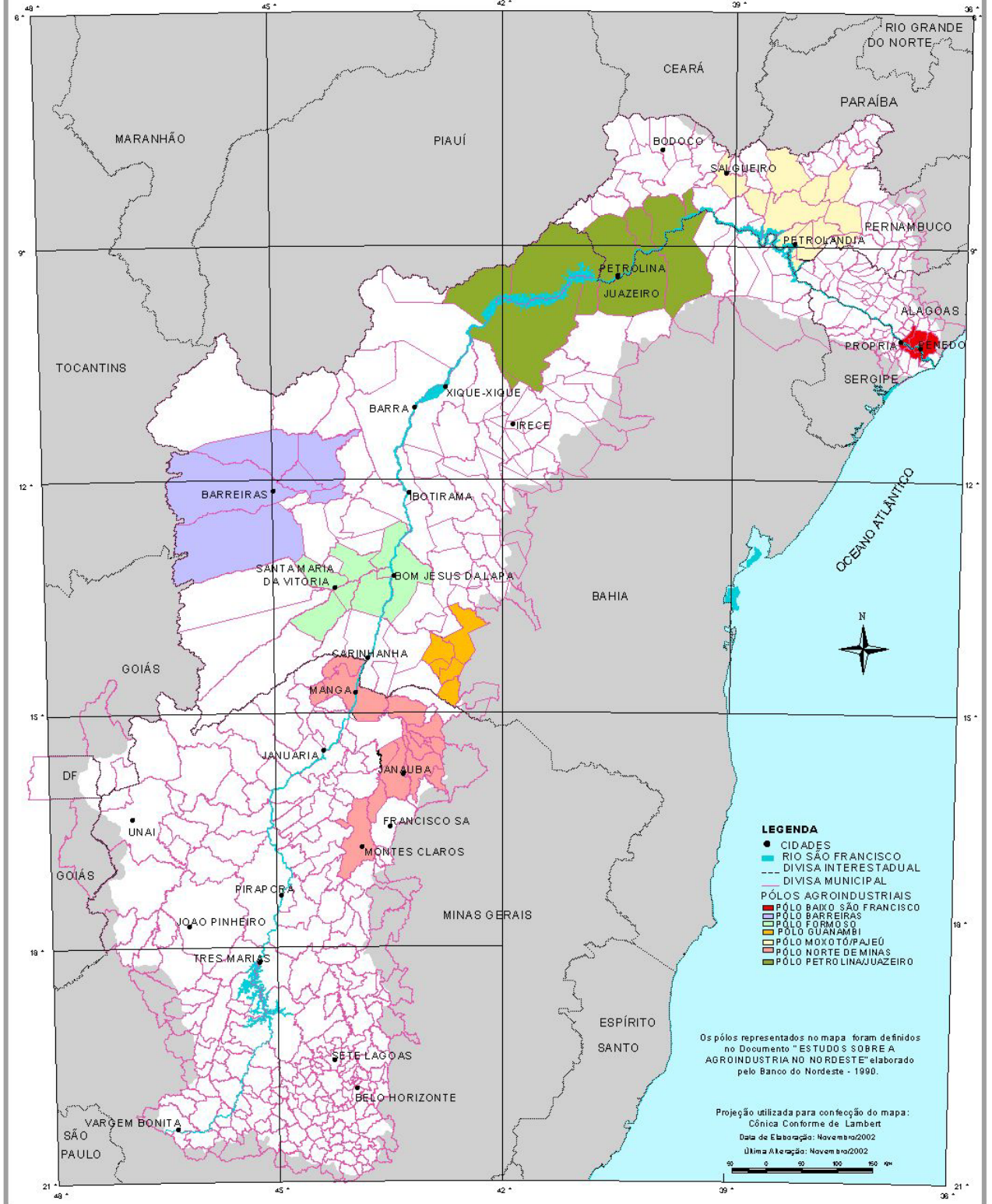


Figure 10. Agro-industrial poles

SÃO FRANCISCO RIVER BASIN

MUNICIPAL HUMAN DEVELOPMENT INDEX (IDH) - 2000

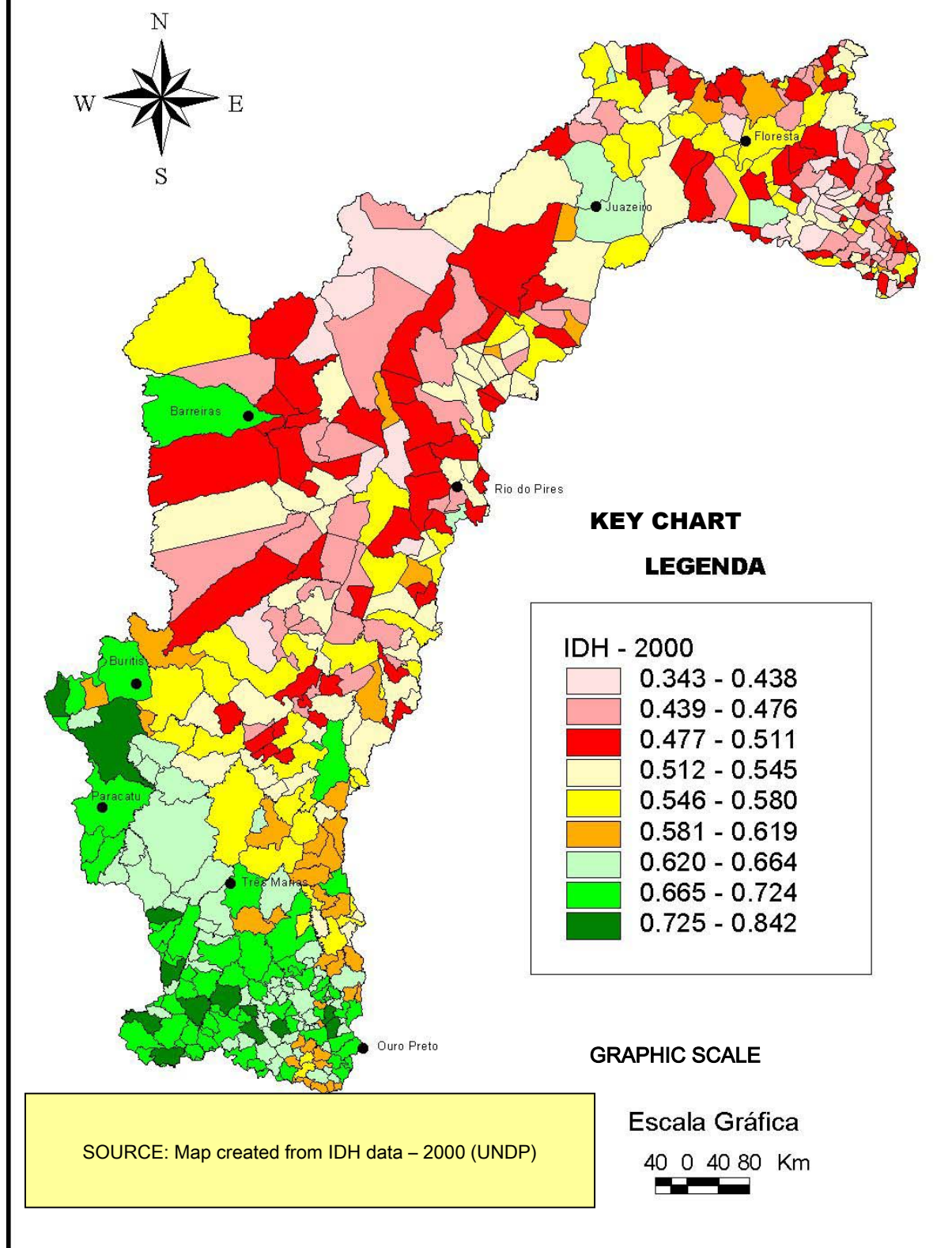


Figure 11. Index of Human Development 2000

3. MAIN USES, PROBLEMS AND CONFLICTS RELATED TO WATER RESOURCES IN THE BASIN

Diverse institutions and governmental and non-governmental organisms have held meetings, seminars and workshops to discuss the uses, the problems, the conflicts and the potentialities of the São Francisco River basin related to its water resources.

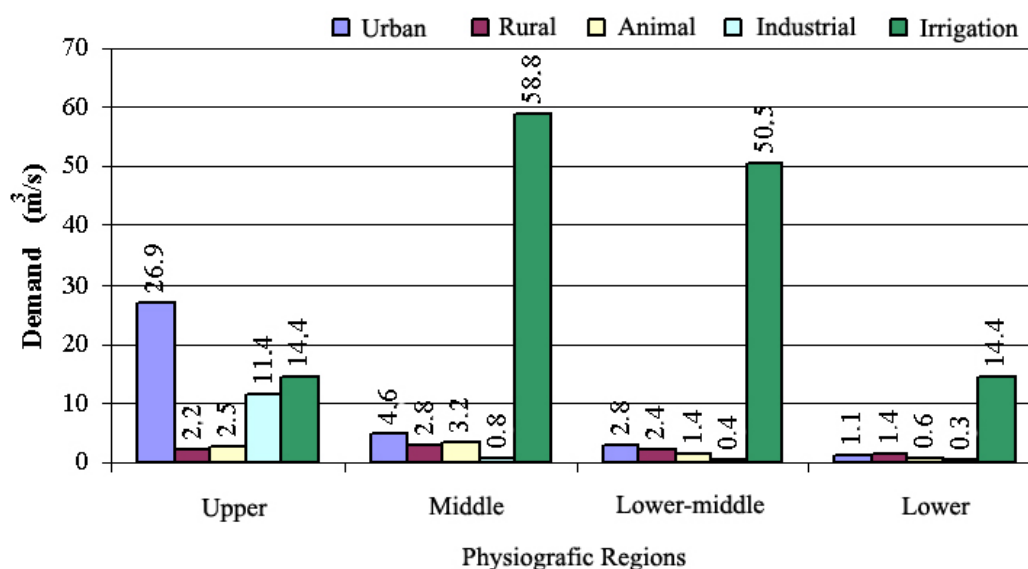
In May of 2003, in the Workshop of Planning, which was held during the First Meeting of the Committee of the São Francisco river basin, in São Roque of Minas – MG, regions of the springs, these themes were considered and discussed by more than 1500 participants, including the titled members and their substitutes of CBHSF. The results of this meeting and of the diverse events, held between 1998 and 2003, were consolidated in the subchapters following.

3.1. Main uses of water

The São Francisco river basin, because of its area and the different stages of development, is a multiple-use basin, attending to practically all categories of water uses.

The hydroelectric generation in the basin is notable for its large, medium and small-sized exploitation, with an installed potential higher than 10.500 MW. Irrigation exercises an important demand. Urban supplying is significant, as is also the industrial use of the water and its potential for waterway transport. There are in the Basin more than 1900 km of navigable waterways with 1243 km, especially between Pirapora and Sobradinho. With respect to the consumption uses, there is a clear predominance of irrigation, with 68% of the total area used in the basin.

Figure 12 permits a graphic visualization of the participation of each sector using water by region in the Basin.



Source: Brazilian National Water Agency – ANA Brasília, 2002

Figure 12. Distribution of the demands in the São Francisco river basin by physiographical region

In summary, the Figures indicate by region that the Upper São Francisco reflects an urban-industrial vocation on the one hand, and a rural vocation on the other. It is a typical situation of multiple uses of water. The middle, Lower-middle, and the Lower areas have a clearly rural vocation, with a predominance of the use of water for irrigated agriculture.

With respect to the non-consumptive utilization, the use of water for the **dilution of effluents**, although elevated and beyond admissible standards, does not appear in the statistics with exactness, for these only reach the users who have water rights granted them due to the existence of treatment stations.

What happens is that in the more developed sub-basins, as in that of the Velhas river, for example, there is a certain degree of precision in the data, in face of the elevated level of urbanization. But, even in sub-basins, there is an enormous quantity of effluents ejected *in natura* in the bodies of water. In the area of Sobradinho, for example, the pollution by pesticides and fertilizers is intense.

It is to be emphasized that the lack of treatment of urban effluents has been one of the most, if not the greatest, motivation for the implantation of charging fees for the use of water in Brazil. In other words, one of the chief applications of the resources collected by charging a fee is for the construction and operation of treatment plants for effluents.

The objective of charging a fee points in this direction, which ANA has as one of its most important actions – **Program of the De-pollution of Basins – PRODES** - which passes on the funds of the Agency for the sanitation businesses or autonomous services which increase the coverage of the treatment service of urban effluents and/or which improve the degree of already existing treatment.

It is important to emphasize the great contribution of the electrical sector for the São Francisco through **Financial Compensation** to municipalities and states, approved by Law 7990/90. In 2002 the total spent was of R\$91.213.120 or US\$ 32,576,114; the funds are allocated to the states where the reservoirs are located and these states receive 45%, the municipalities another 45%, and the Federal Government 10% respectively. Unfortunately, these resources are not applied in projects and interventions in the water area.

3.2. Problems and conflicts related to water resources and environmental interactions

The problems and conflicts related to water resources and environmental interaction in the São Francisco river basin are innumerable. Some are common in all the physiographic regions, others more specific of the Upper, Middle, Lower-middle or Lower regions.

These problems have been the object of discussion among the inhabitants of the Basin and the governmental authorities for years. They are well known and the programs and projects located for combating them and finding solutions already exist. However, due to their costs and the lack of coordinated institutional action, the problems are worsening more and more because of waiting for governmental decisions at the federal, state and municipal levels.

Among main problems identified by the population and the existing conflicts are those indicated in Chart 5.

Chart 5. Problems and conflicts related to water resources and environmental interactions in the São Francisco Basin

Problems identified	Existing conflicts
<ul style="list-style-type: none"> • Clearing the land, including riparian woods and setting fires for clearing on a large scale. • Inadequate use and occupation of the soil and non-conservationist practices; • Throwing of sewage without treatment and solid residues without an adequate final destination; • Indiscriminate use of pesticides and fertilizers; • Erosion and carrying of sediments, including those coming from rural roads; • Silt depositing in the water courses and the lack of conditions for navigability; • alteration of the water system by the operation of the regularizing dams; • wasting of water; • proliferation of "hair algae" in the bed of the Lower São Francisco; • predatory fishing and the resulting decline of fishing resources; • uncontrolled mineral exploitation; • indiscriminate well-drilling; • degradation of marginal lagoons; • acute poverty and rural misery in the semi-arid; • lack of water supplying the poorest communities of the semi-arid areas; • lack of integration between the governmental organs and absence of coordination of the diverse studies and projects realized; • lack of integrated planning and deficient control and inspection on the part of public organs; • fragile environmental education and consciousness of the river dwellers; • distrust of the population in governmental actions 	<ul style="list-style-type: none"> • The use of the waters as receptors of residues, throwing effluents <i>versus</i> uses of water which demand adequate quality, such as supplying for drinking, fish-farming and recreation; • Energy generation <i>versus</i> fish-farming and the biodiversity in the water vehicle, resulting from the effect of the reservoirs, eliminating the nutrients from the waters; • activities which cause erosion of the soil such as agriculture, mining <i>versus</i> uses which require adequate drawing of water like navigation or small amount of sediment in the waters; • conflict of ANA <i>versus</i> ONS in the theme of the operation of reservoirs; • conflict of competence/ ANA actions <i>versus</i> ANEEL <i>versus</i> MMA <i>versus</i> MI; • navigation <i>versus</i> energy generation resulting from the operation of the reservoir of Três Marias; • flow rate of the river <i>versus</i> disappearance of marginal lagoons; • installing of network tanks <i>versus</i> quality of water; • flow rate of the river for energy <i>versus</i> other uses (fishing, irrigation, navigation, supplying); • quantity of nutrients <i>versus</i> diminishing of fishing; • dams <i>versus</i> ecosystems and biodiversity; • Forest recomposition <i>versus</i> owner <i>versus</i> public power; • flow rate of the river <i>versus</i> loss of productive areas, meadows; • use of pesticides <i>versus</i> human supply of water; • land-clearing <i>versus</i> low income of the population

All the problems identified by the population and institutions, which act in the Basin by diverse meetings, workshops and meetings held in the last years in the four physiographical regions, and the existing conflicts, were analyzed and taken into consideration in the preparation of the DAB and should be permanently considered by the governmental authorities and the CBHSF, in the search for a solution to eliminate or minimize their negative effects with a view to sustainable development in the Basin. All are relevant and some are specific to certain areas, and others occur in the whole of the São Francisco river basin.

4. INSTITUCIONAL AND LEGAL FRAMEWORK

The legal and institutional structures were analyzed with respect to their possible implications, direct and indirect, with a view to the sustainable development in the São Francisco River Basin. The institutional field has shown itself to be still in a maturation phase, but with good perspectives of consolidation.

In the field of the consumers of water resources some of the sectors are more solidified, prepared and organized while others still have a long way to go. But touching the legal aspects, one sought to analyze them in the area of the public policies of the Government, principally those referring to water resources and the environmental questions.

4.1. Institutional Framework

4.1.1 The Federal area

The National Plan of Water Resources – NPWR, the main document affirming the National Policy of Water Resources, is a part of the strategies of national development, influencing and influenced by the political policies and plans of development, which affect the sectorial use of water. The elaboration of the NPWR is a process, simultaneously technical and political, to be conducted in a progressive way, in a process of permanent perfecting.

Due to the complexity and amplitude involved in the elaboration of the NPWR, one must count upon an adequate institutional arrangement so as to harmonize the diverse sectorial interests in the water resources area and be able to solve administrative and financial problems.

4.1.2. Federated units area

The federal units possess autonomous institutional arrangements, peculiar to themselves, according to their dimensions, cultural values, size of the problems of water resources in their jurisdictions, among others, competence established in the 1988 Federal Constitution.

Chart 6 presents organs and entities at the federal level, which support the development of the NPWR and the institutional model prevalent in each one of the Basin's federated units.

4.1.3. Municipal area

With the advent of the Federal Constitution of 1988, the role of the municipalities has been strengthened in federative terms. However, they have faced great difficulties in relation to the environmental problems which occur in their jurisdiction and competence. This requires the establishing of **partnerships between the diverse levels of the government**.

The environment question, where water resources are located, has been historically treated at the local level in a compartmentalized or generalized way, and reveals difficulties strikingly with respect to the political articulation and to technical-scientific foundations.

Chart 6. Institutional Arrangement in the Federal Area and of the federated units in the São Francisco Basin

Federal – Ministries and operational or connected entities	Federated Units and organs managing water resources
Ministry of the Environment <ul style="list-style-type: none"> • Secretariat of Water Resources - SRH • Secretariat of Biodiversity and Forests • Secretariat of Policies for Sustainable Development • IBAMA e ANA 	Alagoas <ul style="list-style-type: none"> • Secretariat of the State of Water Resources and Irrigation – SRH • Institute of the Environment – IMA
Ministry of Mines and Energy <ul style="list-style-type: none"> • Secretariat of Energy • CHESF • DNPM; CPRM; ANEEL 	Bahia <ul style="list-style-type: none"> • Superintendency of Water Resources – SRH • Secretariat of the Environment and Water Resources - SEMARH • Superintendency of Environmental Policy - SPA • Center of Environmental Resources – CER
Ministry of Agriculture, of Cattle-raising and of Supplying <ul style="list-style-type: none"> • Secretariat of Agricultural Policy • Secretariat Of Rural Support and Cooperative Movement • INMET • Department of Promotion and Inspection of Vegetable Production 	Federal District <ul style="list-style-type: none"> • Secretariat of the Environment and of Water Resources – SEMARH • Directory of Licensing, Inspection and Environmental Monitoring – DLFMA
Ministry of Transportation <ul style="list-style-type: none"> • National Department of the Infrastructure of Transports – DNIT 	Goiás <ul style="list-style-type: none"> • Secretariat of the Environment, of Water Resources and of Housing – SEMARH • Superintendency of Water Resources • The Goiás Agency of the Environment
Ministry of National Integration <ul style="list-style-type: none"> • Secretariat of Water Infrastructure • Secretariat of Integrated Regional Programs • National Secretariat of Civil Defense • CODEVASF 	Minas Gerais <ul style="list-style-type: none"> • Minas Institute of Waters Management – IGAM • State Foundation of the Environment – FEAM
Ministry of Planning, Budgeting and Management <ul style="list-style-type: none"> • Secretariat of Planning and Strategic Investment • IBGE; IPEA 	Pernambuco <ul style="list-style-type: none"> • Secretariat of Science, Technology and the Environment – SECTMA • Pernambuco Company of the Environment – CPRH
Ministry of Health <ul style="list-style-type: none"> • Secretariat of the Policy of Health • FUNASA 	Sergipe <ul style="list-style-type: none"> • Secretariat of the State of Planning and of Science and Technology – SEPLANTEC / Superintendency of Water Resources – SRH • Secretariat of the State of the Environment/ State Administration of the environment – ADEMA • Secretariat of the State of Infrastructure/ Sub-Secretariat of the State of Infrastructure
Ministry of Foreign Relations <ul style="list-style-type: none"> • DEMA (Department of the Environment) 	
Ministry of the Cities National Secretariat of Environmental Sanitation	
Ministry of Education <ul style="list-style-type: none"> • Secretariat of Fundamental Education (General Coordination of Environmental Education) 	

The municipalities, in this context, feel themselves to be limited with respect to the conditions to establish strategic actions and solve the problems, which in the majority of cases, transcend their competence, as is the case of water resources, and limit their capacity of action or extrapolate their frontiers.

4.1.4. New institutional actors with activities in the Basin

Among the new institutional actors with activities in the Basin there stand out the **Committee of the São Francisco River Basin – CHBSF**, the Board of Directors of which was installed in December of 2002, the **Public Ministry**, the **National Congress**, and the **Court of Accounts of the Union**.

Detailed information about the CBHSF is presented in the Final Report of the Activities 3.4/3.5 which treat of the support for the creation of the Committee and its strengthening.

Brazil is passing through a strong political administrative transformation, since the federal constitution of 1988, where the **Public Ministry – PM** gained a preponderant role in the environmental question. To the extent that one assimilates this responsibility and its representatives prepare themselves for this work, there are strong changes, and new actors are evolved in the questions of water and environmental resources.

The Special Commission to Accompany the Project of Revitalization of the São Francisco River of the Federal Senate came to register that starting from the Project of Conservation and Revitalization, it was possible to mobilize the Public Ministry of the States that make up the Basin, which started a coordinated action to accompany the situation, and which does not dispense with or substitute the action of the federal and state organs of licensing and inspection.

Another great change was the Fiscal Responsibility Law, which implied in changing opportunism and understanding the sectors to be looked on the long term. This has as its starting point planning, a fundamental aspect of control; and as a more striking aspect, the penalties for crime. As an example of this strong change, one can cite the greater dynamism of the **National Congress** and the new role of the **Court of Accounts of the Union**.

In the role performed by the Federal legislative power, this organ sought a more active presence to accompany and evaluate the Program of Revitalization of the São Francisco River Basin and the installation of the respective Committee of the Basin, by means of the aforementioned **Special Commission of the Federal Senate** installed on the 10th of October of 2001, the work of which was concluded on the 15th of December of 2002.

The Court of Accounts of the Union – TCU has accompanied closely the activities, initiatives plans, programs and projects which have to do with the environment and management of water resources and of the environment. The concern of the Court begins from the basic point which is the National Plan of Water Resources and the management of these resources, for it should contain information and analyses which orient the development of this governmental policy.

Due to its importance as an instrument of governmental management, it should already have been elaborated and approved. Yet, despite the fact that the Law of National Policy of Water Resources has been in effect for more than 5 years, the PNRH is still not concluded.

Despite having an important function in the management of natural resources, including being the executor of actions of conservation of water resources specified in the federal budget, IBAMA does not have a seat in the National Council of Water Resources, and is isolated from the decision-making and important discussions referring to these fundamental natural resources.

One knows that the articulation between the diverse actors interested in the management of water resources is fundamental to avoid duplicity of efforts and superimposition of actions developed by the Brazilian Public Sector. However, the organs oriented to the management of water resources still implement their actions in a fragmented form, seemingly existing few concrete initiatives in the sense of articulating actions related to water resources.

Among the initiatives known is the letter sent in September of 2001 by the President of the CHESF to the Executive Secretary of the Ministry of the Environment, in which he indicates that **“the innumerable plans, programs and projects which already have been elaborated for the São Francisco River Basin, have demonstrated that the lack is not in the sphere of planning, but, in fact, in that of coordination that would reduce the dispersed efforts and consequential waste of energy, acting in a way to implement the priority actions for the obtaining of sustainable development in the region inserted in the São Francisco River basin.”**

Within this same line the Court of Accounts of the Union confirmed that despite the necessity of articulation of the Pluriannual Plan of Action – PPA, one does not make adequate integrated planning of the involved sectors in the management of water resources as irrigation, sanitation, urban and industrial development, solid wastes, dams, drainage, which are based on studies of sustainability with a view to coordinate the multiple uses of water and guarantee effectively its supply in quality and quantity.

To reverse this situation, it is necessary that the actions of the PPA not be considered in a sectorial, fragmented and disarticulated way and the priorities be chosen with the concern for increasing the synergy between the programs which develop complementary actions, as well as reducing the negative impacts between these programs. One expects thus, that the PPA 2004-2007 will be prepared and implemented in a coordinated manner.

4.2. The legal aspect

The management of water resources in Brazil is to be found legally defined in the Federal Constitution of 1998, which treats of the differentiation of the waters, defining the federal waters and those of the states. Moreover, the management of waters has its national policy defined in Federal law, with interfaces in other legal instruments as those which refer to environmental management, mining, forests, among others.

One observes that there exists a great opportunity to catalyze the directives foreseen in the Law 6.938/81 of **National Policies of the Environment**, in the Law 9.433/97 of **Water Resources**, in the Law 6.662/79 of **Irrigation** and in the Law 9.795/99 of **Environmental Education**. One needs for this the articulation of actions between the diverse organs of the sector on behalf of a sustainable and rational use of water resources, considering that all these policies have water as their interface.

To this end, it is necessary to reinforce the implementation of the Committees of the Basin, considering that it is fundamental for the debate of the problems of the basins, for the consolidation of the Plans of Management, for achieving the system of management and for the unification of the interfaces of important national policies. In this sense, the Law 9,984/00 in its article 4, section VII, attributes to ANA the duty of stimulating and supporting the initiatives oriented towards the creation of Committees of the Hydrographic Basin. It is important to emphasize that the CBF-SF is already implanted

With the exception of Law 6,662/79, because it treats of sectorial water use, all the other Laws were appreciated and analyzed, including, even the Federal Constitution; the Civil Code in that which refers to public property; the **Code of Waters**, Decree 24,643, of July 10, 1934; the **Mining Code**, Law 8,901/94, which regulates this constitutional disposition, altered this code; Law 9,605/98 **Environmental Crimes**; Law 4,771/65 – the **Forest Code**; Resolution CONAMA 20/86, of June 18, 1986, which establishes quality standards for water and finally, the legal apparatus of the management of water resources in the federated units which have areas inserted in the São Francisco river basin.

Some states of the Federation, however, went ahead and treated the subject in their State Constitutions and have been editing, since 1991, their respective laws about **State Policies of Water Resources**, and creating their Systems of Management.

One should distinguish Law 9,433/97 which instituted the National Policy of Water Resources and created the National System of Management of Water Resources. It regulated section XIX of article 21 of the Federal Constitution and alters article 1 of Law 8,001/90, which modified Law 7,990/89.

This law disposes that water is an object in the public domain, explaining away any doubts remaining in the Code of Waters, which had established that, besides public waters, there are private waters, the common waters and the municipal waters. It establishes, moreover, that water is a natural and limited resource, having economic value. From this disposition one can infer two topics:

- With respect to the **priority use of water resources**, the Law 9,433/97 disposes that in situations of scarcity, human consumption and assuaging the thirst of animals prevail over other uses.
- It is the case that the **management of water resources** should be decentralized and count on having the participation of the government, of the Consumers and of the Community.

The instruments of the National Policy of Water Resources are:

- **Plans of water resources;**
- **Establishing classes of bodies of water, according to preponderant uses;**
- **Concession of the rights to use water resources;**
- **Charging a fee for the use of water resources;**
- **Compensation to municipalities;**
- **System of Information about Water Resources**

With respect to charging fees, its objectives are:

- **To recognize water as an economic ware and give the consumer an indication of its real value.**
- **To give an incentive for the rationalization of the use of water;**
- **To obtain financial resources for the financing of programs and intervention foreseen in the Plans of Water Resources.**

The agencies of water in terms of the Law 9,433/97 will exercise the function of executive secretariat for the respective Committee(s) of the Hydrographic Basin. This means that a single agency will be able to attend one or several Committees.

Concerning the creation of the Agencies of Water, it is important to note that article 51 foresees that consortiums and inter-municipal associations of hydrographic basins mentioned in article 47 can receive the delegation of the **National Council** or of the **State Councils of Water Resources** for a specified period, for the exercise of functions belonging to the competence of the **Agencies of Water**, for as long as these organisms remain unconstituted.

5. EXISTING AND PROGRAMMED PROJECTS IN THE BASIN

Various are the governmental institutions which are active in the São Francisco River basin in the federal, state, and municipal sphere and in the Non-governmental organizations, in the areas of regional development and of research and consequently, various are the projects developed, existing and programmed, in themes correlated to the GEF São Francisco Project.

However, **very great difficulties were encountered** by the prevailing institutional zeal and the recent rapid institutional changes that Brazil has passed through, **in order to obtain information about the existing and programmed projects**, in the governmental area.

Only the constitution of a Consultation Group for the elaboration of the PAE of the São Francisco Basin and its Coastal Zone will permit one to identify all the projects existent and programmed which will be presented by the institutions themselves.

The **main projects existent and programmed** are identified in Chart 7.

Chart 7. Main existing and programmed projects related to water resources of the São Francisco river basin

Existing projects	Programmed projects
Federal area	
<p>Proágua – Program of offering water for the semi-arid and institutional strengthening of the national system of management of water resources MMA/ANA. Financed by the World Bank, it seeks to amplify the offering of water, by means of institutional strengthening and of fundamental and priority works: such as aquaducts, canals, dams, transposition of basins, extraction of groundwater waters.</p> <p>Plan for structuring the water resources management system for the Verde Grande river basin - ANA Has as its main objectives the establishment of mechanisms seeking the organization of the system of management and the making the instruments defined in the legislation operational, especially that which refers to the concession of the right to use water.</p> <p>National Plan of De-pollution for Hydrographic Basins - PRODES – ANA Consists of the financial stimulation, in the form of payment for treated sewage, to renderers of services who invest in the implantation and operation of sewage treatment stations in hydrographic basins with an high degree of water pollution.</p> <p>Program hydrographic Microbasins – Ministry of Agriculture, Cattle-raising and water supply Secretariats of Agriculture and organs of extension and rural technical assistance. Has as its objective to promote rural development in an integrated and sustainable way, using the hydrographic microbasin as a unit of planning and organization of the producers as a strategy to promote the improvement of agricultural productivity and the use of adequate technologies from the environmental, economic and social point of view.</p> <p>Program of Coastal Management (GERCO) MMA- MM- Coastal states – ONG 's Program which plans and administrates the utilization of the natural resources of the coastal zone, with the objective of improving the quality de life of the local populations, promoting the adequate protection of its ecosystems. This program is inserted in the National Plan Program of Coastal Management- PNGC, which was implanted with the promulgation of Law 7,661/88, which instituted it, based on the National Policy of Environment.</p>	<p>Regularization of flow rate of the systems of damming up the rivers: Velhas, Paracatu and Urucuia – Upper and Middle São Francisco – CODEVASF Has as its objective the search for efficiency in the use of water resources, a promotion of multiple uses, socio-economic gains and environmental gains.</p> <p>Program of development of the Semi-arid - CODEVASF Has as its objective, by means of interlinking basins, to make water available for the most needy region of the country, starting from the São Francisco River Basin, constituting, thus, a system of distribution of water for multiple use, in a way to contribute for the sustainable development of the semi-arid region.</p> <p>System of Information about the use of lands and water in the São Francisco River Valley - CODEVASF Has as its objective to establish a progressive interaction between the users and the existing data about the use of the lands and the water in the São Francisco River basin.</p> <p>Direting Plan of water resources for the São Francisco River Basin – ANA In elaboration</p> <p>Water Producer - ANA Has as its objective to improve the quality and quantity of water in rural areas where there are springs for supplying water.</p> <p>Management of Water Resources - that is, an institutionalization of the mechanisms related to the use of and charging for water. The CT-Hydro allocated R\$ 6 million for the program up to 2005</p> <p>Rationalization of the use of Water - ANA Has as its objective to promote the rational use of water taken in its natural source up to its arrival at the receiving body and minimizing of waste.</p>

Existing projects	Programmed projects
<p>Program Our Rivers: São Francisco – ANA Basis of the realization of the project of conservation and revitalization of the São Francisco river basin created by a numberless Decree of June 5, 2001</p> <p>Hydro-environmental Revitalization Plan of the São Francisco River Basin – Coordinated by Ministry of National Integration - MI</p> <p>Revitalization and Conservation Program of the São Francisco – Coordinated by the Executive Secretariat - Ministry of the Environment – MMA</p> <p>Project Manuelzão of Public Participation - Partnership SRH/MMA with the UFMG</p>	<p>Monitoring of the quality of the waters for the sustainable development of water resources in the Brazilian semi-arid area – Ecoágua - EMBRAPA</p> <p>Program of Certification of Sustainability of the Use of water by Irrigated Agriculture – ANA - MBC</p> <p>Ecological-economic zoning of the São Francisco Basin – a first stage coordinated by CODEVASF was done with the elaboration of reports of basic information and will be developed in 2003-2004.</p>
State Area	
<p>Program of Water Supply, Drilling and Recuperation of Wells – CERB/BA</p> <p>Program of Sustainable Development of Sources and Riveredge areas of the State of Bahia – Program Living Springs – Gov.Bahia SRH</p>	<p>Bahia</p> <p>Preservation and Recuperation of the Hydrographic Basin of the Salitre river (BA) – SRH/BA</p>
	<p>Minas Gerais</p> <p>Development of Technology for Decontamination of Areas Degraded by Mining Activities, with the Recuperation of Mercury and Gold (Case study - Rico stream/Paracatu-MG) CETEC - FinancingAgent: CNPq/FNMA</p> <p>Orientation of SRH/MMA for the elaboration of Terms of Reference for Directing Plans of Water Resources of Hydrographic Basins CETEC FinancingAgent : SRH/MMA</p> <p>Methodological Development for the Evaluation of the State of Conservation of the Footpaths starting from Geoprocessing techniques. CETEC – Financing Agent: FAPEMIG</p> <p>Mapping of the Footpaths in the State of Minas Gerais - CETEC – Financing Agent: IGAM</p> <p>Elaboration of maps of Water availabilities associated with geological and geomorphical domains to be applied in processes of granting of water rights by IGAM. This treats of a methodological basis for application in hydrographic basins, applied until now on a smaller scale for corporative interested parties.</p> <p>Elaboration of a registry of users and uses of water in the Paracatu river - IGAM. This methodology should permit the application of mechanisms which permit one to be always up to date considering the dynamics of the changes which occur in this basin.</p> <p>Pilot Project of uses and conservation of water and soil in the hydrographic sub-basin of the stream Entre Ribeiros - IGAM. Aims to apply already accepted concepts of the microbasin to projects financed by the World Bank in some states, such as Paraná, and Santa Catarina.</p> <p>Monitoring of the Quality of the Waters of the São Francisco river basin in the State of Minas Gerais – IGAM</p>

6. CRITICAL PROBLEMS AND PRIORITY ACTIONS IDENTIFIED - CAUSAL CHAIN

6.1. Definition and objective of the Causal Chain

The Causal Chain (Causal Chain analysis) is a tool used by the GEF methodology for definition and delineation of strategic actions for hydrographic basins and water and environmental projects. It is used to trace the path of causes-effects of the problems of considerable environmental impact seeking their origins or root causes and the corresponding actions to solve them.

In the GEF São Francisco Project, different meetings were held to promote the involvement of various actors, specialists, representatives of the community and of the government for identification of the problems, their causes and propositions of actions in corrective measures to be implemented.

6.2. Critical Problems and Priority Actions

Based on the results of the meetings, seminars, and workshops held by diverse institutions and discussions with governmental organisms and non-governmental organisms active in the basin, eight relevant critical problems were identified.

- **Lack of institutional articulation**
- **Conflicts in the use of water**
- **Insufficiency of water for multiple uses**
- **Degrading modification of the aquatic eco-system**
- **Sources of point and diffuse pollution**
- **Modification of the use and inadequate occupation of the soil**
- **Disorderly exploitation of groundwater, dissociated from surface water**
- **Restrictions for navigation**

For each one of the critical problems relevant commentaries and a chart for recommended actions are presented.

6.2.1. Lack of institutional articulation

Institutional articulation, recognized as an essential element for the implementation of laws, regulations and procedures, besides projects of integrated development, was found to be absent in the basin. This lack of articulation includes fragile institutional capacity, especially in what refers to the definition of the objective and establishment of attributions of the different organisms acting in the basin and the identification of the institutions' ability to exercise their functions in a coordinated, articulated and integrated manner (Figure 13).

Preliminarily identified projects	Suggested actions
Critical problem - 6.2.1. Lack of Institutional articulation	
i. Strengthening of the São Francisco River Basin Committee, aiming at implementing the instruments of water resources management foreseen in the current legislation in effect, efficiently and efficaciously, including the creation of the	<ul style="list-style-type: none"> • To stimulate the integrated, inter-ministerial coordination involving in the beginning all the federal organisms which act in the area of water resources and environment in the Basin and later, those of the federated units. This coordination could be implemented through a Permanent Coordinating Group of the Governmental Actions in the São Francisco Basin. • To cooperate for the strengthening of the São Francisco River Basin committee – CBHSF including elaborating an explanatory booklet for its members, a technical note about programs of investment in the basin, and another Technical Note about programs of investment in the Basin and another about Allocation of Water. • To collaborate in the organization, support and strengthening of the Agency of

<p>Basins Agency. Qualification of the related institutions, managers of water resources of different levels</p> <p>Estimated time: 36 months Estimated investment: US\$ 1,890,000 Indicated cost GEF: US\$ 1,030,000</p>	<p>Water, an executive secretariat of the Committee in terms of the Law 9433/97, as well as for the Agencies of those Sub-basins which are viable. To cooperate in the institutional design of the Agency of Water in the elaboration of functional projects for making the Agency operational and elaboration of the Strategic Plan of the Agency, starting from the updating of a general simulation of income and expenses.</p> <ul style="list-style-type: none"> • To develop in cooperation with the Committee and governmental organisms keys, guidelines, and strategies for the entire Basin, including the sub-basins, defining and giving priority to the Committees of the Sub-basins which will be involved. • To take actions with the CBHSF to strengthen institutionally the Committees of Sub-basins and promote the development of practices and processes of control of harmonized use of water resources by the hydrographic sub-basin. • Evaluate the disposition to pay of the consumers of the hydrographic Basin and sub-basins defined as a priority, in partnership with the local institutions, the mayors' offices, and the NGOs.
<p>ii. Public participation of the users and stakeholders as a legitimate means for society to integrate itself in the decision-making process with a view to sustainable use of water resources of the Basin.</p> <p>Estimated time: 18 months Estimated investment: US\$ 1,370,000 Indicated GEF cost: US\$ 620,000</p>	<ul style="list-style-type: none"> • Promote the public conscience, through specific actions, defined with the support of the Committee of the Hydrographic Basin of the São Francisco. • Collaborate in the development of participative computerized management models of groundwater and surface water resources • Promote, with the support of the Mayors' offices and NGO's, thematic events with the participation of actors and interested parties about specific local situations which will be presented and debated, having as their objective the dissemination of knowledge and the involvement of all in the search for adequate solutions. • To hold events at the municipal level to make people aware of the process of participative, decentralized management with technical visits, seminars, workshops, involving representatives of future Agencies of the Basin. • To stimulate, along with IBAMA, Mayors' offices and NGO's the creation and dissemination of community tree nurseries for the production of slips of native essences, associated with consciousness-raising, distribution and planting of the species produced.

6.2.2. Conflicts in the use of water

The possibility of increase in the conflicts in the use of water in the São Francisco River Basin is greater and greater, given the increasing demand for this resource, and imposes the necessity of operating the water system of the Basin in such a way as to attend to multiple uses, establishing the priorities of use according to the precepts of Law 9,443/97 (Figure 4). There still exists, however, a lack of systematic knowledge of the regional and sectorial demands, present and future, and of the availability of the hydrogeological potential and water potential, principally of the ephemeral courses of waters, in order to define these conflicts exactly.

Besides this there is an urgent necessity of developing and implanting models of planning and operation of the system of reservoirs and of increasing the capacity of regularization of the principal tributaries of the Middle São Francisco.

Preliminarily identified projects	Suggested Actions
Critical problem - 6.2.2. Conflicts in the use of water	
i. Development and implantation of models of planning and operation of the system of reservoirs of the São Francisco River Basin, regarding the multiple uses of water	<ul style="list-style-type: none"> • Collaborate with the Economic-Ecological Zoning, which is being done by CODEVASF, emphasizing the priority sub-basins. • Collaborate with the CHESF in the implantation of a geo-referenced system of water information in real time in the stretch Morpará-delta, releasing data of interest to governmental institutions, users and civil society. • Cooperate with ANA, ONS and energy companies in the modeling of the operation of the reservoirs based on the method of restrictions defining an

Estimated time: 24 months Estimated investment: US\$ 2,800,000 Indicated cost GEF: US\$ 550,000	operation of the reservoirs based on the method of restrictions, defining an objective function, and trying to make the best possible energy production, subject to diverse restrictions and among them, the guaranteeing of water for the attending of irrigation demands. <ul style="list-style-type: none"> • Hold a Workshop along with ANA to debate, with concrete data, the question of planning and operation of reservoirs with multiple purposes in the basin.
ii. Actions for the regularization of main tributaries of the Middle São Francisco and the construction of the Pão de Açúcar Reservoir downstream from the Xingó, including the evaluation of artificial flooding in the Lower São Francisco. Estimated time: 36 months Estimated investment: US\$ 6,800,000 Indicated Cost GEF: US\$ 600,000	<ul style="list-style-type: none"> • Cooperate with the study of the feasibility of constructing the reservoir foreseen by CHESF, in its ten-year plan of Expansion 1999/2008, for UHE of Pão de Açúcar, which will also have the nature of regularizing the hourly oscillations as a consequence of the flows liberated by the Xingó Hydroelectric Plant. • Collaborate with the CHESF, ANA and other competent organs in the development of projects based on perfecting operations as much as possible, seeking to assure the availability of constant water in the Basin including by means of damming up the principal tributaries of the left margin of the Middle São Francisco such as Preto, Paracatu, Urucuaia, Formoso, Grande and others, with multiple purposes in mind. • Evaluate, with the participation of the ANA, of the CHESF and of the CODEVASF, propose and test the management model of generating artificial flooding and test for the control of the riverbed, its silt deposition and management of the marginal lagoons in the region of the Lower São Francisco.

6.2.3. Insufficiency of water for multiples uses

In the last decades the government has promoted numerous actions to stimulate the development of the São Francisco Basin. However, the majority of them have been of the sectorial type, so that until now the principal uses have been for generating electrical energy and irrigation (Figure 15). One has tried to improve the utilization of hydro-electrical energy as much as possible along with other uses such as irrigation, navigation, control of flooding, recreation and tourism, water quality and the preservation of aquatic flora and fauna. The previously discussed insufficiency should be analyzed more profoundly through a detailed inventory of availabilities and demands.

Irrigation, as one of the greatest users of water of the Basin, has and will have a preponderant role in its socio-economic development on a sustainable basis, since there are not many alternatives for the semi-arid area. One has confirmed, however, that the efficient use of water in irrigation urgently needs to be improved, as well as implemented the initiatives for the conservation of water and soil.

Preliminarily identified projects	Suggested actions
Critical problem - 6.2.3. Insufficiency of water for multiple uses	
i. Promote the efficient use of water for irrigation in the São Francisco basin Estimated Time: 24 months Estimated investment: US\$ 2,850,000 Indicated Cost GEF: US\$ 900,000	<ul style="list-style-type: none"> • Elaborate actions with CODEVASF, to implement a Plan of strengthening assistance to small producers, adequate for specific uses which employ surface water and for those that use groundwater for irrigation. • Elaborate with competent governmental organisms and implement a Plan for improving the efficiency of the use of water for irrigation in the Basin, by physiographic zones and articulating with machine and equipment manufacturers and the institutions which are representatives of the users. • Institute and maintain in a federal organism, such as CODEVASF, for example, a System of Information about irrigated agriculture emphasizing the efficiencies of the uses.
ii. Initiatives to conserve water and soil and to recompose vegetation including the establishment of protected areas, especially in water recharge zones	<ul style="list-style-type: none"> • Collaborate with the competent federal and state organisms in the elaboration of a Program for prevention of erosion and containing of sediments in the region of the high courses of the rivers Velhas and Paraopeba, as a pilot for other regions. • Make, in cooperation with a federal organism such as IBAMA, for example, the zoning of the areas for refilling the sources to give priority to the areas of

<p>Estimated Time: 36 months Estimated investment: US\$ 4,780,000 Indicated Cost GEF: US\$ 1,180,000</p>	<p>zoning of the areas for refilling the sources to give priority to the areas of vegetation re-composition, such as reforestation and foresting, besides the critical priority areas devoid of de Riparian woods.</p> <ul style="list-style-type: none"> • Stimulate, with the support of CBHSF, private initiative to dedicate itself to the production of arboreal essences with a greater diversity of species adequate for the recuperation of river environments. The areas to attend in each case will be defined by studies of the ecosystems along the Basin. • Establish, with the support NGO's, exchange between nurserymen, stimulating environmental actions for the recuperation of degraded areas and re-composition of riparian environments of the Basin. • To stimulate the preparation of basic documents to institute, in articulation with the Ministry of agriculture, Fishing and of Supply and the IBAMA a Program of incentives for and promotion of soil and water conservation activities. • Collaborate with the IBAMA to establish the dimensions project and implant banks of seeds of native essences for the re-composition of the river environments of the Basin by hypsographic zone in strategic areas; one must consider that there are few existing examples of these species in these environments, as a consequence of the indiscriminate land clearing which occurred along the river and over time. • Collaborate with the responsible federal and state organisms in the mapping of the risk zones of degradation of the soil and identify strategic and priority areas; stimulate the implantation of demonstration units of conservation and soil management in productive areas with technology for the rational use of water, as well as to develop publicity material about these technologies.
---	--

6.2.4. Degrading Modification of the aquatic ecosystem

The basin of the São Francisco river is a very complex area, the historical development of which occurred in a tumultuous and segmented way, with little integrated planning and within a relatively fragile institutional structure. This resulted in the degradation of the Basin and its coastal zone (Figure 16).

Great stretches of the river were regularized, causing alterations in the natural outflow of the river in periods that coincided with the egg laying of the fish. Beside this they affected the deposition of sediments and other contaminating elements in the system. Also the alteration of the standards of erosion and the deposition of sediments began and the discharge of nutrients, principally in the lower stretches of the Basin and the coastal zone. Therefore, urgent actions are necessary to minimize these effects.

Preliminarily identified projects	Suggested Actions
Critical problem - 6.2.4. Degrading Modification of the aquatic ecosystem	
<p>i. Development of fish-farming of the Basin, according to the peculiarities of its physiographic regions, including the marginal lagoons to assure economic opportunities for the São Franciscan population, with the ichthiofauna as an indicator of sustainability</p> <p>Estimated time: 36 months Estimated investment: US\$ 1,510,000 Indicated cost GEF: US\$ 510,000</p>	<ul style="list-style-type: none"> • Establish a zoning of the priority areas for exploration of the intensive Fish-farming with the entities, which act on this theme. • Collaborate for the zoning and control of areas where the exploitation of network tanks is authorized, including defining the concentration of the chemical components in the feed, pollution, and the possibilities of introducing exotic species in the rivers and lakes. • Plan and institute, with the cooperation of the organisms active in the area, a Program of incentive and promotion of fish farming in the Basin, with intense involvement of private initiative and of the traditional remaining fishermen. • Cooperate with the Xingo Institute and competent organisms, in the elaboration and implantation of a Permanent Program of fish repopulation and control of the unloading of fish caught in strategic areas of the Basin. • Elaborate in conjunction with the Mayors' offices and NGO's educational materials for the educational network of the primary schools about Fishing in the São Francisco considering the characteristics of each physiographic region.

ii. Create adequate infrastructure and adopt water and soil management technologies to yield opportunities for economic and ecological uses of water resources Estimated time: 24 months Estimate of investment: US\$ 1,380,000 Indication of Cost GEF: US\$ 530,000	<ul style="list-style-type: none"> • Identify, with the support of governmental organisms which treat this theme, critical areas of degrading infrastructures and inadequate use of the soil in economic activities. • Conceive a program of involvement of the municipalities for making their infrastructures adequate to the concept of micro-basins. • Identify models of incentives and promotion of the integrated participation of the consumers and state and municipal governments, in the programs of highway restructuring. • Collaborate to amplify the support of the federal, state and municipal governments by means of a campaign of enlightenment of the importance of the preservation of the watercourses.
---	--

6.2.5. Sources of point and diffuse pollution

Each physiographic region of the Basin of the São Francisco with its own special peculiarities evinces specific problems, differing thus, one from the other. Among the grave environmental problems identified in the Basin, one finds the direct dumping into the river of non-treated urban waters and of industry and mining effluents, containing heavy metals and cyanides.

Beside this, there exists the indiscriminate use of agrochemical products in agriculture and the occurrence of clearing of land on a large scale for the use of wood as charcoal, for agricultural use, industry in general, including mining. The contamination of the rivers amplifies these impacts on the aquatic fauna of the Basin (Figure17).

Preliminarily identified projects	Suggested actions
Critical problem - 6.2.5. Sources of point and diffuse pollution	
i. Development of low cost models of control of point and diffuse pollution according to the physiographic characteristics of the Basin Estimated time: 24 months Estimated investment: US\$ 3,890,000 Indicated Cost GEF: US\$ 1,090,000	<ul style="list-style-type: none"> • Collaborate with the competent federal and state organs, in mapping the areas with point and diffuse pollution problems of the Basin and in the selection and establishing of a hierarchy of Sub-Basins with respect to the criticalness of the sources of pollution and help to promote the categorization of their water resources. • Cooperate with specific entities at the governmental level in activities related to the development of research for the treatment of waste and its reuse with simple technologies for its purification before it is thrown into the watercourse, conceived according to population level. • Evaluate along with the IGAM, in the case of Minas Gerais, the risks of harming the water resources by mining in the areas of intense mining of the Basin. • Collaborate with the National Department of Mineral Production - DNPM, the CPRM and state organs in the amplification of the Data Bank referring to mining in the region and collaborate in the evaluation of the environmental interferences of its principal mining districts on water resources. • Collaborate in the development and implementation of a model of environmental monitoring for controlling the risks of contamination and use of pesticides. Besides those already tracked, one should consider standards of pesticides which are important in national and international legislation, and above all in the region studied, emphasizing: methamidophos, mancozeb, benomil (carbendazim e thiabendazole), linuron, dieldrin, DDT, endrin, 2,4D, lindano e permetrina.
ii. Program of information and environmental education making the population aware of the risks and evils of pollution and the conservation and preservation of water resources as a consequence.	<ul style="list-style-type: none"> • Collaborate with the competent governmental organisms in the elaboration and implementation of a program of communication, consciousness-raising and social-environmental education for the critical areas and principal problems, by physiological zones. • Elaborate a Program of participative environmental education involving governmental organs and segments of civil society • Elaborate a Program of mobilization and consciousness-raising of the communities for the questions of soil and water conservation together with the Mayors' offices and NGO's. • Elaborate together with governmental and non-governmental organs Programs of Environmental Education by Priority sub-basins based on: <ul style="list-style-type: none"> - Knowledge of the socio-environmental reality starting from the point of view of

<p>Estimated time: 18 months Estimated investment: US\$ 1,090,000 Indicated cost GEF: US\$ 720,000</p>	<p>the local inhabitant.</p> <ul style="list-style-type: none"> - Creation of spaces of discussion about the environmental problems raised by the local inhabitants and those identified by the technicians. - Survey of solutions for each problem and the responsibilities of each one of the actions to be implemented. - Making viable the development of actions of a participative nature. - Establishing partnerships with local organizations and promoting their strengthening - Divulgence of data and information collected, making them available for consultation. - Holding of workshops for the establishment of educational guidelines involving <ul style="list-style-type: none"> - Both the São Francisco public as well as corporative institutions, treating themes of management, use and conservation of water resources. - Editing a publication for ample distribution in the public school system about management of water resources.
---	---

6.2.6. Modification of the use and inadequate occupation of the soil

The various actions implemented by the government for the development of the Basin have been made into sectors with little concern for conceiving a model of integrated, planned and sustainable development. This was due, to a great extent, to the style of development adopted for the area of the Basin. The socio-economic problems continue to exist, while at the same time significant environmental problems have arisen (Figure 18).

Among the most serious environmental aspects are included the erosion of the soil and the consequential silting of the watercourses. Also have contributed: land clearing for extensive agriculture and cattle-raising; the badly conserved rural roads, the extracting of wood for domestic and industrial consumption; the degradation of the sources, the erosion of the banks of the river; the loss of fertility; the compacting of the soil; the formation of silt and the accumulation of barren soil and trash. It is, thus, necessary to complete the actions already initiated by the GEF São Francisco and implement others that have been identified.

Preliminarily identified projects	Suggested actions
Critical problem - 6.2.6. Modification of the use and inadequate occupation of the soil	
<p>i. Conclusion of the determination of land use work in the Upper and Middle São Francisco, covering thus all the Hydrographic Basin.</p> <p>Estimated time: 24 months Estimated investment: US\$ 650,000 Indicated Cost GEF: US\$ 350,000</p>	<ul style="list-style-type: none"> • Make, with the support of the CODEVASF, a thematic mapping of the use of the land of the Middle São Francisco and update the thematic mapping of the use of the land of the Upper São Francisco. • Detail the studies of the dynamics of alteration of the conformation of the São Francisco riverbed, together with the ANA, CODEVASF and the DNIT, complementing the studies realized by the Subproject of GEF São Francisco which has treated this theme.
<p>ii. 7.6.2. Identification and prioritizing of degraded areas, or in the process of degradation, for proper orientation, aiming adequate soil and water use.</p> <p>Estimated time: 24 months Estimated investment: US\$ 880,000 Indicated Cost GEF: US\$ 420,000</p>	<ul style="list-style-type: none"> • Identify, evaluate and give priority to the critical areas of degradation of the resources of water and soil, by physiographic region and their sub-basins, most exposed to risks and vulnerable together with the competent governmental organisms. • Establish partnerships with the IBAMA and Universities of the region and NGO's to consolidate the APA of the mangroves of the Lower São Francisco for its strengthening; • Institute, with federal and state organisms which act in the states of Alagoas and Sergipe, a monitoring system to verify the evolution of the degradation, between the Xingó dam and the adjacent coastal region at the delta, accompanying, initially, the evolution of bathymetric levels and the transport of sediments.
<p>iii. Utilization of adequate technologies, yielding a regional use of water and</p>	<ul style="list-style-type: none"> • To stimulate, before the responsible governmental organs, to make technologies adequate for the use of alternative energy, making them available directly to the low-income consumers.

<p>soil, and search for energy alternatives to minimize the pressure on the natural vegetation.</p> <p>Estimated time: 24 months Estimated investment: US\$ 1,910,000 Indicated cost GEF: US\$ 410,000</p>	<ul style="list-style-type: none"> • Cooperate with the federal and state organisms which treat this theme in the elaboration and implantation of alternative energy programs for underprivileged communities, allying themselves to the Program Zero Hunger of the Federal Government. • Elaborate, together with organisms active and which treat of the theme, a program of zoning of areas with forest potential for wood coal production, based on the precepts of sustainability. • To help to create mechanisms of incentives for implementing of this program.
--	--

6.2.7. Disorderly Exploitation of groundwater, dissociated from the surface water

The use of superficial water resources, principally for the activity of irrigation, has intensified the number of requests for concession of water in some States inserted in the Basin. There are rivers in the Basin which have already reached the maximum limit of capturing flow rate, thus not permitting the liberation of the granting of water any longer. As a result of this situation, several rural producers have tried to use the groundwater through the drilling of deep wells.

Several of these wells register significant flows, thus stimulating the disorderly and uncontrolled opening of new wells. Currently, there do not exist studies that define the hydrodynamic parameters of the majority of the water sources, as well as the areas and the volume of the discharge, their potential and the relation between the groundwater and the surface waters. Since this is the case, it is necessary to make a quantitative survey of the groundwater and the surface waters, registering the wells already drilled and controlling the drilling of others (Figure 19), complementing this with the knowledge of availability of the surface resources.

Preliminarily identified projects	Suggested Actions
Critical Problem - 6.2.7. Disorderly exploitation of groundwater, dissociated from the surface water	
<p>i. Recuperation and amplification of the hydro-meteorological network, including monitoring of surface and groundwater</p> <p>Estimated time: 36 months Estimated investment: US\$ 5,300,000 Indicated Cost GEF: US\$ 2,490,000</p>	<ul style="list-style-type: none"> • Support the ANA in the updating of the registry of the entities which maintain or operate networks of hydrometeorological monitoring in the Basin. • Cooperate with the ANA in the extending of the network of Hydrometeorological monitoring within the standards defined by the OMM, attending, also, to the aspect of quantity and quality of the waters. • Collaborate in elaborating, along with the responsible governmental organisms, digital topographical maps on the appropriate scale for the zones with a potential for groundwater. Stressing the form of the water sources, indicating all existent wells, principal springs, zones of refilling and of discharge with geo-references to construct equi-potential lines, flow lines, defining the conditions of the shape for modeling and a Databank. • Stimulate, the Governmental organisms which have this theme as their attribution, the development of hydrogeological models for the principal water-bearing systems. • Orient the state organs of management of groundwater resources so that they equip selected stations with automatic meters for the level of wells, linigraphs and meteorological stations supplied with datalog to make viable the setting up of a net for collecting daily information, including measuring the parameters of monitoring the quality of the water for the purpose of monitoring and classification. • Collaborate with the ANA in the implantation of the network of piezometric monitoring as defined and recommended by the Activity Proposal of a Network of piezometric Monitoring of the sub-basin of the Verde Grande river-MG/BA do Project GEF São Francisco.
<p>ii. Divuligation and clarification of objectives and the importance of monitoring and of an effective control of extracted flows, aiming the sustainability of groundwater resources</p>	<ul style="list-style-type: none"> • Conceive along with the competent governmental organisms, services which have as their objective the improvement of knowledge, control and dissemination of the information about the groundwater and surface water availability, especially for the decision-makers, and primary school teachers. To make compatible, with the support of the responsible governmental organs systems of registry and concessions between all the managing organs or water

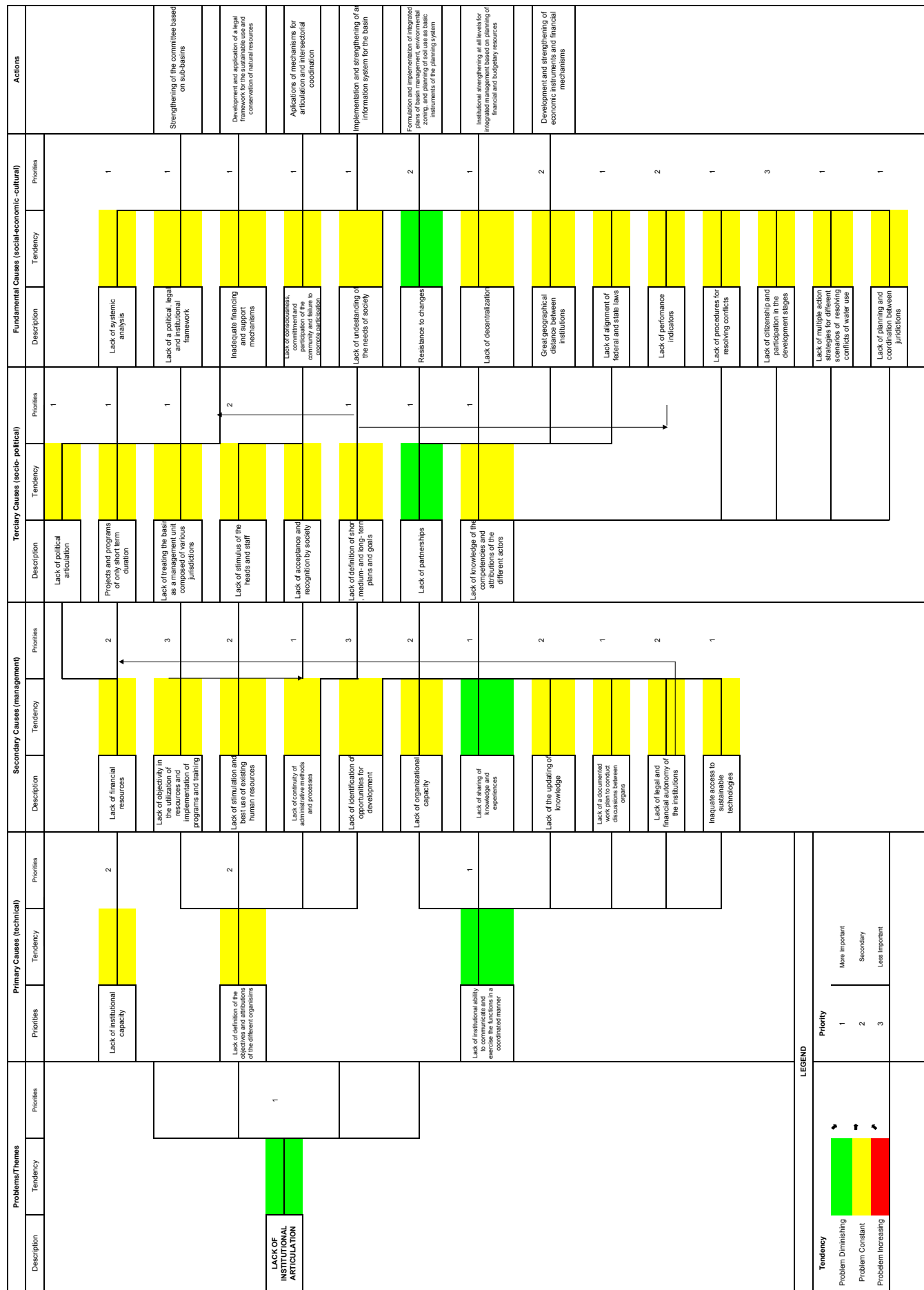
Estimated time: 24 months Estimate of investment: US\$ 1,200,000 Indicated cost GEF: US\$ 380,000	resources of the Basin, maintaining them up to date and accessible for all interested parties. <ul style="list-style-type: none"> • Make campaigns of clarification and divulgation directed at the consumers, treating the objectives and importance of monitoring, by utilizing educational pamphlets, events in educational institutions, and the use of the radio.
--	---

6.2.8. Restrictions for navigation

Navigation has already been a factor in the development of the São Francisco River Basin, when the approximately 1.900 kilometers of its waterways stimulated the process of occupation and the creation of commercial poles. In the last decades the use of the waterway has gradually been deactivated, due to transport policies which favored the highway models, and, on a secondary plane, the railroad system. These factors in a certain sense contributed to the neglect of the maintenance of the waterway and so harm navigation.

It is known that the waterway transport presents advantages when compared to the other modes of transport. In the face of this fact, one should analyze the problems of integrated navigation with the other modes, with the objective of increasing the competition of irrigated agriculture of the Basin, especially in the West and Southwest regions. There exist important aspects to be analyzed and which include the absence of public policies and adequate gauge of the channels of navigation. The process of silt formation, which causes restrictions to navigation, is started by the inadequate management of the soil, and should be considered in the planning of the basin (Figure 20).

Preliminarily identified Projects	Suggested actions
Critical Problem - 6.2.8. Restrictions for navigation	
i. Revitalization of navigation in the São Francisco river and navigable tributaries, including the involvement of private initiative Estimated time: 18 months Estimated investment: US\$ 820,000 Indicated Cost GEF: US\$ 320,000	<ul style="list-style-type: none"> • Cooperate with the ANA and other federal organs in the adoption of a system of articulation of the sectors of navigation, management of water resources, irrigation, and generation of energy. This will permit the Federal Government, States, regional and local institutions and communities that contribute, each one in his own way, with the investments necessary to the achieving these goals. • Cooperate with the DNIT and the competent organisms to define the costs of the services of Maintenance of the Navigability of the Waterway, where one will adopt environmental control measures integrating the various municipalities and national states, thus increasing the competitiveness of the products generated in the area of the waterway's influence. • Collaborate with the ANA, in the studies of revitalization of navigation of the stretch from Ibotirama a Juazeiro, which has already been begun. • Collaborate to celebrate and fulfill an agreement, of the necessity of the maintenance of a minimum discharge of 500 m³/s between the 230 km of Pirapora to São Francisco in MG, already foreseen with the CEMIG – Energy Company of de Minas Gerais. In this stretch one verifies the greatest density of low waters caused by the irregularity of the discharges liberated by the Três Marias Hydroelectric plant. • Help to produce and distribute Educational material oriented to the elementary school level, containing explanations relative to the functioning of the waterway, its interface with the taking advantage of water resources of the Basin, its management and the benefits generated for the population.



LEGEND

Tendency	Priority
Problem Diminishing	1
Problem Constant	2
Problem Increasing	3

Figure 13. Causal Chain - Lack of Institutional Articulation

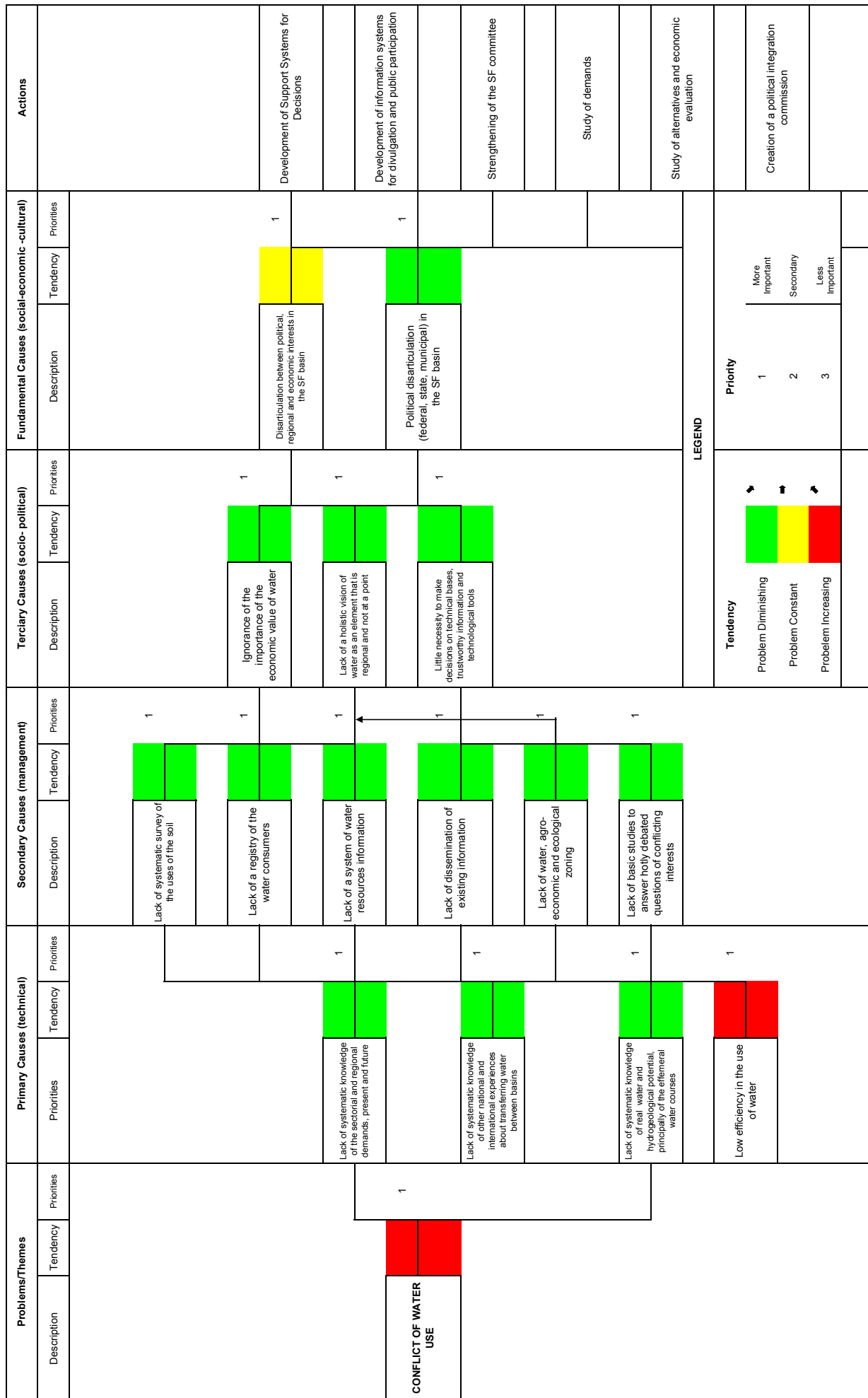


Figure 14. Causal Chain - Conflict of Water Use

Problems/Themes			Primary Causes (technical)			Secondary Causes (management)			Tertiary Causes (socio-political)			Fundamental Causes (social-economic-cultural)			Actions												
Description	Tendency	Priorities	Profiles	Tendency	Priorities	Description	Tendency	Priorities	Description	Tendency	Priorities	Description	Tendency	Priorities													
INSUFFICIENCY OF WATER FOR MULTIPLE USES	Problem Increasing	1	Problem Increasing	Inadequate water allocation and disorderly soil management	Problem Increasing	1	Problem Increasing	1	Problem Increasing	Lack of management at the basin level	Problem Increasing	1	Disarticulation between federal, state and municipal policies	Problem Increasing	1	Put in practice the water resources and environmental legislation (at the federal, state and municipal levels) and intensify inspection											
				Excessive losses (principally in irrigation)	Problem Increasing	1				Lack of information and technical knowledge about the theme	Problem Increasing	1	Inadequate process of economic exploitation	Problem Increasing	1	Implementation of registry systems of consumers, concession, inspection and charging fees (and the [future] water market)											
				Lack of protection of the headwaters	Problem Increasing	1				Lack of divulgation of the existing information	Problem Increasing	1	Lack of human and financial resources for research	Problem Increasing	1	Studies and implementation of efficient uses of water, principally in irrigation (chief consumer)											
				Lack of integration of surface and subterranean waters	Problem Increasing	Non-integrated policies					Problem Increasing					Lack of formal education of the local population	Financing of projects for the forming of human resources and research										
					Problem Increasing						Problem Increasing							Education for the different types of consumers									
				Unfavorable Climatic Conditions	Problem Increasing	2				Problem Increasing	Unfavorable Climatic Conditions	2	Problem Increasing	2	Problem Increasing	Insufficient knowledge of the river-aquiferous relation	Problem Increasing	2	Fragility of the communication channels	Problem Increasing	1	Information and technology transfer to the consumers					
																Sectarianism of the areas of knowledge	Problem Increasing	1	Integrated research and hydrology and hydrogeology multi-institutional technical events								
																				Lack of human and financial resources for research	Problem Increasing	1	Development of systems of water information of SF				
																								Lack of communication between the technicians and the scientists of the area	Problem Increasing	2	Strengthen studies and actions for the re-use and rationalization of water use
LEGEND																											
Tendency		Priority																									
Problem Diminishing		1		More important																							
Problem Constant		2		Secondary																							
Problem Increasing		3		Less important																							

Figure 15. Causal Chain - Insufficiency of Water for Multiple Uses

LEGEND				
Tendency	<div> <div></div> <div></div> <div></div> </div>	Priority		
		1	2	3
		More Important	Secondary	Less Important
		Problem Diminishing	Problem Constant	Problem Increasing

Problems/Themes		Primary Causes (technical)			Secondary Causes (management)			Tertiary Causes (socio- political)			Fundamental Causes (social-economic -cultural)			Actions
Description	Tendency	Priorities	Tendency	Priorities	Description	Tendency	Priorities	Description	Tendency	Priorities	Description	Tendency	Priorities	
DEGRADATION OF THE AQUATIC ECOSYSTEM		1		3			3			1	Priority for the generation of energy , water supply and irrigation		1	Redefinition of the rules for operating the reservoirs, taking ecological demands into consideration
							3			1	Lack of control of sectorial uses		1	Management of the offering of water, taking the multiple uses of water into consideration
							1			1	Lack of planning		1	Zoning of the use and occupation of the soil
							1			1	Growth in the demand for water		2	Territorial ordering of economic activities
							1			2	Coal production			
							1			1	Expansion of the agricultural area			
							1			2	Cellulose, steel and construction industries			
							1			1	Fish farming and crab farming		2	

Figure 16. Causal Chain - Degrading Modification of the Aquatic Ecosystem

Problems/Themes			Primary Causes (technical)			Secondary Causes (management)			Tertiary Causes (socio- political)			Fundamental Causes (social-economic-cultural)			Actions	
Description	Tendency	Priorities	Priorities	Tendency	Priorities	Description	Tendency	Priorities	Description	Tendency	Priorities	Description	Tendency	Priorities		
MODIFICATION OF USE AND INADEQUATE SOIL OCCUPATION																
						Soil erosion		1	Land clearing		1		Real estate speculation		1	
						River bank erosion		1	Degradation of the ciliary woods		1	Expansion of the agropasture area				Use and occupation zoning of urban and rural soil
													Lack of land regularization and control of property fragmentation		1	
						Loss of fertility		1	Constant flow level		1	Construction of reservoirs				Rules for operating reservoirs
			1													
						Soil compaction		1	Inaquate soil management		1	Lack of control systems and deficient inspection				Monitoring and inspection
						Salinization		1	Inadequate management of irrigation		1					Qualification of soil users
						Loss of beaches		3	Low carrying of sediment to the ocean		2					Elaboration and imlementation of environmental and urban directing plans
						Silting		1	Mining		1					
						Accumulation of steril refuse		2								
<div><div><div>Tendency</div><div><div></div><div></div><div></div></div><div><div>Problem Diminishing</div><div>Problem Constant</div><div>Probleem Increasing</div></div></div><div><div>Priority</div><div><div>1</div><div>2</div><div>3</div></div><div><div>More Important</div><div>Secondary</div><div>Less Important</div></div></div></div>																

Figure 18. Causal Chain – Modification of use and inadequate soil occupation

Problems/Themes			Primary Causes (technical)			Secondary Causes (management)			Tertiary Causes (socio- political)			Fundamental Causes (social-economic-cultural)			Actions					
Description	Tendency	Priorities	Priorities	Tendency	Description	Tendency	Priorities	Description	Tendency	Priorities	Description	Tendency	Priorities							
DISORDERLY EXPLOITATION OF THE GROUNDWATER, DISSOCIATED FROM SURFACE WATER	Green	Green	1	Green	Lack of knowledge of hydrogeology and hydrometeorology	Green	1	Lack of hydrogeological and hydrometeorological studies	Green	1	Lack of human and financial resources	Green	1	Inadequate legal, political and institutional structure	Green	2	Studies, integrated research and multi-institutional technical events of hydrogeology and hydrometeorology			
					Lack of recognition of the strategic value of subterranean water resources			Lack of an articulated system of information of superficial and subterranean waters										Lack of policies of integrated uses of surface and subterranean waters	Lack of long-term planning	Lack of integrated planning and coordination between different institutions and jurisdictions
					Lack of consciousness of the necessity of preservation			Lack of consciousness, commitment and participation of the community and failure to promote this participation										Lack of a systemic analysis	Lack of alignment of federal and state laws	Implementation of systems of registry of consumers, granting of rights, and inspection
					Lack of control of the drilling and exploitation of wells			Lack of registration of wells										Lack of a system of granting subterranean waters	Inadequate mechanisms of financing and support	Development of support systems for decision-making for integrated management of surface and subterranean waters
								Lack of a hydrometeorological and hydrogeological inventory, study and monitoring											Lack of monitoring and control	Development of water market studies
																				Information and technology transfer and divulgation of educational programs of preservation (non-contamination of subterranean waters)
																				Applications of mechanisms for intersectorial articulation and coordination
																				Formulation and implementation of environmental zoning plans
																				Institutional strengthening at all levels for integrated management of surface and subterranean waters
																				Development of studies to recharge the water-bearers and implementation of the studies' recommendations
				Development and strengthening of economic instruments and financial mechanisms																

LEGEND			
Tendency	Priority		
Problem Diminishing	1	More Important	
Problem Constant	2	Secondary	
Problem Increasing	3	Less Important	

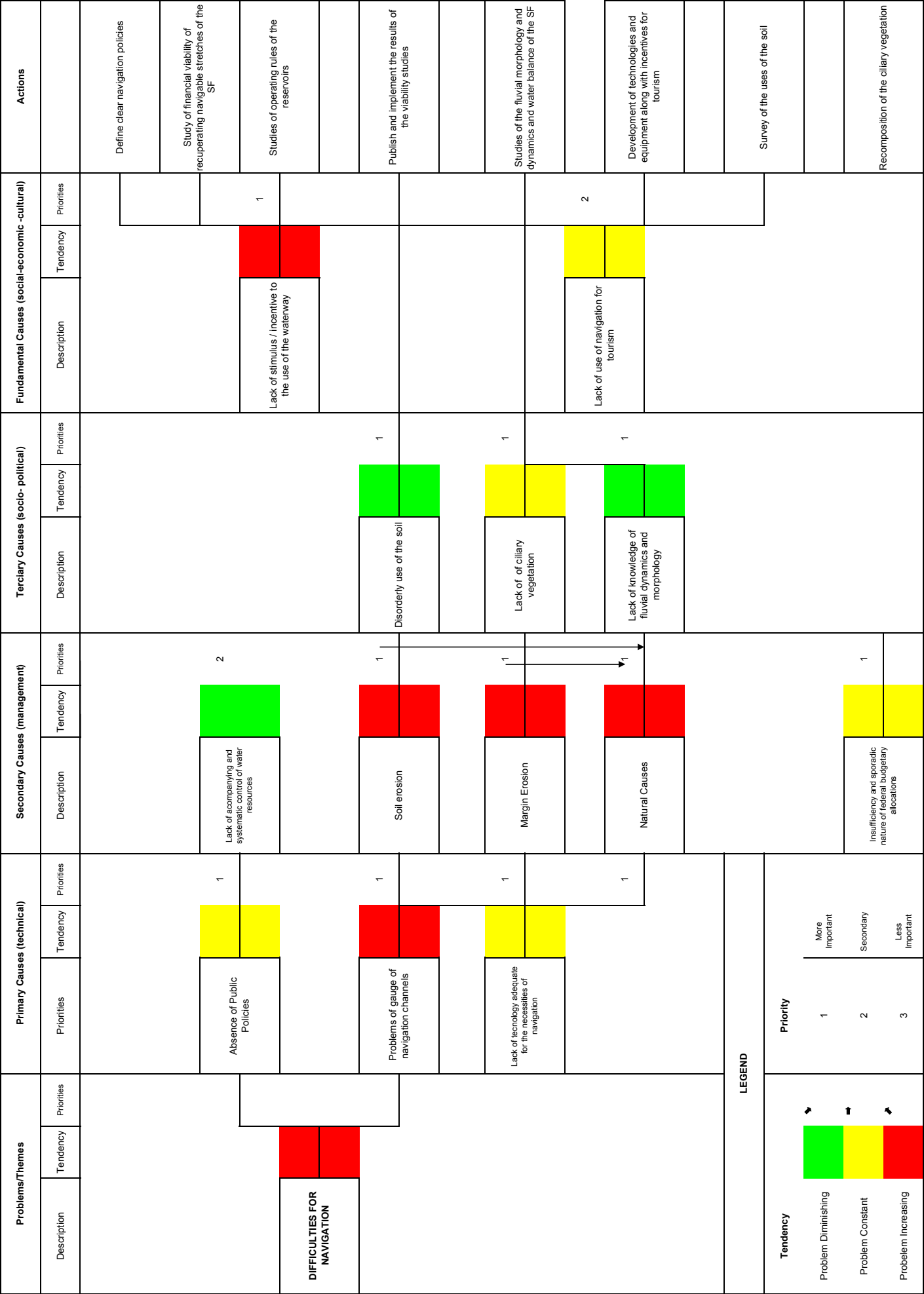


Figure 20. Causal Chain – Restrictions for Navigation

7. ACTIONS PROPOSED FOR THE STRATEGIC ACTION PROGRAM FOR THE INTEGRATED MANAGEMENT OF THE SÃO FRANCISCO RIVER BASIN AND ITS COASTAL ZONE - PAE

The analysis of the results presented in the previous chapters and of the consultations to diverse governmental organizations and non-governmental organizations permitted one to identify preliminarily broad range projects with high impact in a way to orient the following stage of elaboration of the Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone – PAE. These projects are directly related to the causal chain.

The actions foreseen or recommended when approved, will serve to receive donations of the GEF corresponding to the increased costs.

These actions in the preparation stage of PAE should be analyzed in a detailed way, reviewed, adjusted and given priority, and **should have their number reduced** for greater effectiveness of the resources which will be made available. It should be emphasized that several of these actions should be executed by governmental organisms, and according to the model already determined by the GEF Project Sao Francisco, implemented through Activities in their first stage.

The actions recommended in the previous chapter can be grouped in four large components referring to:

- I. Institutional strengthening and Public Participation;**
- II. Sustainable Development of the Water Resources;**
- III. Prevention, Protection and Environmental Rehabilitation;**
- IV. Environmental Qualification and Education.**

These components concentrate diverse actions which are recommended or proposed to be analyzed during the preparation of the Strategic Action Program for the Integrated Management of the Sao Francisco River Basin and its Coastal Zone – PAE and are indicated on chart 9.

They amount to an indicated cost for the GEF of US\$12.000.000, for an estimate of investment of US\$40.000.000 with the participation of diverse governmental, federal, state, and municipal organisms, beside non-governmental organisms in the period of 3.8 years or 44 months, between 2004 and 2007.

Chart 9. Actions proposed for the Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone – PAE

Component	Projects/Objectives	Indicated Cost US\$ GEF	Total US\$
I. Institutional Strengthening and Public Participation	1.1. Strengthening the Committee of the São Francisco River Basin with the objective of implementing, efficiently and effectively the instruments of management of water resources foreseen in the legislation currently in effect, including to create the Agency of the Basin . Qualification of the related institutions, managers of water resources of different levels.	1,030,000	1,890,000
	1.2. Public Participation of the consumers and interested parties as a legitimate means for society to integrate itself in the decision-making processes with a view to sustainable use of water resources of the basin.	620,000	1,370,000
		1,650,000	3,260,000
II. Sustainable Development of the Water Resources	2.1. Development and implantation of systems of planning, including models of planning and operation of the system of reservoirs of the São Francisco river basin, considering the multiple uses of water.	550,000	2,900,000
	2.2. Actions to regularize the principal tributaries of the Middle São Francisco and the construction of the Pão de Açúcar reservoir between the Lower-middle and the Lower São Francisco including the promoting of artificial flooding .	600,000	6,900,000
	2.3. Promote the efficient use of water in irrigation of the basin do Rio São Francisco	900,000	2,950,000
	2.4. Development of low-cost models for inspection of point and diffuse pollution , according to the physiographic characteristics of the Basin, especially for small communities.	1,090,000	3,890,000
	2.5. Recuperation and extension of the hydrometeorological network , including the monitoring of surface and groundwater.	2,490,000	5,380,000
	2.6. Revitalization of the navigation of the São Francisco river and navigable tributaries including the involvement of private initiative	320,000	1,320,000
		5,950,000	22,340,000
III. Environmental Prevention, protection and rehabilitation	3.1. Initiatives of water and soil conservation and of re-composition of vegetation including the establishing of protected areas especially in the zones of the refilling of the sources.	1,180,000	4,780,000
	3.2. Development of fish-farming in the Basin, according to the peculiarities of its physiographic regions, including the marginal lagoons to assure economic opportunities for the São Franciscan population, with the ichtiofauna as a quality indicator .	510,000	1,510,000
	3.3. Making the infrastructures adequate and allocating technologies of soil and water management , creating opportunities of economic and ecological use of these resources	530,000	1,380,000
	3.4. Conclusion of the work of determining the use of land in the Upper and Middle São Francisco , thus, covering all the Hydrographic basin.	350,000	650,000
	3.5. Identification and giving priority to problem areas, degraded or in the process of degradation for the proper orientation, aiming at the adequate use have the soil and water .	420,000	880,000
	3.6. Utilization of adequate technologies, regionalizing the use of water and soil, and seeking energy alternatives to minimize the pressure on the natural vegetation.	410,000	1,910,000
		3,400,000	11,110,000
IV. Qualification and environmental education	4.1. Program of information and environmental education making the population conscious of the risks and evils of pollution and the resulting conservation and preservation of water resources.	720,000	1,090,000
	4.2. Divuligation and direct explanations of the objectives and importance of monitoring and of effective control of the flows extracted, aiming at the sustainability of groundwater resources	280,000	1,200,000
		1,000,000	2,290,000
Total		12,000,000	40,000,000

APPENDIX 1. INSTITUTIONS AND PERSONNEL INVOLVED IN THE GEF SÃO FRANCISCO PROJECT, BY ACTIVITY

Activity	Objectives and Products	Institutions and Participants Executing the Plan	Coordinating Consultants	Number of Persons involved
I – ENVIRONMENTAL ANALYSIS OF THE BASIN AND COASTAL ZONE				
1.1A – Hydrodynamic and Sediment Studies of the Lower São Francisco at its Estuary and Adjacent Coastal Zone-AL/SE	Objectives: Identify the current hydrodynamics of the lower course of the São Francisco river, from the estuary and from the adjacent ocean region, quantifying the current distribution and transport of sediments, and relating them to the biotic productivity in the trophic levels of the phyto-, zoo- and ichthyoplankton. Products: • Final Report - Hydrodynamic and Sediment Studies of the Lower São Francisco at its Estuary and Adjacent Coastal Zone-AL/SE • 5 Appendices • 1 Workshop** - The Lower São Francisco, Identification of the Water Problems and Mitigating Measures. Xingó-AL, 2000 • 1st Seminar*** - From the Old to the New Chico: A Discussion of the Problems and Hydro-environmental Solutions for the Lower São Francisco and the Delta Própria-SE, 2002	Federal: UFAL*; CHESF; CODEVASF; UFBA; UFRN State: IMA; SERHI-AL; SRH-SE NGOs: FUNDEPES; Xingo Institute	Coordinator: Arno Maschmann Consultants: Adriana Reis Arthur Hernandez Geórgenes Cavalcante Helenice Vital Paulo Mafalda Júnior Allysson Matos Anderson Nunes Christiane Souza Marco Gonçalves Newton Júnior Oberdan Oliveira Rivaldo Júnior Werner Tabasa Yatska Hernandes	Consultants: 14 Workshop**: 76 Seminar: 500***
1.1B – Estuary Nutrient Load Sediment Determination in the Delta of the São Francisco	Objectives: Characterize the load and the seasonal variation of the nutrients at the delta of the São Francisco river; identify the importance of the River for the enrichment of nutrients of the adjacent ocean environment; relate the results found with the statistics of existing fishing Products: • Final Report - Nutrient Load Determination in the Estuarine Zone of the São Francisco River. • 1 Workshop** • 1 Seminar***	Federal: UFAL*	Coordenador: Paulo Petter Consultants: Bastiaan Knoppers Geórgenes Cavalcante João Lorenzetti Manuel dos Santos Silvana Quintela Sinval G. Júnior Alex N. Oliveira Esdras L. Andrade Paulo Barros Omena	Consultants: 9
1.1C – Evaluation of the Contribution of the Lower São Francisco River's Navigational Route to the Agriculture Competitive Enhancement in the Basin-AL/SE	Objectives: Analyze the integrated waterway as an alternative with other modes of transport, and as a factor of increasing the competitiveness of agriculture in the São Francisco river valley, especially in the west and southeast regions of Bahia Products: • Final report - Evaluation of the Contribution of the Lower São Francisco River's Navigational Route to the Agriculture Competitive Enhancement in the Basin-AL/SE	Federal: MT*; ANA; DNIT State: CODEBA;FRANAVE Private: AHRSF	Coordinator: Paulo Godoy Nathércia Schneider	Consultant: 1 Collaborators: 7
1.2– Environmental Assessment of Mining Activities in the Water Resources at the Alto Rio das Velhas River Basin-MG	Objectives: Identify and quantify the impact of the activities of mining on the quality and quantity of water of the Upper Velhas River Products: • Final Report - Environmental Assessment of Mining Activities in the Water Resources at the Alto Rio das Velhas River Basin-MG • 6 Appendices • 2 Seminars	State: IGAM*; CEMIG; CERH-MG; COPAM-MG; COPASA-MG; EMATER-MG; FEAM-MG; IEF-MG; PPNL; PPOP; SEE-MG; SEMAD-MG Municipal: CMI; CMNL; CMR; CMRA; PFNL; SAAEIT; SMDEI; SMMA; SMMAI; SMMANL; SMMARA; SODAEOP; SODAERA NGOs: ACAL; ACBOV; ACJC; ACSB; ACT; AMAMC; AMOVILE; AMPA; CCA; FOBES; Fund. Gorceix; MEL; PM; RET; UAI Private: ANGLOGOLD; BL; CM; CL; EHIL; FORTECO; GA; MAS; MRV; MBR; MPMM; PCEAI; SAAE; TIMCI	Coordinator: Elisa Boechat Consultants: Golder Associates Vitória Tuyama Willer Hudson Pós	Consultants: 3 Collaborators: 21 Seminars: 70
1.3 – Recomposition of the Remophilic ichthiofauna of the Lower São Francisco-AL/SE	Objectives: Identify the native species of economic value on the Lower São Francisco and generate subsidies for a Program of Repopulating the fish in the Xingó reservoir and downstream	NGOs: Inst. Xingó* APAL; CPAL	Coordinator: Fábio C. Branco Consultores: Rivaldo Couto Sineide Montenegro	Consultants: 5

	Products: • Final Report – Reconstitution of the Rheophilic Ichthiofauna of the Lower São Francisco • 1 Seminar**		Enaide M. Magalhães Maria Célia Lyra Manoel dos Santos	
1.4 – Development of a Water Quality Monitoring System in the Lower-middle São Francisco-BA/PE	Objectives: Define a methodology of monitoring to evaluate the quality of the multiple-use waters according to agro-industrial, forest and industrial activities in the region of the Lower-middle São Francisco. Products: • Final Report – Development of a System of Monitoring of the Quality of Water in the Lower-middle São Francisco River: Index of Environmental Sustainability of Water Use-ISA_Water • 9 Appendices • 4 Courses – Education of Voluntary Environmental Agents	Federal: EMBRAPA-MA* ; ANA; CODEVASF; CPATSA; UnB State: ITEP; UNICAMP NGO: IRPAA	Coordinator: Aderaldo Silva Consultants: Ana de La Cruz Anderson S. Pereira Carlos Alcebiades Cláudio Buschinelli Daniel Lobo Daniela M. Mariuzzo Enio Farias e Silva Francisco N da Silva Izilda A. Rodrigues José Aragão José M. Gascó Julián Del Rey Luis Carlos Hermes Luiza Brito Marcos C. Ferreira Maria Inês Ferreira Osmar Abílio Renato F. Guimarães Roberto A. Marino Ronaldton Machado Zacarias Vaz Filho	Consultants: 21 Collaborators: 554 Courses: 246
1.5 - Impact of Agriculture on Groundwater Resources in the Verde/Jacaré Rivers-BA	Objectives: Make a diagnosis of impacts and structure the bases for implanting a pilot system of monitoring and collection of data in the non-saturated zone, in areas where one practices intensive irrigated agriculture to evaluate the impacts on the quantity and quality of the surface and water in the Verde River basin/ Acre. Identify root causes and recommend mitigating measures. Products: • Final Product: Impact of Agriculture on Groundwater Resources in the Verde/Jacaré Rivers-BA • 9 Appendices • 2 Courses • 1 Workshop • 1 Seminar	Federal: UFBA*; CODEVASF; EMBRAPA; UFBA; UFV; UFS State: CERB; CRH-MG; EMBASA; ITEP; SRH-BA International: CYTED; LAVAL; Univ. Jaume I; Univ. País Basco	Coordinator: Heraldo Silva Consultants: Everardo Mantovani Haroldo S. Dórea Ignácio Evangelista Iñaki Antigüedad José Llamas Semara de Andrade Ricardo Rodrigues	Consultants: 7 Collaborators: 7 Courses: 26 Workshops: 49 Seminars: 119
II –PUBLIC AND STAKEHOLDER PARTICIPATION				
2.1 – Determination of Land Use in the Lower, Lower-middle and Upper São Francisco River Basin	Objectives: Determine the use and the occupation of the soil in the Upper, Lower-middle and Lower São Francisco as a basis for the actions of water resources management, preservation and environmental monitoring Products: • Final Report – Determination of the Land Use in the Lower, Lower-middle and Upper São Francisco River Basin • 7 Appendices • 1 Workshop** • 1 Seminar***	Federal: CODEVASF*	Coordinator: Rui Junqueira Consultants: Albano H. Araújo Jurema Ribeiro Carlos Alcebiades Carlos H. Saito Francisco Fernandes Ileana Mota Karla C. Rosa Mário J. Gonçalves Ricardo Marques Roberto Rodriguez Verner Riebold	Consultants: 11 Collaborators: 3
2.2.A – Partnership for the Improvement of Water Quality in the São Pedro Stream-MG	Improve the quality of the waters of São Pedro Stream, by means of involving the community in adopting corrective measures of soil management, besides treating the focal points of pollution associated with neighboring highways, agricultural, urban and industrial activities. Products: Final Report – Partnership for the Improvement of the Ribeirão São Pedro Water Quality • 10 Appendices • 66 Courses • 8 Meetings • 4 Seminars	Federal: EMBRAPA State: CEMIG; COPASA-MG; EMATER-MG; FEAM-MG; IGAM; IMA; INESP; PMMG; UEMG Municipal: CCRG; CMDR; São S. do Oeste Mayor's office NGO: CBHPA* Private: CAD; ECONSULT PEDOGEO; TRANZDUARTE	Coordinator: Regina Greco Consultants: Edwaldo A. Santana Joaquim A. Júnior José Roberto Possato Marcelo M. Pinto Roberto Rodrigues Vetor Reni de Souza	Consultants: 6 Collaborators: 210 Courses: 1826 Workshops: 146 Seminars: 595
2.2B – Recovering Our Forests	Objectives: Develop activities of conservation and environmental recuperation, by implementing riparian's woods, conservation practices of soils, participative environmental education, and the strengthening of the local organizations in the municipality of Luz –MG Products: Final Report	Federal: ME State: CEMIG; COPASA-MG; EMATER-MG; FASF; IMA Municipal: ADLUZ; CEPALUZ; Pref. Luz; SMMALUZ NGOs:	Coordinator: Francisco Soares Fernando Sasdelli Marília Q. Nogueira Bruno O. Miranda Dayvisson Paulinelli Emerson Macedo Márcia C. da Silva Vagno A. da Silva	Consultants: 7 Collaborators: 8 Courses: 204

	<p>– Community-Government Partnership and Society Participation as an Instrument for Reconstituting Riparian Woods and for Environmental Conservation</p> <p>• 17 Appendices</p> <p>• 12 Courses</p>	ASF*; SPRLUZ		
2.2C - Multitemporal Analysis of Riverbed Shape Alteration Dynamics in the Middle São Francisco-BA	<p>Objectives: Analyze the dynamics of the change of shape of the São Francisco Riverbed (Middle stretch) in the periods of 1946-1948, 2000-2001 and correlate them to the natural and anthropic changes of the physical medium occurred in the area.</p> <p>Products:</p> <p>• Final Report – Multitemporal Analysis of Riverbed Shape Alteration Dynamics in the Middle São Francisco-BA</p> <p>• 5 Appendices</p>	<p>Federal: CODEVASF*; CHESF; UFBA; UFS</p> <p>State: SRH-BA</p> <p>International: LAVAL</p>	<p>Coordinator: Rui Junqueira</p> <p>Consultants: Albano H. Araújo Francisco B. Rolim Jurema B. Ribeiro Karla C. Rosa</p>	<p>Consultants: 4</p> <p>Collaborators: 1</p>
2.4 - River Banks Erosion Process Evaluation Studies and its Effects in the River Sedimentation Dynamics-AL/SE	<p>Objectives: Identify the changes occurred in fluvial dynamics after the construction of the large dams and the causes, the agents and the principal processes acting on dynamics of erosion of the banks of the São Francisco River in its lower course.</p> <p>Products:</p> <p>• Final Report – River Banks Erosion Process Evaluation Studies and its Effects in the River Sedimentation Dynamics-AL/SE</p> <p>• 2 Appendices</p> <p>• 1 Seminar***</p>	<p>Federal: UFS*; CODEVASF; UFF; UFG</p> <p>State: FAPESE; SRH-SE; SEPLANTEC-SE</p>	<p>Coordinator: Luís Carlos Fontes</p> <p>Consultants: Francisco S. Holanda Ana Patrícia Casado Cícero dos Santos Edgardo Latrubesse Rivaldo dos Santos Sandra B. da Cunha</p>	<p>Consultants: 6</p> <p>Collaborators: 7</p>
III – DEVELOPMENT OF THE ORGANIZATIONAL STRUCTURE				
3.1 – Evaluation of Water Resources National Policy Instruments Implementation for the Maranhão River Pilot Basin-MG	<p>Objectives: Support the implementation of Federal Law nº 9,433/97, and of the corresponding state legislation and of the other instruments of water resource management foreseen in the legislation through the support of the Committee of the Basin of the Maranhão river-MG</p> <p>Products:</p> <p>• Final report – Feasibility Study for the Creation of a Water Agency in the Maranhão River Sub-Basin-MG</p> <p>• 3 Appendices</p> <p>• 2 Courses</p> <p>• 11 Meetings</p>	<p>State: IGAM*; FEAM-MG</p> <p>Municipal: CODEMA; COPASA Pref. Congonhas; Pref. Conselheiro Lafaiete; Pref. Ouro Branco</p> <p>Private: AÇOMINAS</p>	<p>Coordinator: Elisa Boechat</p> <p>Consultants: Antônio Leão Lanna Carlos Orsini Nunes Percival I. Souza</p>	<p>Consultants: 3</p> <p>Collaborators: 21</p> <p>Courses: 71</p> <p>Meetings: 300</p>
3.2 – Conjunctive Use of Surface and Groundwater in the Fêmeas River Basin-BA	<p>Objectives: Identify the hydrogeological characteristics of the water-bearing rivers and the hydrological characteristics of the principal bodies of water. Determination of hydrodynamic parameters for the utilization of simulation models. Study of relations between the surface and groundwater. Proposition of criteria for granting of rights to use the water.</p> <p>Products:</p> <p>• Final Report - Conjunctive Use of Surface and Groundwater in the Fêmeas River Basin-BA</p> <p>• 13 Appendices</p>	<p>Federal: UFBA; UFPB</p> <p>State: SRH-BA*</p> <p>Municipal: Luís E. Magalhães Mayor's office; São Desidério Mayor's Office</p> <p>NGO: AIBA</p> <p>Private: HIDROBASA; HIDROCON; HIDROLOG; MAUERBERG</p>	<p>Coordinator: Kátia Nascimento</p> <p>Consultants: Claudia Vieira Emanuel Barros Hans Dieter Schuster Heráclio Araújo Fernando Genz José P. dos Santos João Ilton de Oliveira Lúcia Tenório Oliver Lima Paulo Henrique Prates Rosane Aquino Zoltan Cavalcante</p>	<p>Consultants: 12</p> <p>Collaborators: 38</p>
3.3.A – Citizen Training for the Management of Basin Committees and Environmental Education	<p>Objectives: Form and implant Consumers' Councils for the participative management of dams; form multiplying agents for environmental education activities; qualify consumers for the multiple and rational use of dams; qualify farmers for the adequate recuperation and management of the soil.</p> <p>Products:</p> <p>• Final Report - Participative Management of Water Resources in the State of Pernambuco: The Jazigo Reservoir and the Pontal Creek Perennation Experiences</p> <p>• 4 Appendices</p> <p>• 2 Courses</p>	<p>Federal: CODEVASF</p> <p>State: SRH-PE*; EBAPE</p> <p>Municipal: Petrolina Maior's Office; Serra Talhada Maior's Office</p>	<p>Coordinator: Paulo Dutra</p> <p>Consultants: Marisa S. Figueiroa Déborah A. Trajano Fábio C. Aquino Janayna Farias Silva José Carlos Borba José Oto de Oliveira Jucélio M. de França Luiz C. de Oliveira Paulo F. Araújo</p>	<p>Consultants: 8</p> <p>Collaborators: 40</p> <p>Courses: 76</p>

3.3.B – Development of a Water Basin Integrated Management Plan for the Salitre River-BA	Objectives: Elaborate the Management Plan for the Salitre River Basin, by means of a participative process, as a pilot project to be applied to other basins of the São Francisco River. Products: • Final report – Development of a Water Basin Integrated Management Plan for the Salitre River-BA • 11 Appendices • 40 Meetings	Federal: UFBA*: ANA; CHESF; CNRH; CODEVASF; CPRM; EMBRAPA; FNMA; FNS; IBAMA; MIN; MMA; SRH-MMA State: CERB; CRA-BA; EBDA; EMBASA; FEP; SRH-BA; UEFS; UNEB Municipal: CDAR; Campo Formoso Mayor's Office; Jacobina Mayor's Office; Juazeiro Mayor's Office; Miguel Calmon Mayor's Office; Mirangaba Mayor's Office; Morro do Chapéu; Mayor's Office; Orolândia Mayor's Office; Umburanas Mayor's Office; Várzea Nova Mayor's Office.	Coordinators: Yvonilde Medeiros Consultants: Antônio M. da Silva Isabel Galo Martins Lenise C. B. Santos Maria E. dos Santos	Consultants: 25 Collaborators: 45 Courses: 102 Meetings: 730
3.4 – Support to the Creation of the Integrated Water Basin Committee 3.5 – Support to the Strengthening of the Integrated Water Basin Committee of the São Francisco Basin-AL/BA/MG/PE/SE	Objectives: Collaborate for the creation of the Committee of the São Francisco Basin and support its strengthening as an axis of development of the institutional structure of the São Francisco basin Products: • Final Report – The Process of Creation of the São Francisco River Basin Committee: Report and Evaluation of the Methodological, Normative e Contextual Aspects • 12 Appendices • 39 Plenary Meetings/Mobilization Meetings	Federal: ANA*; ANEEL; CBHSF; CHESF; CODEVASF; FUNAI; MIN; MMA; MME; MP; MTP State: ABESA; CASAL; CEMIG; COELBA; COPASA-MG; EMBASA; FEPE; FUNDIFRAN; IGAM; MEB; SAAE-AL; SAAE-BA; SAAE-MG; SEINFRA; SEMARH-MG; SEPLANTEC-BA; SEMARH-MG; SERHI-AL; SRH-GO; UFAL; UFBA; UFPE; UFS; UNEB; UNIT Municipal: ADESA; ADSQ; AEAP; AEDA; CPP; DIPCP; FUNEDI; FUTAG; SAAEB; SAAECAP; SAAEJ; SAAEPA; Mayor's Offices of: Carmo do Cajurú; Ibotirama; Itacarambi; Juazeiro; Luiz E. Magalhães; Pão de Açúcar; Piranhas; Pirapora; Poço Redondo; Porto da Folha; Salgueiro; Santa Maria da Boa Vista; São Roque de Minas; Sento Sé; Três Marias NGO's: ABIR; ABRH-PE; ACSSL; AMDA; AMPPRVI; APRSS; APS; ARFB; ASPAVARG; ATPPRBG; CBHRS; COPPABACS; CPBA; CPMG; DSCAS; FAEMG; FETAEMG; FIEMG; FPEMG; Biodiversitas Foundation; IMAN; Guaicuy Institute; MEST; OAB-MG; SAAE; SIGMNM; SINDIEXTRA; SRP; SSABSFCT; STC; STRPA; UAVS Private: AFA; AGOL; CNL; COOPADAP; COOPERC; CC; CCM; CMM; FV; IMNE; LIASA; VALÉE	Coordinator: Rodrigo Flecha Consultants: Rui Anastácio Silva Rosana Garjulli Flávia Barros José T. de Araújo Ana de Menezes Antônio Lima Maria G. Ogata Patrícia Souza Lima	Consultants: 7 Collaborators: 187 Committee of the São Francisco Basin: <i>Federal:</i> 6 <i>State:</i> 12 <i>Municipal:</i> 16 <i>Civilian Society:</i> 32 <i>Water users:</i> 47 Plenary Sessions and Meetings: 5726
IV - FORMULATION OF THE PROGRAM OF INTEGRATED MANGEMENT OF THE HYDROGRAPHIC BASIN				
4.1 – Promotion of Public Participation in the São Francisco River Basin	Objectives: Promote the people's participation in the management of water resources in the BHSF. Create a Web page of the Committee of the São Francisco Basin; production of an informative pamphlet about the São Francisco River; promote workshops and meetings Products: • 2 Final Reports: - Creation of a Webpage for the São Francisco River Basin Committee - VI Northeastern Regional Water Resources Symposium • 1 Informative pamphlet – 10.000 copies - The São Francisco River • 1 Vídeo/CD - 250 copies - The GEF São Francisco Project • 1 Folder – 5000 copies - The GEF São Francisco Project – Portuguese/English version	Federal: ANA*; ABRH; CODEVASF; PRO-ÁGUA; UFAL State: SERHI-AL Private: AGENCY5; TDA	Coordinator: José Luiz de Souza Consultants: Fernando Cordeiro Rui Junqueira Sandro Quadros Marcos Rebouças Wilde C. G. Júnior	Consultants: 4 Collaborators: 10 Workshop: 120 Symposium: 493

	<ul style="list-style-type: none"> • 1 Symposium - VI Regional Symposium of the Northeast on Water Resources - with 1 publication of Annals • 1 Web page – GEF São Francisco - http://www.ana.gov.br/gefsf 			
4.2 A- Evaluation of Economic Instruments for the Sustainable Management of Water Resources in the Sub-basin of the Verde Grande-MG/BA	Objectives: Evaluation of the financial mechanisms, principally the granting of and charging for water, sustainable management of the water resources of the Pilot Basin of the Verde Grande River Products: <ul style="list-style-type: none"> • Final Report – Evaluation of Economic Instruments for the Sustainable Management of Water Resources in the Sub-basin of the Verde Grande-MG/BA • 3 Appendices 	Federal: ANA*; CODEVASF; DNOCS; UFBA; UFV State: RURALMINAS; CETEC; DERBA; EMBASA; IGAM; INDI; SRH-BA; UFBA Municipal: COPASA Private: FAHMA	Coordinator: Devanir G. Santos Consultant: Guilherme E. Simão	Consultants: 8
4.2 B- Evaluation of Economic Instruments for the Sustainable Management of Water Resources in the São Francisco Basin	Objectives: Provide a detailed structure of the utilization of the economic instruments for the management of water resources, including proposals for the legislation and the strengthening of the administrative mechanisms necessary to implement these instruments. Products: <ul style="list-style-type: none"> • Final report – Proposal for the Supplementation of Water Use Charging in the São Francisco River Basin • 15 Appendices 	Federal: ANA*; CODEVASF; SRH/MMA; CHESF	Coordinator: Devanir G. Santos Consultant: Raimundo Garrido	Consultant: 1
4.3 – Quantification and Assessment of the Efficiency of Water Usage by Agriculture in the São Francisco River Basin	Objectives: Characterize the use of water by the agricultural sector and quantify its efficiency of utilization aiming to make the best use of water resources and increase its availability in the São Francisco basin Products: <ul style="list-style-type: none"> • Final Report – Quantification and Assessment of the Efficiency of Water Usage by Agriculture in the São Francisco River Basin • 13 Appendices 	Federal: UFV*; CODEVASF; EMBRAPA State: CEASA; IGAM; RURALMINAS; SEIBA; SIRBA; SRH-BA NGO: AIBA Private: CI; PL; VE	Coordinators: Márcio Mota Ramos Fernando F. Pruski Consultants: Alessandro Teixeira Cassiana S. Rocha Demetrius da Silva Gessionei Santana Lineu Neiva Luciano Novaes Nori Paulo Giebler Rafael de A. Ribeiro Rafael Ribeiro Sergio O. de Avellar Silvio Bueno Suely Silveira Wallisson Freitas	Consultants: 13 Collaborators: 5
4.4 - Subsidies for the Formulation of Operational Policies for the Great Reservoirs in the São Francisco River Basin	Objectives: Present alternatives of operational Modeling of the reservoirs of the São Francisco River, considering multiple uses for its water resources. Products: <ul style="list-style-type: none"> • Final Report – Subsidies for the Formulation of Operational Policies for the Great Reservoirs in the São Francisco River Basin • 3 Appendices 	Federal: ANA*; CHESF; ONS State: CEMIG	Coordinator: Marcos Freitas Consultants: João Eduardo Lopes João Luiz Brandão Mario T. de Barros	Consultants: 3
4.5A - Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone - DAB	Objectives: Identify and harmonize the initiatives of development in the São Francisco Basin and its coastal zone and promote the strategic and rational integration of these initiatives for the sustainable development of the region Products: <ul style="list-style-type: none"> • Final Report – Diagnostic Analysis of the São Francisco River Basin and its Coastal Zone - DAB • 8 Appendices 	Federal: ANA*; CODEVASF; IBAMA; MI; MMA; SRH-MMA State: SERHI-AL; SRH-BA; SRH-PE; SRH-SE; SEMARH-MG	Coordinator: José Luiz de Souza Consultants: Fernando Rodriguez Guilherme P. Holtz Arno Maschmann Rolando Gaal Vadas José Lins de A. Filho	Consultants: 5 Collaborators: 2
4.5B – Formulation of a Program of Integrated Management of the Basin and the Coastal Zone - SAP	Objectives: Formulation of the Strategic Action Plan for the Program of Integrated Management of the Basin of the São Francisco and of its Coastal Zone Products: <ul style="list-style-type: none"> • Final Report – Strategic Actions Program - SAP 	Federal: ANA*	Coordinator: João Lotufo Consultant: Carlos H. Aranha	Consultant: 1
4.6 – International Workshop on Marine Environmental Protection from Land Based Activities	Objectives: Inform, consult and involve the professionals in water resources and in other pertinent areas in the diagnosis and corrective means for the environmental problems related to the São Francisco River Basin Disseminate the experiences acquired in determining and implementing actions of	Federal: ANA*	Coordinator: José Luiz de Souza	

	water resource Management. Products: • Final Report - Public Participation Meetings for the PAE			
4.7A – Proposal for Complementation of the Hydrometeorologic Network in the São Francisco Basin	Objectives: Perfect the network for the collection of hydro-meteorological information, water quality and sediments of the São Francisco Basin through a diagnosis and proposal of complementation. Products: • Final Report - Diagnosis and Proposal for Complementation of the Hydrometeorologic Network in the São Francisco Basin • 12 Appendices	Federal: ANA*; CHESF; CODEVASF; CPRM; DNOCs; SUDENE; FURNAS; INMET; MA State: ADEMASE; CAESB; CASAL; CEAL; CEMIG; CERB; CETEC; COELBA; COPASA-MG; CPMA; CRA-BA; DHM-AL; DLFMA-DF; EBDA; EMATER-MG; EMBASA; ENERGEPIE; FEAM-MG; IC-BA; IEF-MG; IGAM; IMA; SEAGRI-BA; SEMAD-MG; SERHI-AL SEMARH-DF; SEMARH-PB; SRH-BA; SRH-PE; SEMARH-GO	Coordinators: Augusto Bragança Waldemar Guimarães Consultant: Christian A Govastki	Consultant: 1 Collaborators: 18
4.7B – Plan for a Piezometric Monitoring Network in the Basin of the Rio Verde Grande-MG	Objectives: Proposal of a network of piezometric monitoring for obtaining subsidies for more detailed knowledge of the availabilities of groundwater of the Verde Grande river basin. Products: • Final Report - Plan for a Piezometric Monitoring Network in the Basin of the Rio Verde Grande-MG • 1 Appendix	Federal: ANA*; CODEVASF; CPRM State: COPASA; CREDINOR; EMATER-MG; IGAM; SEMAD-MG Municipal: Mayor's offices: Capitão Enéas; Janaúba; Montes Claros NGO: ABANORTE Private: LEME	Coordinator: Fernando Dantas Consultant: Waldemir B. da Cruz	Consultant: 1 Collaborators: 24
4.7C – Meta-data Based Reference Information System	Objectives: Form a data bank with references about information and documents of the São Francisco Basin dispersed in diverse institutions of the Federal Government. Products: • Final Report – São Francisco River Basin Information Network - RISF • 4 Appendices • 6 Meetings • 1 Web page - http://risf.ana.gov.br	Federal: ANA*; ANEEL; CODEVASF; CPRM; IBAMA; INMET; SRH-MMA	Coordinators: Augusto Bragança Waldemar Guimarães Consultants: Luiz Bursztyn Francisca A. Neta	Consultants: 2 Collaborators: 40 Meetings: 28
4.7.D – Water Resources Projects Information System	Objectives: Elaborate a System of Management Information to accompany water resources projects financed by GEF Products: Final Report – Development and Implementation of the GEF Projects's Information Management System 1 System of Management Information	Federal: ANA* Private: IKHON	Coordinator: A. Félix Domingues Consultants: Alexandre M. Braga Fabiano Carvalho	Consultants: 2
TOTAL				
28 Activities 210 Events	Institutions: 41 Federal 66 State 67 Municipal	60 NGOs 43 Private 7 International	Consultants: 190 Collaborators: 1248 Participants: 11,503	

* Institution executing; ** Realized along with Activities 1.1A, 1.1B e 2.1

*** Realized along with Activities 1.1A, 1.1B, 1.3, 2.1 e 2.4

APPENDIX 2. DIRECTION AND COORDINATION OF THE GEF SÃO FRANCISCO PROJECT

Brazilian National Water Agency – ANA (Agência Nacional de Águas)

<http://www.ana.gov.br>

Jerson Kelman

Director-President of ANA

SPS, Área 5, Quadra 3, Bloco B
70.610-200, Brasília, DF, Brasil
Tel: (55-61) 445.5441
Fax: (55-61) 445.5404
E-mail: kelman@ana.gov.br

Benedito Braga

Director of ANA

SPS, Área 5, Quadra 3, Bloco B
70.610-200, Brasília, DF, Brasil
Tel: (55-61) 445.5431
Fax: (55-61) 445.5415
E-mail: benbraga@ana.gov.br

Antônio Félix Domingues

Superintendent of Water and Soil Conservations - ANA National Director of the GEF São Francisco Project

SPS, Área 5, Quadra 3, Bloco L
70.610-200, Brasília, DF, Brasil
Tel: (55-61) 445.5212
Fax: (61) 445.5354
E-mail: felix@ana.gov.br

José Luiz de Souza

Technical Coordinator of the GEF São Francisco Project

SPS, Área 5, Quadra 3, Bloco L
70.619-200, Brasília, DF, Brasil
Tel: (55-61) 445.5291
Fax: (55-61) 445.5354
E-mail: jls.gef@ana.gov.br

Devanir Garcia dos Santos

Manager of the Superintendency of Water and Soil Conservations - ANA

SPS, Área 5, Quadra 3, Bloco L
70.610-200, Brasília, DF, Brasil
Tel: (55-61) 445.5212
Fax: (55-61) 445.5354
E-mail: devanir@ana.gov.br

Brazilian Agency of Cooperation of the Ministry of International Relations – ABC/MRE (Agência Brasileira de Cooperação do Ministério das Relações Exteriores)

<http://www.abc.mre.gov.br/>

Cecília Malagutti de Souza

Manager of Multilateral Technical Cooperation - ABC/MME (Cooperação Técnica Multilateral Recebida)

Palácio do Itamaraty, Anexo 1, 8º Andar

70.170-900, Brasília, DF, Brasil

Tel: (55-61) 411.6883

Fax: (55-61) 411.6894

E-mail: csouza@abc.mre.gov.br

Global Environment Facility - GEF

<http://www.gefweb.org>

Alfred Duda

Senior Advisor

GEF International Waters

1818 H Street NW

Washington DC, 20433, USA

(1-202) 458-8198/473-1077

(1-202) 522-3240

E-mail: aduda@worldbank.org

Andrea Merla

Program Manager

GEF International Waters

1818 H Street NW

Washington DC, 20433, USA

(1-202) 458-8198

(1-202) 522-3240

E-mail: amerla@worldbank.org

PNUMA – Programa das Nações Unidas para o Meio Ambiente

<http://www.unep.org/>

Isabelle Van Der Beck

Task Manager Projetos GEF/UNEP

P.O. Box 30552

Nairobi, Kenya

Tel.: (254-2) 62-4339.4028

Fax.: (254-2) 62-2798.3943

E-mail: isabelle.vanderbeck@unep.org

Organization of the American States - OAS

<http://www.oas.org>

Jorge Rucks

Chief of the Geographic Area II, South America

Technical Project Unit – USDE/OAS

Junin, 1940 P. B.

1113, Buenos Aires, Argentina

Tel: (54-11) 4803.7606

Fax: (54-11) 4801.6092
E-mail: oea@oea.com.ar

Nelson da Franca Ribeiros dos Anjos

International Coordinator of GEF Projects in Brazil
Principal Specialist in Water Resources - USDE/OAS
SGAN Quadra 601, Lote. 01, Ed. Codevasf, Sala 213
70.830-010, Brasília, DF, Brasil
Tel: (55-61) 322.7895; (55-61) 224.2861
Fax.: (55-61) 224.6902
E-mail: nelsonf@codevasf.gov.br

Maria Apostolova

Specialist of the Unit of Sustainable Development and Environment
Oficina Nacional de la OEA en México
Presidente Masaryk, no 526, piso 1, Edificio SEP, colonia Polanco, 11560, México-DF
Tel: (5255) 5280-1208
E-mail: mstesanova@prodigy.net.mx

DIAGNOSTIC ANALYSIS OF THE SÃO FRANCISCO RIVER BASIN AND ITS COASTAL ZONE - DAB

SUMMARY

INTRODUCTION

1. CHARACTERISTICS AND ANTECEDENTS OF THE DAB

- 1.1. Characteristics of the DAB
- 1.2. Available Information
- 1.3. Activities of the GEF São Francisco Project

2. THE SÃO FRANCISCO RIVER BASIN AND THE NEW PHYSIOGRAPHIC DIVISION

- 2.1. The São Francisco river basin
- 2.2. The new physiographic division

3. MAIN USES, PROBLEMS AND CONFLICTS RELATED TO WATER RESOURCES IN THE BASIN

- 3.1. Main uses of water
- 3.2. Problems and conflicts related to water resources and environmental interactions

4. CRITICAL PROBLEMS AND PRIORITY ACTIONS IDENTIFIED IN THE EXECUTION OF THE GEF SÃO FRANCISCO PROJECT

- 4.1. Definition and objective of the Causal Chain
- 4.2. Critical problems and priority actions
 - 4.2.1. Lack of institutional articulation
 - 4.2.2. Conflict in the use of water
 - 4.2.3. Insufficiency of water for multiple uses
 - 4.2.4. Degrading modification of the aquatic ecosystem
 - 4.2.5. Sources of point and diffuse pollution
 - 4.2.6. Modification of the use and inadequate occupation of the soil
 - 4.2.7. Disorderly Exploitation of groundwater, dissociated from the surface water
 - 4.2.8. Restrictions for navigation

5. INSTITUCIONAL AND LEGAL FRAMEWORK

- 5.1. Institutional framework
 - 5.1.1. Federal area
 - 5.1.2. Federated units area
 - 5.1.3. Municipal area
 - 5.1.4. New institutional actors with activities in the Basin
- 5.2. The legal aspect
 - 5.2.1. Management of water resources
 - 5.2.2. Environmental management
 - 5.2.3. Users of water resources
 - 5.2.4. State laws of water resources

6. EXISTING AND PROGRAMMED PROJECTS IN THE BASIN AND THEIR RELATIONSHIP TO THE CRITICAL THEMES IDENTIFIED

- 6.1. Existing projects

- 6.1.1. Federal area
- 6.1.2. State area
- 6.1.3. Area of Non-Governmental Organizations and private entities
- 6.2. Projects programmed or in the process of being programmed
 - 6.2.1. Federal area
 - 6.2.2. State area

7. PROJECTS IDENTIFIED PRELIMINARILY AS PRIORITIES FOR IMPLEMENTING ACTIONS DEFINED IN THE ANALYSIS OF THE CAUSAL CHAIN

- 7.1. Lack of institutional articulation
 - 7.1.1. Strengthening of the São Francisco River Basin Committee, aiming at implementing the instruments of water resources management foreseen in the current legislation in effect, efficiently and efficaciously, including the creation of the Basins Agency. Qualification of the related institutions, managers of water resources of different levels
 - 7.1.2. Public participation of the users and stakeholders as a legitimate means for society to integrate itself in the decision-making process with a view to sustainable use of water resources of the Basin.
- 7.2. Conflicts in the use of water
 - 7.2.1. Development and implantation of models of planning and operation of the system of reservoirs of the São Francisco River Basin, regarding the multiple uses of water
 - 7.2.2. Actions for the regularization of main tributaries of the Middle São Francisco and the construction of the Pão de Açúcar Reservoir downstream from the Xingó, including the evaluation of artificial flooding in the Lower São Francisco.
- 7.3. Insufficiency of water for multiple uses
 - 7.3.1. Promote the efficient use of water for irrigation in the São Francisco Basin
 - 7.3.2. Initiatives to conserve water and soil and to recompose vegetation including the establishment of protected areas, especially in water recharge zones
- 7.4. Degrading Modification of the aquatic ecosystem
 - 7.4.1. Development of fish-farming in the Basin according to the peculiarities of its physiographic regions, including the marginal lagoons to assure economic opportunities for the São Franciscan population, with the ichthiofauna as an indicator of sustainability
 - 7.4.2. Create adequate infrastructure and adopt water and soil management technologies to yield opportunities for economic and ecological uses of water resources.
- 7.5. Sources of point and diffuse pollution
 - 7.5.1. Development of low-cost models of point and diffuse pollution control according to the physiographic characteristics of the Basin.
 - 7.5.2. Environmental information and education program making the population conscious of the risks and pollution hazards and consequential need to conserve and preserve water resources.
- 7.6. Modification of use and inadequate occupation of the soil
 - 7.6.1. Conclusion of the determination of land use in the Upper and Middle São Francisco, covering, thus, all the Hydrographic Basin.
 - 7.6.2. Identification and prioritizing of degraded areas, or in the process of degradation, for proper orientation, aiming adequate soil and water use.

- 7.6.3. Utilization of adequate technologies, yielding a regional use of water and soil, and search for energy alternatives to minimize the pressure on the natural vegetation.
- 7.7. Disorderly Exploitation of groundwater dissociated from the surface water
 - 7.7.1. Recuperation and amplification of the hydro-meteorological network, including monitoring of surface and groundwater
 - 7.7.2. Divulcation and clarification of objectives and the importance of monitoring and of an effective control of extracted flows, aiming the sustainability of groundwater resources
- 7.8. Restrictions for navigation
 - 7.8.1. Revitalization of navigation in the São Francisco River and navigable tributaries, including the involvement of private initiative.

8. ACTIONS PROPOSED FOR THE STRATEGIC ACTION PROGRAM FOR THE INTEGRATED MANAGEMENT OF THE SÃO FRANCISCO RIVER BASIN AND ITS COASTAL ZONE

9. MAIN BIBLIOGRAPHIC REFERENCES

- 9.1. Reports of ANA/GEF/UNEP/OAS
- 9.2. Water Resources Plans
- 9.3. Other references

10. ACTORS

- 10.1. Governmental and non-governmental organisms involved in the GEF São Francisco Project
- 10.2. Direction and Coordination of the GEF São Francisco Project

LIST OF CHARTS

- 1. Institutions and personnel involved in the GEF São Francisco Project by Activity
- 2. Area, population and number of municipalities, by federal unit, in the São Francisco river basin
- 3. Physical, natural and socio-economic characteristics of the São Francisco Basin by physiographic region
- 4. Demand by type of water use in the São Francisco Basin in m³/s
- 5. Availability and demand for water resources in the São Francisco Basin by physiographic region.
- 6. Main electric energy generating enterprises in the São Francisco Basin
- 7. Financial compensation of the Electricity sector in 2002, in the São Francisco Basin
- 8. Institutional arrangement in the Federal area and of the federated units in the São Francisco Basin
- 9. Water resources management – legal aspects
- 10. Environmental Management – legal aspects
- 11. Users of water resources – legal aspects
- 12. State laws on water resources
- 13. Existing projects in the Basin and their relationship with the critical themes identified
- 14. Main existing and programmed projects in the Basin and their relation with the critical problems identified
- 15. Actions proposed for the Strategic Action Program for the Integrated Management of the São Francisco River Basin and its Coastal Zone – PAE

LIST OF FIGURES

1. Location of the São Francisco River Basin
2. Location of the Activities of the GEF São Francisco
3. Region of the Spring of the São Francisco River
4. Physiographic Regions – Limits in 1967
5. Physiographic Regions – New Limits 2003
6. Delimitation of the Municipalities inserted in the São Francisco River Basin
7. Hypsometry
8. Climate and pluviometric precipitation
9. Pluviometric and fluviometric network in 2003
10. Monthly average precipitations and flow rate
11. Annual total sunshine
12. Annual average potential evapo-transpiration
13. Main sub-basins
14. Main permanent tributaries
15. Quality of water by class
16. Vegetation
17. Soils - Consolidated map
18. Use and occupation of soils
19. Current erosion
20. Potential erosion
21. Risk of water degradation
22. Main rivers with water
23. Intermodal trunk
24. Bus and railroad stations
25. Mineral reserves
26. Main existing and programmed dams
27. Irrigated areas
28. Areas irrigated by State
29. Irrigation projects
30. Potential of lands for irrigation
31. Classes of lands for irrigation
32. Risk of salinization
33. Agro-industrial poles
34. Integrated development poles
35. Index of Human Development 2000
36. Americo Vespúcio Expedition 2001
37. Distribution of demands in the São Francisco River Basin by physiographic region
38. Structure of the Causal Chain
39. Logic Matrix – Critical Problems x Activities of the GEF São Francisco
40. Causal Chain – Lack of institutional articulation
41. Causal Chain – Conflict of water use
42. Causal Chain – Insufficiency of water for multiple uses
43. Causal Chain – Degrading Modification of the aquatic ecosystem
44. Causal Chain – Source of point and diffuse pollution
45. Causal Chain – Modifications in the use and inadequate occupation of the soil
46. Causal Chain – Disorderly exploitation of groundwater, dissociated from the surface water
47. Causal Chain – Restrictions for navigation