

**BRAZIL**  
**GUAÍBA WATERSHED ENVIRONMENTAL MANAGEMENT PROGRAM**  
**(BR-0073)**

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#### TECHNICAL INFORMATION AVAILABLE IN THE PROJECT FILES

- Relative population and density by region, state of Rio Grande do Sul
- The Guaíba watershed and its subbasins
- Description of the rural area of the subbasins
- Description of microwatersheds
- Typical latosol and lithosol properties
- Description of conservation units
- Coverage of water and sewerage services
- Results of physical, chemical, and bacteriological analyses of water quality in the Guaíba watershed
- Summary of SEMA and COSAMA classification of the Guaíba River and its main tributaries
- Predictive water quality model
- Cachoeirinha and Gravataí sanitary sewerage system. Technical features of the projects
- Porto Alegre sanitary sewerage systems: São João-Navegantes system. Technical features of the project
- Porto Alegre sanitary sewerage systems: Southern zone system. Technical features of the project
- Action plan for control of industrial pollution. Basic proposal. FEPAM
- Basic action plan for solid waste management in Porto Alegre
- Master plan for solid waste management in the Porto Alegre metropolitan region. Basic terms of reference. METROPLAN
- Environmental monitoring system for the Guaíba watershed. FEPAM, CORSAN, DMAE
- Planning of priority microwatersheds
- Microwatershed prioritization criteria
- Reafforestation activities

- Soil management and control of toxic farm chemicals. Targets and investments
- Soil management and control of toxic farm chemicals. Investment timetable
- Integration of beneficiaries and anticipated adoption rates for new practices
- Conservation units
- Nonformal environmental education program
- Formal and nonformal environmental education activities - Summary table
- Geographic information system
- Human resources training. Summary of activities
- Terms of reference for preparation of the master plan for environmental monitoring and management of the Guaíba watershed
- Basic investment costs by component and executing agency
- Terms of reference for consultants for management of phase I of the program
- Organization chart for program execution
- Regulations of the Permanent Revolving Fund
- Status of preparation of projects
- Investment timetable
- Analysis of the budget of the State of Rio Grande do Sul
- CORSAN. Financial analysis
- CORSAN. Operating data
- DMAE. Operating data
- Institutional analysis of FEPAM, FZB, EMATER, SAA and SE
- State of Rio Grande do Sul. Basis for income and expenditure projections
- CORSAN. Basis for financial projections
- DMAE. Basis for financial projections
- Economic analysis tables

# ABBREVIATIONS

BANRISUL	Banco do Estado do Rio Grande do Sul [Bank of the State of Rio Grande do Sul]
CEA/SE	Environmental Education Committee of the Education Secretariat
CEEE	Companhia Estadual de Energia Elétrica [State Electric Power Company]
CEF	Caixa Econômica Federal [Federal Savings Bank]
CONAMA	Conselho Nacional do Meio Ambiente [National Environmental Council]
CORSAN	Companhia Rio-Grandense de Saneamento [Rio Grande Sanitation Company]
DEP	Municipal Department of Storm Sewers
DEPRC	State Department of Ports, Rivers and Canals
DMAE	Municipal Department of Water and Sewerage
DMLU	Municipal Department of Urban Sanitation
DNAEE	National Department of Water Supply and Electric Power
DNMET	National Meteorology Department
DRNR	National Department of Renewable Natural Resources
EMATER/RS	Associação Rio-Grandense de Empreendimentos de Assistência Técnica [Rio Grande Association for Technical Assistance]
FAE	Fundo de Água e Esgotos [Water Supply and Sewerage Fund]
FDRH	Fundação para o Desenvolvimento de Recursos Humanos [Foundation for Human Resources Development]
FEPAM	Fundação Estadual de Proteção Ambiental [State Environmental Protection Foundation]
FSO	Fund for Special Operations
FZB	Fundação Zoobotânica
IBAMA	Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis [Brazilian Environmental and Renewable Natural Resources Administration]
ICMS	Goods and services (sales) tax
IPAGRO	Instituto de Pesquisas Agronômicas [Agricultural Research Institute]
METROPLAN	Fundação Metropolitana de Planejamento [Metropolitan Planning Foundation]
NGO	Nongovernmental organization
OC	Ordinary capital
PAI	Immediate Action Program
PNMA	National Environmental Program
RIMA	Environmental impact statement
RS	Rio Grande do Sul
SAA	Secretariat of Agriculture and Provisioning
SE	Education Secretariat
SIGPROGB	Pró-Guaíba Geographical Information System
SPA	Secretariat of Planning and Administration
UC	Conservation unit

# BRAZIL

Basic Socio-Economic Data  
Statistics and Quantitative Analysis  
Economic and Social Development Department

## Executive Summary

### Social Statistics

Land Area (Km2)	1992	8,456,508
Population (Thousands)	1992	154,105
Population (Average Annual Growth Rate)	1983-1992	2.0
Rural (Percent)	1992	22.7
Density (Population per Km2)	1992	18.2
Vital Statistics		
Crude Birth (Rate per 1,000 Population)	1991	24.0
Infant Mortality (Rate per 1,000 Live Births)	1991	58.0
Crude Death (Rate per 1,000 Population)	1991	7.5
Life Expectancy at Birth (Years)	1991	66.0
Illiteracy (Percent)	1990	18.9
Primary School Enrollment Ratio	1990	108.0

### Economic Statistics

Market Exchange Rate (Cruzeiros/US\$)	5-1993	37,040.3
GDP per Capita (Average Annual Growth Rate)	1983-1992	-0.1
Labor Force (Thousands)	1990	55,026
Unemployment Rate (Percent)	1992	5.9
Consumer Prices (Twelve Month Variation)	4-1993	1,423.1
NF Public Sector Operational Balance (% of GDP)	1991	-1.3
Domestic Credit (% of GDP)	1992	21.1
Balance of Payments (Millions of US\$)		
Current Account Balance	1992	6,300
Trade Balance	1992	15,700
Capital Account Balance	1992	8,800
Change in Reserves (- Increase)	1992	-15,100
Total External Debt (Millions of US\$)	1992	120,679
Total Debt Service (Millions of US\$)	1992	10,300
Debt to GDP Ratio (Percent)	1992	35.0
Debt Service Ratio (Percent)	1992	25.1

16 August 1993

# BRAZIL

## Basic Socio-Economic Data

### 1. Exchange Rates

#### Cruzeiros/US\$, End of Period Index 1980 = 100

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Market Rate	0.0	0.0	0.0	0.0	0.1	0.8	11.4	177.1	1068.8	12387.5
Real Effective Index	130.1	134.6	138.6	147.8	147.7	136.9	109.8	93.5	116.5	129.8

### 2. Prices

#### Average Annual Growth Rates in Percent

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Consumer Price Index	142.0	196.7	226.9	145.3	229.7	682.3	1287.0	2938.0	440.8	1000.0
Wholesale Price Index	200.0	233.3	233.3	140.3	206.9	697.1	1284.1	2710.0	401.1	...

### 3. International Liquidity

#### Millions of US\$

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Reserves	4562	11996	11609	6761	7458	8116	8729	9176	8764	23268
Reserves minus Gold	4355	11508	10605	5803	6299	6972	7535	7441	8033	22521
Special Drawing Rights (SDRs)	0	1	1	0	0	0	...	11	13	1
Reserve Position in the IMF	...	...	...	...	...	...	...	...	...	...
Foreign Exchange	4355	11507	10604	5803	6299	6971	7535	7430	8020	22520
Gold (National Valuation)	207	488	1004	958	1159	1144	1194	1735	731	747

### 4. National Accounts

#### Millions of 1988 US\$ 1988 US\$

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Gross Domestic Product	267318	281184	302978	326788	337755	337301	348050	332791	335283	331534
GDP Per Capita	2058	2118	2235	2362	2394	2346	2377	2233	2212	2151

#### Annual Growth Rates in Percent - Constant Prices

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
GDP Per Capita	-5.6	3.0	5.7	5.5	1.6	-2.0	1.4	-6.1	-0.8	-2.5
GDP by Type of Expenditure (MP)	-3.5	5.2	7.9	7.6	3.6	-0.1	3.3	-4.4	0.9	-0.9
Consumption	-2.9	2.2	2.8	12.5	1.7	-1.4	4.0	-1.9	2.0	-2.3
Gross Domestic Investment	-22.6	3.7	31.1	9.6	-1.3	-4.8	1.2	-8.1	-4.1	-0.7
Exports of Goods and Services	14.3	22.0	7.0	-10.6	19.2	13.1	5.1	-4.9	6.6	5.2
Imports of Goods and Services	-17.4	-2.9	0.0	28.7	-2.9	-1.1	8.9	10.1	10.1	-1.6
GDP by Sector of Origin (FC)										
Agriculture, Forestry and Fishing	-0.6	3.3	10.0	-8.0	15.0	0.8	2.9	-3.7	2.5	6.0
Mining and Quarrying	15.9	30.7	11.5	3.6	-0.9	0.4	3.9	2.9	0.3	-4.1
Manufacturing	-5.8	6.2	8.3	11.3	0.9	-3.4	2.9	-9.5	-0.5	-0.3
Electricity, Gas and Water	7.5	12.4	10.0	8.5	3.2	5.9	1.6	1.8	4.3	1.9
Construction	-13.9	0.8	6.0	18.5	1.0	-2.8	3.2	-8.4	-4.0	-4.4
Wholesale and Retail Trade	-3.9	3.9	7.4	7.8	2.6	-2.6	3.1	-6.4	1.4	-3.2
Transport and Communications	1.0	6.7	9.8	13.8	6.0	6.4	8.7	1.6	6.5	3.2
Financial Services	5.6	7.7	10.0	-1.8	-4.7	0.3	1.3	-3.1	-8.0	-4.6
Government	2.0	1.9	1.9	2.0	1.9	1.9	2.0	1.9	1.9	1.9
Other Services	-55.9	-27.4	-33.0	371.8	62.1	14.0	9.0	6.4	27.6	-9.5



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## Basic Socio-Economic Data

### 4. National Accounts (cont.)

#### Composition in Percent - Current Prices

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
<b>GDP by Type of Expenditure (MP)</b>										
Consumption	80.4	77.7	75.7	78.5	74.5	72.1	72.0	76.8	79.1	...
Gross Domestic Investment	17.2	16.5	19.1	19.1	22.2	22.7	24.8	21.5	18.9	...
Exports of Goods and Services	11.7	14.2	12.2	8.8	9.4	10.9	8.2	7.2	8.5	...
Imports of Goods and Services	9.3	8.3	7.1	6.3	6.2	5.7	5.0	5.5	6.5	...
<b>GDP by Sector of Origin (FC)</b>										
Agriculture, Forestry and Fishing	11.9	12.9	11.8	11.5	10.3	10.5	8.9	10.4	10.8	...
Mining and Quarrying	1.9	3.0	3.2	2.7	2.2	1.9	1.6	1.6	1.7	...
Manufacturing	31.6	31.8	33.6	32.9	31.8	31.0	29.6	26.3	25.0	...
Electricity, Gas and Water	2.2	2.4	2.3	2.3	3.3	2.8	2.4	2.8	3.6	...
Construction	6.6	6.2	6.0	7.1	8.4	8.0	9.2	7.8	7.1	...
Wholesale and Retail Trade	10.1	9.4	9.1	8.7	8.0	8.1	7.8	7.3	7.1	...
Transport and Communications	5.8	5.6	5.3	5.1	5.2	5.4	5.5	5.5	5.5	...
Financial Services	9.9	10.2	9.3	10.0	10.6	11.4	11.7	14.2	15.8	...
Government	7.6	6.5	7.6	8.2	8.6	8.7	10.6	11.8	9.9	...
Other Services	12.2	11.9	11.7	11.7	11.5	12.2	12.8	12.2	13.6	...

### 5. Non-Financial Public Sector

#### As a Percent of GDP

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Borrowing Requirements	-21.7	-24.2	-28.5	-11.2	-32.2	-52.8	-82.7	-29.3	-25.8	...
Operational Balance (- Deficit)	-4.4	-2.7	-4.4	-3.6	-5.7	-4.8	-6.8	1.3	-1.3	...

### 6. Monetary Survey

#### As a Percent of GDP

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Domestic Credit	40.3	33.9	31.9	33.3	31.3	22.6	13.7	22.5	20.4	21.1
Public Sector	10.5	9.2	9.3	9.4	9.9	6.4	3.9	7.0	6.4	6.0
Private Sector	29.8	24.7	22.6	23.9	21.4	16.2	9.8	15.6	14.0	15.1
Money (M1)	5.1	3.5	3.2	9.1	4.1	2.1	1.2	3.7	2.7	1.4

### 7. External Trade

#### Direction in Percent Index 1980 = 100

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
<b>Exports of Goods (fob)</b>										
Developed Countries	63.3	64.3	64.4	66.7	65.9	65.2	67.9	68.0	63.4	58.7
Developing Countries	36.7	35.7	35.6	33.3	34.1	34.8	32.1	32.0	36.6	41.3
Latin America	10.3	11.3	9.6	12.3	12.3	11.9	11.8	11.3	16.5	22.2
<b>Imports of Goods (cif)</b>										
Developed Countries	38.4	39.8	45.3	59.2	56.0	57.5	55.8	54.9	59.3	60.2
Developing Countries	61.6	60.2	54.7	40.8	44.0	42.5	44.2	45.1	40.7	39.8
Latin America	14.4	15.6	12.3	13.1	12.1	12.8	18.3	17.1	18.0	16.5
Terms of Trade Index	77.9	85.8	83.5	97.9	87.1	96.8	88.9	83.8	91.7	90.0

# BRAZIL

## Basic Socio-Economic Data

### 7. External Trade (cont.)

	Composition in Percent									
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Exports of Goods (fob)										
All Food	40.9	39.2	37.2	34.7	32.5	29.6	27.5	28.0	25.0	...
Agricultural Raw Materials	4.1	3.1	2.6	2.8	3.6	3.4	3.5	3.5	3.5	...
Fuels	5.4	6.8	6.4	3.2	3.6	2.7	2.5	2.2	1.5	...
Ores and Metals	17.4	17.2	18.1	19.8	17.9	23.3	25.1	25.3	27.7	...
Manufactured Goods	32.3	33.7	35.7	39.5	42.3	41.0	41.4	41.0	42.3	...
Chemicals	5.8	6.4	6.6	5.7	6.2	6.5	6.0	6.4	6.4	...
Machinery and Transport Equipment	14.0	12.6	15.4	17.4	20.5	19.0	20.1	18.7	18.8	...
Other Manufactured Goods	12.5	14.6	13.7	16.4	15.7	15.5	15.3	15.9	17.1	...
Imports of Goods (cif)										
Capital Goods	12.2	9.6	11.2	13.9	16.0	17.6	15.6	17.6	...	...
Consumption Goods	4.1	3.0	4.2	11.8	6.7	5.1	10.4	11.4	...	...
Intermediate Goods	83.4	87.2	84.3	74.0	77.3	77.2	73.9	70.7	...	...
Fuels	...	...	...	...	...	...	...	...	...	...
Other	0.4	0.3	0.3	0.2	0.1	...	0.1	0.3	...	...

### 8. Balance of Payments

	Millions of US\$									
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Current Account Balance	-6837	42	-273	-5304	-1450	4159	1025	-3788	-1408	6300
Trade Balance	6469	13086	12466	8304	11158	19168	16112	10747	10578	15700
Exports of Goods (fob)	21898	27002	25634	22348	26210	33773	34375	31408	31619	36200
Imports of Goods (fob)	15429	13916	13168	14044	15052	14605	18263	20661	21041	20500
Service Balance	-13414	-13215	-12894	-13695	-12678	-15103	-15331	-15369	-13542	-11400
Freight and Insurance	403	453	514	34	152	235	143	-50	-156	-250
Travel	-392	-153	-375	-509	-184	-588	474	-122	-212	-50
Investment Income	-11008	-11470	-11192	-11127	-10319	-12084	-12547	-11613	-9652	-9135
Other Services	-1109	-832	-972	-1219	-1357	-1369	-1766	-1944	-1965	-1965
Unrequited Transfers	108	171	155	87	70	94	244	834	1556	2000
Private	106	161	139	89	113	107	226	813	...	...
Official	2	10	16	-2	-43	-13	18	21	...	...
Capital Account Balance	5532	4928	292	2006	4417	-1621	1495	5330	753	8800
Non-Monetary Sector	7760	5331	3528	4960	6194	493	4201	8317	3724	11700
Private Sector	-126	-4010	-2393	-4233	-6840	-6482	-3887	1047	3598	12600
Direct Investment	1373	1556	1267	177	1087	2794	744	236	-42	...
Portfolio Investment	-286	-272	-237	-450	-428	-498	-421	575	3808	...
Other Long-Term	-848	-1391	-2421	-4135	-7471	-7272	-3670	-232	-1077	...
Other Short-Term	-365	-3903	-1002	175	-28	-1506	-540	468	909	...
Government Sector	7886	9341	5921	9193	13034	6975	8088	7270	126	-900
Long-Term	9274	11283	6325	8818	7995	7947	2737	-3584	-3416	...
Short-Term	-1388	-1942	-404	375	5039	-972	5351	10854	3542	...
Monetary Sector	-2228	-403	-3236	-2954	-1777	-2114	-2706	-2987	-2971	-2900
Long-Term	-1519	-1404	-2643	-3647	-2178	-2520	-2415	-1354	...	...
Short-Term	-709	1001	-593	693	401	406	-291	-1633	-2355	...
Change in Reserves (- Increase)	1891	-5369	511	3232	-2165	-1711	-1701	-1246	-221	-15100
Errors and Omissions	-586	399	-530	66	-802	-827	-819	-296	876	...

**BRAZIL**  
Basic Socio-Economic Data

**9. External Debt**

	Millions of US\$ Ratios in Percent									
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Debt	98367	105424	106147	113735	123864	115726	111378	116417	116514	120679
Long-Term Debt	81368	90113	91915	99550	106227	101477	90375	90431	95129	97898
Public and Publicly Guaranteed	59856	70809	74738	84909	91793	89963	84368	83760	87476	90070
Bilateral	5021	6859	8176	10542	12867	13028	13354	15469	14779	14761
Multilateral	5122	5622	7358	10027	12311	11413	11088	11386	11068	10343
Bond Holders	2231	1698	1816	1787	1516	1546	2183	2339	9150	11330
Banks	41199	50750	50107	54000	55839	55833	49949	46185	44041	45201
Suppliers	2636	2590	3117	3614	3684	3028	2605	2585	2745	2699
Other Creditors	3647	3290	4164	4939	5576	5115	5189	5796	5693	5736
Private Non-Guaranteed	21512	19304	17177	14641	14434	11514	6007	6671	7653	7828
Use of IMF Credit	2644	4185	4619	4501	3976	3333	2422	1821	1238	1045
Short-Term Debt	14355	11126	9613	9684	13661	10916	18581	24165	20147	21736
Interest Arrears on Debt	151	178	344	398	3431	593	3755	9240	4352	5673
Total Debt Service	13416	13989	11309	11809	12043	17740	13425	8041	10754	10300
Public and Publicly Guaranteed	7528	8026	7042	7568	7889	13059	8752	5577	7603	7306
Bilateral	769	919	684	1122	955	591	1321	1079	1532	1910
Multilateral	708	890	1084	1522	1980	2132	1911	2494	2451	2577
Private Non-Guaranteed	4224	4137	2427	2172	1860	2225	2504	1468	1090	1436
IMF Repurchases and Charges	68	204	402	978	1455	1179	1069	996	717	493
Short-Term Debt (Interest only)	1596	1622	1438	1091	839	1277	1100	0	1344	1065
Debt to GDP Ratio	43	43	37	36	36	34	31	37	34	35
Debt Service Ratio	55	46	39	47	42	48	35	22	30	25

... Not Available

0.0 Indicates that the amount is nil or negligible

# **BRAZIL**

## **Basic Socio-Economic Data**

### **Sources and Notes**

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#### **Executive Summary**

##### **Social Statistics:**

Land Area: Organization of American States (OAS), América en Cifras 1974.

Population: IDB estimates based on data from Latin America Demographic Center (CELADE) and United Nations Population Division.

##### **Vital Statistics:**

World Bank, Social Indicators of Development - 1993 Edition and Economic Commission for Latin America and the Caribbean (ECLAC), Statistical Yearbook - 1992 Edition.

##### **Economic Statistics:**

Labor Force: World Bank, Social Indicators of Development - 1993 Edition.

Unemployment: Programa Regional del Empleo para América Latina y El Caribe (PREALC).

#### **1. Exchange Rates:**

International Monetary Fund (IMF), International Financial Statistics (IFS).

Real Effective Index: IDB estimates based on data from the IMF.

#### **2. Prices:**

IMF, IFS. Annual figures are expressed as average annual growth rates; monthly figures as a twelve month variation.

#### **3. International Liquidity:**

IMF, IFS.

#### **4. National Accounts:**

GDP in 1988 US Dollars: IDB estimates.

GDP by Type of Expenditure and Sector of Origin: Fundação Instituto Brasileiro de Geografia e Estatística, Departamento de Contas Nacionais. Consumption includes changes in inventories from 1985.

#### **5. Non-Financial Public Sector:**

Banco Central do Brasil, Departamento Econômico. Operational Balance excludes monetary and exchange correction on the domestic debt.

#### **6. Monetary Survey:**

Domestic Credit: Banco Central do Brasil, Relatório Anual, various issues (geometric mean of year-end stocks).

Money Supply: Ibidem (mid-year observations).

#### **7. External Trade:**

Trade by Direction: IMF, Direction of Trade Statistics (magnetic tapes).

Terms of Trade: ECLAC, Balance Preliminar de la Economía de América Latina y el Caribe, 1992.

Export Composition: United Nations Statistical Division (UNSTAT) Commodity Trade (COMTRADE) Data Base; Exports include Re-Exports.

Import Composition: ECLAC. Fuels and Lubricants and Passenger Automobiles are included in Other.

#### **8. Balance of Payments:**

Banco Central do Brasil and IMF, Balance of Payments Statistics (magnetic tapes).

#### **9. External Debt:**

World Bank, World Debt Tables (magnetic tapes).

# B R A Z I L

## Tentative Program 1993-1994

1 9 9 3			
Number	Sector	Name	Amount in US\$ millions
BR-0072	OS	Clean-up of Guanabara Bay	405
BR-0073	OS	Clean-up of Gualaiba Bay	116
BR-0162	TR	Modernization Highway Fernão Dias	267
BR-0196	TR	Transportation Bahia	147
BR-0194	VR	Sectoral Debt Reduction	400
Subtotal			1.335
1 9 9 4			
BR-0192	OS	Sanitation Igarapés Manaus	98
BR-0204	TU	Development of Potential for Tourism in the Northeast	200
BR-0203	OS	Sanitation Bahia Todos os Santos	216
BR-0159	OS	Drainage São Paulo II	319
BR-0150	TR	São Paulo-Florianópolis Highway	200
BR-0166	VR	Strengthening Integration Mechanisms	10
BR-0163	TR	Urban Transportation São Paulo-Metro	400
BR-0164	CYT	Science and Technology FINEP II	160
Subtotal			1.603
TOTAL			2.938

**BRAZIL**  
**OPERATIONS DEPARTMENT**  
**OPS/ITC/IRO**

**IDB LOANS**

**APPROVED AS OF JULY 31, 1993**

	<b>US\$Thousand</b>	<b>Percentage</b>
<b>TOTAL APPROVED *</b>	<b>8,838,635</b>	<b>100.0%</b>
DISBURSED	6,928,190	78.4%
CANCELLATIONS	1,143,111	12.9%
UNDISBURSED BALANCE	1,910,445	21.6%
PRINCIPAL COLLECTED	3,549,053	40.2%
<b>APPROVED BY FUND</b>		
ORDINARY CAPITAL	7,233,938	81.8%
FUND FOR SPECIAL OPERATIONS	1,473,176	16.7%
SOCIAL PROGRESS TRUST FUND	61,510	0.7%
VENEZUELAN TRUST FUND	51,721	0.6%
OTHER FUNDS	18,290	0.2%
<b>APPROVED BY SECTOR</b>		
AGRICULTURE AND FISHERY	956,901	10.8%
INDUSTRY AND MINING	1,547,970	17.5%
TOURISM AND MICROENTERPRISE	0	0.0%
ENERGY	1,912,086	21.6%
TRANSPORTATION AND COMMUNICATIONS	1,636,483	18.5%
EDUCATION SCIENCE AND TECHNOLOGY	509,002	5.8%
PUBLIC AND ENVIRONMENTAL HEALTH	1,442,037	16.3%
URBAN DEVELOPMENT	491,576	5.6%
PLANNING AND REFORM	0	0.0%
EXPORT FINANCING	266,477	3.0%
PREINVESTMENT AND OTHER	76,103	0.9%

\* Net of cancellations with monetary adjustments and export financing loan collections.

# GUAÍBA WATERSHED ENVIRONMENTAL MANAGEMENT PROGRAM

(BR-0073)

## EXECUTIVE SUMMARY

**BORROWER:** State of Rio Grande do Sul

**GUARANTOR:** Federative Republic of Brazil

**EXECUTING AGENCY:** Secretariat of Planning and Administration (SPA) and other agencies.

**AMOUNT AND SOURCE:**

IDB: OC	US\$110.2 million
FSO	US\$ 22.1 million
Local counterpart funding:	US\$ 88.2 million

**TERMS AND CONDITIONS:**

	<u>OC loan</u>	<u>FSO loan</u>
Amortization period:	25 years	25 years
Disbursement period:	4 years	4 years
Interest rate:	Variable	3%
Inspection and supervision:	1%	1%
Credit fee:	0.75% p.a	-

**OBJECTIVES:** The overall objective is to improve the environmental quality of the Guaíba River watershed, by reducing rural and urban pollution and preserving its natural resources. The specific objectives are: (i) to monitor and reduce urban pollution from residential and industrial sources; (ii) to introduce soil conservation practices and improve the management of toxic agricultural chemicals in priority micro-watersheds; (iii) to support consolidation of the system of conservation units; (iv) to support the setting up of formal and nonformal programs for raising awareness of and education on environmental issues; and (v) to strengthen the environmental management capacity of the state institutions.

**DESCRIPTION:** To achieve the aforesaid objectives, a series of activities and projects has been designed to: expand the coverage of the sanitary sewerage systems in Porto Alegre and the metropolitan region, including sewage treatment plants; initiate the process of controlling pollution in Lake Guaíba and its tributaries; contribute to efficient management of soils and of toxic agricultural chemicals; and preserve the biodiversity of parks and nature reserves. The following works would be executed: (i) sewerage systems including sewers, connections,

and treatment plants for the cities of Cachoeirinha and Gravataí and in the southern and central areas (São João-Navegantes) of Porto Alegre. In addition, support would be provided for the collection of special solid wastes, tertiary treatment of the leachate from the landfill in the northern area would be introduced and the capacity of FEPAM - the environmental authority - would be strengthened so it can launch a plan to control industrial pollution; (ii) a rural extension program targeting soil management and conservation, reforestation and control of pollution from toxic agricultural chemicals, that will serve a total of 7,820 farms; (iii) infrastructure will be improved and protection and supervision will be stepped up in five conservation units; (iv) a pilot environmental education program will be launched in six municipalities and the master plan for environmental education in the state will be drawn up; and (v) additional actions for institutional strengthening of the participating agencies, including: expansion and improvement of the environmental monitoring network; preparation of a master plan for solid waste management in the metropolitan region of Porto Alegre; setting up a geographical information system; training and development; and drawing up a master plan for management of the watershed and studies to define the subsequent stages.

**ENVIRONMENTAL  
CLASSIFICATION:**

The Environmental Management Committee, at its meeting of November 26, 1991, classified this as a Category III operation. The environmental summary was approved on March 9, 1993.

**BENEFITS:**

The program benefits will take the form of improvements in the environmental conditions and quality of life of the inhabitants of the Guaíba River watershed. Improvement in the provision of sanitary sewerage services will benefit about 400,000 inhabitants of the metropolitan region of Porto Alegre, by eliminating open sewage channels and creeks and treating sewage before it is emptied into the receiving bodies of water. There would also be an improvement in the control of industrial pollution, decreasing the organic load discharged into bodies of water by approximately 50%. A total of 7,820 low-income rural families will benefit from an increase in productivity of their farms, whilst at the same time conserving soils and decreasing the use of toxic chemicals. Biodiversity will be protected by preserving habitats and important species, some of which are in danger of extinction, and the



recreational choices of the population will be expanded.

**RISKS:**

Achievement of the program's medium- and long-term goals entails the participation of several institutions and of the population, as well as the allocation of funds. Attaining the final objectives would require investments tentatively estimated at US\$1 billion. Achievement of the objectives of the integral watershed management effort would be subject to the scope of the specific goals of the first-phase subcomponents and the implementation of the subsequent phases. This risk would be reduced to the extent that the open participation and support of civil society and the understanding between the state government and the municipal governments endure.

**THE BANK'S  
COUNTRY STRATEGY:**

The program is in line with the priority objectives and guidelines of the Seventh Replenishment of the Bank's resources and is consistent with the strategy agreed upon with the country in the programming exercise for the period 1991-1993, which gives priority to the financing of projects designed to address social and environmental problems. The federal government has accorded high priority to resolving environmental and sanitation problems, and to that end has submitted to the Bank requests for support to finance national environmental improvement and sanitation programs and programs in the states of Ceará, Rio Grande do Sul, Rio de Janeiro, São Paulo, Amazonas and Bahia.

To date, the Bank has financed 22 loans to the sanitation sector in Brazil for a total of US\$1,438,400,000 equivalent, of which 16 have been fully disbursed and the remainder are under execution. In 1992, sanitation loans were approved for São Paulo, Tietê River (US\$450 million) and Fortaleza (US\$200 million). For 1993, in addition to the project described in this report, the Guanabara Bay project is being considered (US\$400 million). The tentative program for 1994/95 includes sanitation loans for the states of Bahia, Amazonas, Rondônia and Goiás.

## I. FRAME OF REFERENCE

### A. Environmental conditions in Brazil

- 1.1 The United Nations Summit Conference on Environment and Development held in June 1992 in the city of Rio de Janeiro focused the growing concern expressed in various studies and world forums on environmental conditions in Brazil. The report prepared by the country, entitled "The Challenge of Sustainable Development", summarizes the main problems, makes recommendations and sets forth national priorities.
- 1.2 The principal environmental problems noted include: (a) 60% of the population lives in the nine largest metropolitan areas. If this growth continues, by the year 2000 close to 80% will reside in cities which have problems of extreme poverty, overcrowding, lack of basic services and pollution; (b) soil erosion and compacting as a result of increasingly intensive agriculture; (c) high levels of deforestation as a result of 500 years of land settlement, agricultural expansion and urban growth; (d) 60 species of birds and mammals became extinct between 1900 and 1950, and a total of 14 plant species and 207 animal species are on the list of endangered species; and (e) current knowledge of biodiversity is insufficient for the adoption of strategies and practices aimed at preserving it.
- 1.3 The recommendations and priorities for the environment and development include: (a) rational management of natural resources; (b) redistribution of national income to give priority to the construction of urban basic sanitation services to improve health conditions; (c) strengthening of institutional capacity and promotion of studies and research on environmental issues; and (d) preservation of biodiversity, in particular in the araucaria forests.
- 1.4 The environmental problems associated with the haphazard settlement of land and with industrial and residential pollution stem from Brazil's development model in recent decades. The state of Rio Grande do Sul is one of the most critical examples of the impact this type of development has had on the urban and rural environment. Its cities have grown at a rate of more than 10% over the last two decades. This growth has exceeded the service capacity and at this time the coverage of basic sanitation systems is inadequate. Expansion of the agricultural frontier has drastically reduced forest cover and there has been a major increase in soil erosion.

B. The economy in 1993

- 1.5 According to first-half figures, the economy has been recovering in 1993, and growth in domestic product this year may reach 4%. However, there is some uncertainty as to whether the recovery will be sustained in the last months of the year, as inflation is rising steadily.
- 1.6 To deal with the risk of climbing inflation rates and the country's fiscal problems, the authorities announced in mid-June an "Immediate Action Program" (PAI), which contains a set of measures to bring down the deficit, boost revenues, cut down on tax evasion, improve the financial condition of State banks, and speed up the privatization program. Most analysts view the PAI as a serious, comprehensive initiative to attack the main problems that have kept the authorities from narrowing the fiscal deficit. One promising sign in this respect is the rescheduling of the US\$10.4 billion debt owed by 10 states to the federal government, with repayments spread over 20 years.

C. Basic data on Rio Grande do Sul

- 1.7 The total area of the state of Rio Grande do Sul is 280,476 km<sup>2</sup>, which is 3.2% of the national territory. Of this area, 267,572 km<sup>2</sup> is land and 12,904 km<sup>2</sup> areas of inland water.
- 1.8 The state's population of 8.6 million in 1991 accounted for nearly 6.2% of the country's total population. Of this number, 76% lived in cities and the remainder were scattered in rural areas or small communities.
- 1.9 The distribution of population by administrative political districts reveals the relative importance of the Porto Alegre region, where 31% of the state's population resides.
- 1.10 The state's domestic product grew at an average rate of 2.3% during the eighties, and stood at approximately US\$31 billion by the end of the decade. At the same time, the Brazilian economy grew at an average rate of 2.2%, and generated a product of around US\$412 billion by the end of the decade. In view of the marked differences in the population growth rates, the growth of the state's economy signified a per capita income growth of 5.1% - to US\$3,500 in 1989 - while the national average rose 4.4% to US\$2,800.
- 1.11 The state's economy has undergone a significant change, which is seen in the composition of the GDP. The share of the agricultural sector has dropped steadily since 1970, from 19.6% of the state GDP in that year to 15.4% in 1980 and 9.5% in 1989. At the same time, the share of the industrial sector, primarily processing industries, has increased from 26.6% in 1970 to 31.3% in 1980 and 36% in 1989. Nationwide there has been a decline in the participation of

the agricultural sector, but unlike the situation in the state, the industrial sector's share also declined during the eighties.

- 1.12 The state of Rio Grande do Sul comprises three major regions. The first is the south, taking in the Jacuí and Ibicuí River regions, and features primarily large properties dedicated to livestock raising and rice cultivation. The second region, the north or Planalto area, is also primarily agricultural but has medium- and small-sized holdings. Despite the diversity of this region, highly diversified output is tending to give way to mechanized wheat and soybean culture. The third region, the northeast or Porto Alegre - Caxias do Sul axis, contains the major cities and principal industries.
- 1.13 Up until the mid-19th century, the area to the south of the Jacuí River saw the greatest economic growth in the state. With successive waves of settlers arriving from Europe, principally Germans and Italians, the north of the state began to grow more rapidly, with an economy organized principally around small farm holdings. This touched off the rapid expansion of Porto Alegre, which became the state's most important economic center.

D. Project area

- 1.14 The Guaíba River has the largest catchment basin in the state, covering 85,950 km<sup>2</sup>, or 30% of the total area of Rio Grande do Sul. The watershed contains 222 municipalities, representing 77% of those in the state, and a population of nearly 6 million, which is 70% of the total population. The most important productive activities are found within this watershed, including: (a) iron and steel, cement, pulp and paper, leather and petrochemical industries; (b) production and processing of coal and petroleum; (c) power generation; and (d) agricultural activities.
- 1.15 This watershed consists of eight smaller drainage areas or subbasins: the upper Jacuí, middle Jacuí, lower Jacuí, Vacacaí, Cai, Sinos, Gravataí and Guaíba. The highest population densities are found in the Gravataí and Lake Guaíba watersheds, in the Porto Alegre region, which account for only 2.6% and 3.7%, respectively, of the basin's area.
- 1.16 The original vegetation in the state was of two types: 52% was used as pasture for livestock, and 48% consisted of tropical and subtropical vegetation. The change in land use has led to a rapid loss of native vegetation, from the original 11.2 million hectares to only 729,000 hectares at this time, which is a mere 2.6% of the area.
- 1.17 There are three main reasons for the degradation of the environment in the watershed area: (a) deforestation and soil depletion, accompanied by intensive agriculture concentrated in the north-western and central region of the basin; (b) the lack of a

consolidated and representative system of protected areas to guarantee preservation of the basin's biodiversity; and (c) residential and industrial pollution, produced by the urban concentration in the metropolitan region of Porto Alegre.

- 1.18 The program described in the next chapter is a first stage, which envisages the financing of top-priority works and of studies for subsequent phases. Achievement of the ultimate objectives for integral management of the watershed will require investments tentatively estimated at US\$1 billion, and will be contingent upon completion of the following stages.

1. The rural area

- 1.19 More than 73,000 km<sup>2</sup> of the watershed are devoted to agriculture. More than 9.4 million kilograms of toxic agricultural chemicals are used in the basin (1.28 kg/ha/year), of which 39% are insecticides, 35% herbicides and 26% fungicides (1990 data). The use of toxic chemicals has led to a steady increase in the number of poisonings, from 127 in 1980 to 376 in 1990.
- 1.20 In the subbasins, the problems of conflict in land use are greatest in the upper and lower Jacuí drainage areas, which cover nearly 59% of the area of the watershed. In these smaller catchment areas, 90% of the farms are less than 50 hectares in size, and the farmers are working with poor soils that are unsuited to annual crops, which means that on more than 200,000 hectares there is acute conflict in land use. Moreover, these two subbasins have the highest rates of use of toxic chemicals, equivalent to an average of 2.21 kg/ha/year for the upper Jacuí, and 1.86 kg/ha/year for the lower Jacuí.
- 1.21 Of the 1.38 million inhabitants of these smaller drainage areas, 47% are rural dwellers. They are mostly located in the regions of Planalto and the Central Depression.
- 1.22 The soils of the subbasins have undergone considerable physical degradation, as seen in the acute loss of their structural qualities. This structural decline can be seen both in the soil profile and in the appearance of a fine crust on the surface of compacted soils. The degree of compacting observed means lower rates of infiltration and higher rates of surface ponding and of erosion, which in turn implies an increase in production costs per unit of area and a reduction in the productivity of the crops.
- 1.23 Productivity within the watershed varies considerably and is primarily affected by high acidity and lack of phosphorus, soil compacting and severe erosion, insufficient use of measures to correct acidity and of fertilizers and the use of inappropriate cultivation techniques such as the time and density of planting, spacing and others. Once corrective measures are adopted, yields and productivity increase significantly.

- 1.24 Typical and representative microwatersheds of the upper and lower Jacuí drainage areas have been identified. Within these typical microwatersheds, representative properties have been identified for the two predominant soil groups (latosols and lithosols), specifying the socioeconomic condition, types of crop and predominant agricultural technology. Two typical properties were proposed for latosols and three for lithosols.

## 2. Parks and reserves in the project area

- 1.25 The most effective means of preserving natural ecosystems is to set up protected areas, known in Brazil as conservation units (UC). There are 28 UCs in the Guaíba River watershed, nine of which are administered by the state, two by the federal government, 13 by the municipal governments and four are privately-run. Fifteen are parks, six are primarily for recreational purposes, and seven are classified as biological and ecological reserves. The remainder are national and municipal forests. They cover only a small area, approximately 53,300 hectares. The management and protection of the units has been neglected, and their management plans have not been implemented. Some have been encroached upon and in several cases the designated use is not consistent with the features and function of the areas.
- 1.26 There is a lack of knowledge of the ecosystems represented in the UCs. In several of the units there are no inventories of flora and fauna and available data are in most cases preliminary and incomplete. There are no buffer zones. In general, the UCs lack the financial and human resources needed to attain the objectives for which they were created: the preservation and conservation of natural resources and other aesthetic or cultural values and the development of environmental awareness in the population.
- 1.27 The eastern area of the basin contains the majority of the population and consequently the UCs in this region show the greatest anthropogenic impact. In addition, they receive more visitors as they are located close to the metropolitan region of Porto Alegre.

## 3. The urban areas

### a. Coverage of drinking water supply and sewerage services

- 1.28 In the entire state, 472 localities in 290 municipalities have water supply systems. In 63 of these municipalities, the water supply services are run by autonomous and semiautonomous agencies and municipal utilities, which serve about 196 localities.
- 1.29 Of the total number of municipal seats: (a) the Companhia Rio-Grandense de Saneamento (CORSAN) is responsible for supplying water to 227, serving a population of 4.2 million or 70% of the total population with service; and (b) the Municipal Department of Water

and Sewerage (DMAE) supplies the largest urban center in the state, Porto Alegre, or 30% of the population served.

- 1.30 With regard to sewerage systems, CORSAN serves 400,000 inhabitants and DMAE 800,000. In most cases there are only collection systems. The raw sewage is discharged directly into the rivers and tributaries of the drainage area and into Lake Guaíba itself. With the existing systems, CORSAN, DMAE, other agencies and municipalities serve 14% of the state's total population. Eighteen percent of the urban population is served.

b. Solid waste management

- 1.31 The solid waste generated in the municipality of Porto Alegre is taken to the landfills operated by the Municipal Department of Urban Sanitation (DMLU), located in the northern and southern areas of the capital. DMLU is responsible for managing solid waste within the municipality of Porto Alegre.
- 1.32 Approximately 1,000 tons of solid waste are handled daily by the DMLU facilities. Of this, about 750 tons come from residential areas, about 100 from industries, about 40 from health services, about 100 are debris and about 10 tons are refuse from public areas. In addition, around 120 tons are generated in outlying districts and shantytowns.
- 1.33 Most of the residential and industrial solid waste is collected by a private company under contract to DMLU. Nevertheless, there are shortcomings in refuse collection in areas that are not easily accessible, in refuse collection from health establishments and industries and in the effective implementation of selective collection and recycling plans.

E. Industries in the project area

- 1.34 The Department of Economic and Financial Data of the Secretariat of Finance has established that there are 47,000 industries in the entire state, of which 33,000 are located within the Guaíba River watershed. According to the same source, there are 6,500 industries with the potential to pollute water in the state and about 4,700 in the Guaíba basin.

F. Residential and industrial pollution

- 1.35 Although the coverage of water supply services in the project's area of influence is acceptable within certain quality limitations, the growth in urban centers, industrialization and, in addition, the lack of sewerage services with proper treatment and final disposal of sewage and control of industrial effluent, have led to a deterioration in sanitary and environmental conditions, particularly in the lower Guaíba basin.

- 1.36 Except for smaller plants that treat volumes that account for less than 5% of total residential sewage, raw sewage collected in the sewerage system, as explained, is discharged directly into the receiving bodies of water. Moreover, there is no evidence that industries with the potential to pollute water that are located in the Guaíba watershed are satisfactorily complying with environmental legislation. These industries represent 72% of the industries statewide.
- 1.37 As a result, levels of fecal coliform bacteria greater than 4,000/100 ml are recorded in particular over a wide area from the Gravataí River to the areas located several kilometers downstream from the city of Porto Alegre in Lake Guaíba. <sup>1/</sup> Some of these extremely polluted areas are upstream from: (a) the drinking water intakes for urban centers, including Porto Alegre; and (b) beaches previously used for recreational purposes by the population of the metropolitan region, thus representing a serious threat to public health.

G. Monitoring water quality

- 1.38 FEPAM, CORSAN and DMAE have been responsible for monitoring water quality in the Guaíba River watershed. The main focus has been on the lower basin where DMAE has systematically monitored water quality since 1966 as part of the master sewerage plan of Porto Alegre.
- 1.39 DMAE has 146 sampling stations and analyzes 73 parameters of physical, chemical and bacteriological quality. For their part, CORSAN and FEPAM conduct sampling at some of the DMAE stations and at other stations close to drinking water intakes and liquid waste outfalls. A total of nearly 70,000 data sets are available from the analyses conducted over a 20-year period. Coverage of the network needs to be expanded, particularly for air quality monitoring in urban areas and water quality monitoring in the tributaries draining Lake Guaíba.

H. Predictive water quality modeling

- 1.40 The use of predictive models of water quality was developed under the master plan for sanitary sewerage of Porto Alegre. Using the models, individual projects have been configured based on the concepts of least cost and technical and economic viability, bearing in mind the assimilative capacity of the receiving bodies, the use of the water, the areas and water resources to be protected, and the target water quality levels. Annex I-1 contains the results of the model.

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<sup>1/</sup> Less than 1,000/100 ml is considered acceptable.



I. Environmental education

- 1.41 The Education Secretariat is responsible for education in the state, which includes the federal, state, municipal and private systems, with a total of 14,794 establishments, 160,000 teachers and 1.9 million students. The principal problems it faces include an illiteracy rate of 16.7%, a drop-out rate of 8.6% and a repeater rate of 16.4%. Federal and state legislation stipulates that education policy should be an instrument for preservation of the environment and requires the inclusion of environmental education at all levels.
- 1.42 The size of the education system, the diversity of regions within the state, the different types of schools and lack of funds have precluded the incorporation of environmental issues into the education curriculum of Rio Grande do Sul.

J. Situation of environmental institutions and legislation

- 1.43 In Brazil the Conselho Nacional do Meio Ambiente [National Environmental Council] (CONAMA) is responsible for national policy and regulations under the Environment Act. The Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis [Brazilian Environmental and Renewable Natural Resources Administration] (IBAMA) is responsible for supervising and monitoring implementation of the policy at the federal level, and comes under the Ministry of the Environment.
- 1.44 Environmental issues in the state of Rio Grande do Sul are dealt with in its constitution, which in addition to ratifying the fundamental content of the federal constitution, introduces some additional specific provisions. The Fundação Estadual de Proteção Ambiental [State Environmental Protection Foundation] (FEPAM) is responsible for implementing the environmental provisions at the state level.
- 1.45 Federal and state legislation requires a series of environmental permits to be obtained during preinvestment and up to the start of operations of any projects that it is felt might have an adverse effect on the environment. There is a permit that must be obtained prior to the formulation of the basic design, an installation permit as a prerequisite to initiating the works and an operating permit to begin the operation. To obtain these permits, specific environmental studies are conducted and in the case of projects with a major environmental impact, an environmental impact assessment study and environmental impact statement (RIMA) must be prepared. The approval process includes consultation with technical agencies and the affected population.
- 1.46 Besides specific environmental legislation, environmental provisions are included in sector laws relating to soil, water, the forest code, wildlife, nonrenewable natural resources, marine

pollution, agricultural chemicals, fertilizers, etc. The main problems in this area stem from lack of enforcement of the law, as a result of several factors, primarily institutional weaknesses, 2/ lack of training and absence of political determination to establish rigorous control.

- 1.47 Watershed management activities necessitate the coordinated participation of several institutions that are responsible for managing natural resources, controlling pollution and environmental health. State Decree 33,660 of November 27, 1989 set up the Pró-Guaíba program to establish the necessary conditions for management of the watershed.

K. Bank/country strategy

- 1.48 The proposed project is in line with the objectives and guidelines established as priorities under the Seventh Replenishment of the Bank's resources, and is consistent with the Bank's strategy agreed upon with the country in the programming exercise for the period 1991-1993, which emphasizes the financing of projects designed to address social and environmental problems.
- 1.49 The federal government has accorded high priority to resolving environmental and sanitation problems. To that end, it has submitted to the Bank six financing requests for projects or programs relating to sanitation and environmental improvement in the states of Ceará, Rio Grande do Sul, Rio de Janeiro, São Paulo, Amazonas and Bahia.
- 1.50 In 1992, loans to Ceará and São Paulo were approved. The operations program for 1993 includes loans in the sanitation sector for Rio de Janeiro and Rio Grande do Sul. Loans for Amazonas and Bahia are scheduled for approval in 1994.

L. Experience of the Bank and other financial institutions

- 1.51 To date, the Bank has authorized loans for the sanitation sector in Brazil amounting to US\$1,438,400,000. The projects financed have been in the basic sanitation, water supply and sewerage sectors. The results can be considered satisfactory in view of the impact they have had on the development of the sector and of the country.
- 1.52 In terms of the environment, the Bank is financing the National Environmental Fund (BR-0078) to assist in executing a program with the following principal objectives: (i) to promote the conservation and sustainable use of natural resources, as well as improvement in the quality of the environment in Brazil; and

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2/ The state environmental monitoring agency FEPAM has been in existence only since 1990.

(ii) to expedite and encourage the participation of civil society in resolving the country's environmental problems.

- 1.53 As regards other sources of external financing, two important environmental programs are now under way in Brazil: the Second Project for Control of Industrial Pollution in the State of São Paulo, that has World Bank financing amounting to US\$50 million equivalent, and the National Environmental Program (PNMA), with US\$117 million equivalent in funding from the World Bank.

## II. THE PROJECT 3/

### A. Objectives

- 2.1 The overall objective of the program is to restore environmental quality in rural and urban areas so as to improve the quality of life of the population and to promote the sustainable use of the natural resources of the Guaíba River watershed.
- 2.2 The specific objectives are:
  - a. to monitor and reduce urban pollution from residential and industrial sources;
  - b. to introduce soil conservation practices and fertilization, and improve the handling of toxic farm chemicals in priority microwatersheds;
  - c. to consolidate the system of protected areas located within the watershed;
  - d. to support the setting up of formal and nonformal programs for raising awareness of and education on environmental issues; and
  - e. to strengthen the environmental management capacity of the institutions working in these areas.
- 2.3 To achieve the aforesaid objectives, execution of the following components is proposed:
  - a. Prevention and control of industrial and residential pollution.
  - b. Soil management and control of toxic farm chemicals in priority microwatersheds.
  - c. Consolidation of conservation units.
  - d. Environmental education and raising of public awareness.
  - e. Institutional management and strengthening.

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3/ Documents and annexes in the technical files for the project contain background and details on the matters dealt with in chapters II, III, IV and V of this proposal.

B. Description

1. Prevention and control of industrial and residential pollution

a. Objective

- 2.4 The objective of this component would be to reduce the harmful effects of: (i) some of the discharges of raw sewage and untreated liquid industrial effluent that flow into receiving bodies of water upstream from water supply intakes and from beaches that in the past were used for recreation; (ii) pollution caused in the water resources of the Gravataí River subbasin by the leachate from the landfill in the northern area of Porto Alegre, and (iii) the lack of a system for collecting solid wastes in special situations, such as populated areas that cannot be easily accessed and industries that produce hazardous solid wastes.

b. Goals

- 2.5 To achieve the proposed objective, during the first stage of the program, works would be constructed and plans of action executed to attain the following goals:

(i) Control of residential pollution

- 2.6 Cities of Cachoeirinha and Gravataí: To provide sanitary sewerage systems for the population of the cities of Cachoeirinha and Gravataí, of approximately 171,560 inhabitants at the beginning of the period and estimated to increase to about 243,760 by the end of the first stage of the program (more than 95% coverage).
- 2.7 City of Porto Alegre: To provide sanitary sewerage systems for 119,520 inhabitants of the city of Porto Alegre at the beginning and 165,390 by the end of the first stage of the program. The São João-Navegantes sewage treatment plant in the central area of Porto Alegre would serve 118,890 inhabitants and the sewerage system of the southern area, including sewers, sewage treatment facilities and final disposal, would serve 46,500, for a total of 165,390.

(ii) Control of industrial pollution

- 2.8 During the first stage, to reduce the significant pollution load by 50%, which could be achieved if FEPAM granted operating permits to about 500 industries. The licensing plan will begin in the first year, with annual targets of 50 industries set for that year, 150 for the second year, 200 for the third year, and 100 for the fourth year. This target has been established tentatively based on the fact that of the 33,000 industries located in the Guaíba River watershed, FEPAM estimates that approximately 4,700 have the potential to pollute water resources and that of this number probably around 20% produce significant loads.

(iii) Solid waste management

- 2.9 The following activities would be executed in the urban area of Porto Alegre, to complement the works and activities already carried out by DMLU: (i) introduce a tertiary treatment system of 7.4 l/s of leachate from the northern area landfill that currently receives about 800 tons of solid waste daily; (ii) organize a specific service of selective collection in around 160 schools; in areas that are not easily accessible - about 50 tiny settlements around Porto Alegre - where a population of about 68,000 would be served; and of special inert industrial wastes, that could be on the order of 190 tons per day; and (iii) implement a pilot program to recycle solid wastes such as metals, glass, plastic and paper, using unskilled labor.

c. Description of the works, action plans and additional activities

(i) Sanitary sewerage in Cachoeirinha and Gravataí. Executing agency: Companhia Rio-Grandense de Saneamento (CORSAN)

- 2.10 These projects would serve the adjacent cities of Cachoeirinha and Gravataí, that are located within the metropolitan region of Porto Alegre, upstream from where the Gravataí River flows into the Guaíba River. From the sanitary standpoint, the works of the subprojects would initiate stages of decontamination of the waters of one of the most degraded tributaries of the Guaíba River.

- 2.11 The works that would be executed in the sanitary sewerage projects include: (a) sewer systems with household connections, intercepting, branch and trunk sewers, pumping stations, and outfalls; (b) sewage treatment plants; and (c) final disposal facilities that would discharge the effluent from the plants into the Gravataí River. The treatment plants would consist of parallel staged anaerobic, facultative and maturation ponds.

(ii) Sanitary sewerage in Porto Alegre. Executing agency: Municipal Department of Water and Sewerage (DMAE)

- 2.12 The project consists of the construction of a sewage treatment plant to serve the most densely populated areas of the São João-Navegantes district of Porto Alegre, which is on the northern side of the city, and currently has sewer systems that discharge raw sewage directly into the Guaíba River upstream from the city's water supply intakes.

- 2.13 The sewage treatment plant selected comprises a modified activated sludge system with disinfection of the effluent. In this design, the liquid phase would be treated in detritus tanks, aerobic reactors, secondary settling tanks and chlorination units. The

solid phase would be treated using mechanized centrifugal thickening, anaerobic digestion and mechanized centrifugal dewatering of the digested organic sludge. The sludge product will be disposed of in the sanitary landfill that DMLU would bring into operation at the end of this year.

- 2.14 Some minor sections of interconnections with the existing sewer network will be constructed, as will the system for final disposal of the treated effluent in a canal that discharges into the Guaíba River and which is maintained and operated by the Municipal Department of Storm Sewers (DEP).

(iii) Sanitary sewerage in the southern zone of Porto Alegre. Executing agency: Municipal Department of Water and Sewerage (DMAE)

- 2.15 The project includes: (a) sewerage system with household connections, intercepting, branch and trunk sewers, pumping stations and outfall to the treatment plant; (b) the treatment plant; and (c) the final disposal system.

- 2.16 The sewage treatment includes parallel modular stabilization ponds. Each of the modules would consist of a series of anaerobic, facultative and maturation ponds, and would discharge the treated effluent into a canal connected to Salso Creek.

(iv) Action plan for control of industrial pollution. Executing agency: Fundação Estadual de Proteção Ambiental (FEPAM)

- 2.17 This action plan would cover the entire area of the watershed, which is 85,950 km<sup>2</sup>, and includes the following basic activities:

- a. Survey of the sources of industrial pollution and implementation of an environmental information system.
- b. Register of sources of industrial pollution.
- c. Classification of sources of industrial pollution, based on their polluting potential.
- d. Preparation and execution of an action plan to bring the industries that cause pollution under environmental legislation.

(v) Plan of basic actions for solid waste management in Porto Alegre. Executing agency: Municipal Department of Urban Sanitation (DMLU)

- 2.18 This plan of basic actions would consist of a series of activities to complement those already undertaken by DMLU, in order to improve

the services of collection and final disposal of solid waste in Porto Alegre. These actions are as follows:

- a. Collection of solid wastes in areas that are not easily accessible and from industrial establishments.
- b. Selective collection of solid wastes in schools of Porto Alegre.
- c. Recycling using simplified technology that enables the use of unskilled labor.
- d. Tertiary treatment of the leachate from the northern zone landfill and monitoring of the results obtained.

(vi) Master plan for management of solid waste in the metropolitan region. Executing agency: Fundação Metropolitana de Planejamento (METROPLAN)

- 2.19 With the assistance of consultants, a master plan would be drawn up for the management of solid waste in the metropolitan region. The master plan proposed will constitute the first instrument of this type at the regional level. The principal activities would be conducted in the context of the following phases: (a) information on and understanding of the problem; (b) assessment and prognosis; (c) proposal of alternative solutions, selection and formulation of the plan; and (d) setting of investment priorities and review of results.

(vii) Environmental monitoring network. Co-executing agencies: FEPAM, CORSAN and DMAE

- 2.20 The proposed network would complement the stations and equipment that the three co-executing agencies currently have available. Parameters of water, air and soil quality in the Guaíba River watershed would be monitored.
- 2.21 The project to monitor water resources would include the setting up of approximately 80 stations for the basic network, 40 stations for special water studies, 25 wells for monitoring groundwater, and 55 stations for sediment sampling. In addition, the existing pluviometric, fluviometric, climatological and piezometric systems would be complemented. These are operated for specific purposes by the National Department of Water Supply and Electric Power (DNAEE), Companhia Estadual de Energia Elétrica (CEEE), State Department of Ports, Rivers and Canals (DEPRC), National Meteorology Department (DNMET) and Instituto de Pesquisas Agronômicas (IPAGRO). To this end, approximately 22 stations for rainfall measurement, 27 river-gaging stations, 6 climatological stations and 12 piezometric stations would be built.



2.22 Using atmospheric measuring equipment, the state's sampling system would be expanded and modernized, including 13 stations (of which six would be manual, one would be automatic and mobile and the remaining six automatic and stationary), five meteorological towers, and one echo sounder for measurements of the vertical atmospheric structure.

2.23 There would be two levels to the system monitoring the use and settlement of land: determination of soil profiles and types and settlement activity in critical regions subject to implementation of priority actions. The geographical information system to be set up in the institutional management and strengthening component would be used to execute this system.

2. Soil management and control of toxic farm chemicals in priority microwatersheds

a. Objectives

2.24 The objectives of this component are: (i) to increase agricultural productivity based on principles of sustainable development; and (ii) to increase the net income of productive units, opening the way for improvement in the quality of life of the rural family.

2.25 Under the responsibility of the Associação Rio-Grandense de Empreendimentos de Assistência Técnica (EMATER/RS) four basic interrelated subcomponents have been identified, as described below:

- a. Soil management and conservation.
- b. Environmental reforestation.
- c. Control of pollution from toxic farm chemicals.
- d. Rural extension services.

b. Goals

2.26 In the 117 microwatersheds selected, a total of 7,820 farms will be served, covering an area of 166,130 ha, of which 78,824 ha are devoted to annual crops.

(i) Soil management and conservation

2.27 The soil management and conservation subcomponent includes: (i) broad-base (30,147 ha), medium-base (14,303 ha) and retention (12,290 ha) terracing systems; (ii) filling and leveling of gullies (861,337 m); (iii) decompacting of soil (43,067 ha); (iv) correction of acidity (78,824 ha); (v) fertilization (78,824 ha); (vi) use of mulching and cover pasture (26,647 ha); (vii) boundary hedges (12.8 million linear meters); and (viii) construction of 1,014 composters.

(ii) Environmental reforestation

- 2.28 The plan for environmental reforestation includes the planting of 13,296 ha of woods with native, fast-growing species. The activities include planting of 2,827 ha of protective vegetation along river banks; 1,088 ha of reforestation of steep slopes; 1,049 ha of windbreaks; 1,778 ha of agroforestry combined with maté and 6,554 ha of multipurpose fast-growing species.

(iii) Control of pollution from toxic farm chemicals

- 2.29 EMATER/RS will offer extension services to promote the participation of cooperatives and other farmers' organizations in proper handling of agricultural chemicals and in the introduction of new practices of biological control and integrated management of pests and diseases.
- 2.30 The activities envisaged include: reduction in the use of insecticides, acaricides, fungicides and herbicides and/or their replacement by integrated pest control, the construction of posts to supply sprayers, disposal areas for toxic chemical residues, replacement of sprayers, and dissemination of personal protective equipment.
- 2.31 Integrated pest management includes the use of biological control agents of the soybean chinch bug (*Piezodorus guildinii*) using wasps (*Frissolus basal*) (17,254 ha); of the fall armyworm (*Spodoptera frugiperda*) using bacilloviruses (1,422 ha); of the grain aphid (*Sitobion avenae*) (12,137 ha); of mites (10,403 ha); of the velvetbean caterpillar (*Anticarsia gemmatilis*) (24,156 ha) and of the fruit fly. These practices will include plant protection from diseases and harmful weeds on 34,349 ha.
- 2.32 The small works to control pollution from toxic farm chemicals include 782 posts to supply sprayers, 63 disposal areas for toxic chemical residues, 3,128 storage units for toxic chemicals, 140 freezers for storage of biological agents, 3,128 sets of personal protective equipment and resources for replacement and repair of sprayers.

(iv) Rural extension services

- 2.33 The execution of works in the microwatersheds necessitates a rural organization infrastructure with the participation of the municipal agricultural councils and the microwatershed committees. The extension activities will continue along similar lines to the present, in which EMATER works together with the municipal network. The focus is on motivating, raising the awareness of, guiding, assisting and organizing farmers and their families to carry out the activities scheduled under the program.

- 2.34 At least one senior specialist and one mid-level specialist will work full-time on the project in each municipality, along with one rural extension worker who will work 50% on environmental education activities, actions to motivate, raise the awareness of and organize rural families living in the selected microwatersheds, and training in public health and the control and management of pollution from toxic agricultural chemicals.

3. Consolidation of conservation units

a. Objective

- 2.35 The specific objectives of this component would be:

- a. to ensure the protection, supervision and improvement of the infrastructure in five existing conservation units;
- b. to conduct studies for the expansion or creation of new units within the watershed;
- c. to develop a program of environmental education for conservation; and
- d. to strengthen the institutional capacity of the Fundação Zoobotânica (FZB) and of the National Department of Renewable Natural Resources (DRNR).

b. Goals

- 2.36 Preservation of biodiversity was considered as the most important criterion for selection of the priority UCs for the project. <sup>4/</sup> Other factors taken into account were: lack of effective protection, representation of the ecosystems and biological diversity characteristic of the basin, ease with which these areas could be used for environmental promotion and education, and finally the level of pressure on the areas.

- 2.37 The action plans of the five conservation units and the studies will enable achievement of the following goals:

(i) Jacuí Delta Park

- 2.38 Consolidation of the park includes the following macroactivities to be conducted by FZB: (i) assessment of the natural conditions of flora and fauna, updating of zoning and the park's management plan; (ii) assessment of the socioeconomic conditions and preparation of the strategy and plan of action for the park; (iii) construction

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<sup>4/</sup> The national UCs were not included as they are run by the federal government and are supported by a program financed by the IBRD.

and establishment of the unit for administration and supervision of the park; and (iv) restoration of properties on Pólvora Island.

- 2.39 The assessment of the natural conditions of the flora and fauna includes updating inventories, surveys and examination of native species in the park, determination of their habitats, selection of appropriate habitats for their reproduction, qualitative and quantitative evaluation of the population, mapping of habitats and recommendation of protection and conservation measures. The medium-term objectives include the selection of species for studies, reintroduction of species to restock areas, and suggestions as to the types of use of the different habitats. The maps will be to the scale of 1:20,000. The research will culminate in a proposal for management of the park, including additional activities to those financed during this phase entailing research, resource management, environmental interpretation and education, monitoring, administration, supervision and maintenance.
- 2.40 The assessment of the socioeconomic conditions includes the identification and quantification of urban occupancy, characterization of current land use, identification of potential conflicts and indication of measures, instruments and actions for consolidation of the park. To this end, the following stages will be conducted: (i) field data survey (census and mapping of economic activities); (ii) surveys and interviews with residents; and (iii) preparation of the plan of action.
- 2.41 Construction of the administrative unit, laboratories, attached facilities and supervisory unit involves building on approximately 900 m<sup>2</sup>. In addition, 10 posts to control access, gateways and facilities for housing rangers, four observation towers, quays, garages and stables for horses would be built.
- 2.42 Restoration of properties on Casa da Pólvora Island includes the guardhouse, a 240 m<sup>2</sup> building, that would become an ecological, anthropological and folklore museum; the Paiol da Casa da Pólvora, 400 m<sup>2</sup>, which would become a natural history museum, aquarium and greenhouse; and the Casa da Pólvora, 115 m<sup>2</sup>, that would house the Delta data laboratory.

(ii) Botanical Garden

- 2.43 The activities to be conducted by FZB in the Botanical Garden include the construction of improvements to the infrastructure of the estate and buildings, research with botanical exploration excursions and an environmental education program for conservation units.
- 2.44 The improvements to the infrastructure of the garden relate to expansion of the internal road system and construction of lakes and a canal; expansion of the water sanitation system, 1,600 m of sewage pipes, 100 m of storm sewers, and 1,500 m of treated water

pipes; expansion of the electric power system, 5,500 m of underground cables; installation of rest areas; upgrading of the telephone system, with a new 80-line exchange; replacement of boundary fences, 2,000 m; construction of a support and services building, 500 m<sup>2</sup>, and utility units of 55 m<sup>2</sup> each; construction of sheds, 255 m<sup>2</sup>; construction of a building to house the seed bank; expansion of the nursery, 70 m<sup>2</sup>; repair of the existing greenhouse and construction of two new greenhouses, 500 m<sup>2</sup>; and construction of an orchid house.

- 2.45 The subcomponent of botanical exploration excursions includes research in seven preselected areas, which include the region of granite hills, the Serra Geral, the Serra do Sudeste, the Planalto de Araucárias and Aparados da Serra. Expansion of the live collections entails the gathering of plants for the collection, their cataloguing, phenological analysis and inclusion in the seed bank. The aim is to double the existing live plant collection over a five-year period, in the hope of holding a total of 1,800 species.
- 2.46 The environmental education program for conservation units includes surveys and direct research with visitors to the parks and residents of surrounding areas; visits geared to selected groups; preparation of educational materials for teachers of early grades; training of teachers and meetings and seminars with NGOs and interest groups; and permanent exhibitions and informational material for the general public.

(iii) Zoological Park

- 2.47 FZB's activities in the Zoological Park include improvements to the basic infrastructure, construction of facilities for animal care, administration and public services; formulation of a management plan for adjoining areas and the forest garden, and setting up of the information and environmental education center.
- 2.48 Improvements to the infrastructure will involve the gateway and entrance post (42 m<sup>2</sup>); forest ranger post (96 m<sup>2</sup>); research laboratory (50 m<sup>2</sup>); animal quarantine pen (253 m<sup>2</sup>); storehouses; garages; picnic facilities; lavatories and services; implementation and maintenance of a security system involving the hiring and training of 10 guards; topographical survey (850 ha) and construction of a boundary fence (43,200 m<sup>2</sup>); construction of a perimeter road (67,500 m<sup>2</sup>); repair of internal paths and roads; and construction of eight guard posts and an observation tower.
- 2.49 The environmental education center entails the construction of 360 m<sup>2</sup> that would include an auditorium, exhibition hall, library, bathrooms and other adjoining facilities.

(iv) Itapoã Park

- 2.50 The program to be conducted by DRNR includes initiating the plan for control and protection of the park, improving the infrastructure for administration, research and public visitors and establishing a training center for park rangers. The counterpart funds will be used to pay the previous owners of 3,783 hectares, on which the properties have been declared to be in the public interest and form part of the park.
- 2.51 The buildings correspond to five houses for park rangers (390 m<sup>2</sup>), five watchtowers (one with a deck), a laboratory and accommodations for researchers, administrative headquarters and a visitor center (450 m<sup>2</sup>), a military brigade post, expansion of an existing building for the park ranger training center, camping and sanitary facilities, entrance gate, stables, a nursery, docks and other small support facilities.

(v) Serra Geral Biological Reserve

- 2.52 The actions within the reserve to be conducted by DRNR are designed to improve 20 km of access path, mark the perimeter boundaries, establish a minimum group of five professionals and three rangers to draw up the inventory and protect the area, and construct the administrative headquarters, accommodations for researchers and rangers (total 310 m<sup>2</sup>), four guard posts and stables.

(vi) Studies for consolidation of the conservation units

- 2.53 The studies to be conducted by FZB are designed to obtain knowledge of the situation of areas with potential for conservation that are representative of the ecosystems of the basin, of the swamps and wetlands and sites of paleontological interest. Strategies will be established for their protection and management plans will be proposed, with a justification for the creation of new conservation areas.
- 2.54 The component includes three principal activities: (i) selection of new areas for protection, drawing up of inventories, preparation of studies to justify declaring them as protected areas and preparing their zoning. Five areas of interest that cover an area of more than 2,000 hectares have already been identified; (ii) mapping, assessment and management of swamps and wetlands, for which purpose analyses of flora and fauna will be conducted and strategies for their protection designed; and (iii) preservation of the paleontological sites of vertebrates, in which vertebrate fossils will be collected and studied, important findings will be published and exhibitions set up for the public in the Natural Sciences Museum.

4. Education and raising of awareness of environmental issues

- 2.55 This component, to be conducted by the Education Secretariat, includes: (i) preparation of a master plan for environmental

education for the state; (ii) establishing a pilot project in the so-called environmental education cores, a total of nine schools located in Caxias do Sul, Passo Fundo, Porto Alegre, Santa Cruz do Sul, Santa Maria and São Leopoldo; (iii) equipping these core schools; (iv) training 750 teachers through 10 development and training courses; and (v) initiating the process of changing the curriculum.

- 2.56 These activities include development courses, training, interdisciplinary workshops, meetings between universities and with the community, and publications. Each educational core will have ties with the university of the region, which will participate actively in the process. The activities will directly benefit more than 2,000 teachers and professionals, 11,000 students and more than 1,000 representatives of the community and NGOs.
- 2.57 The Education Secretariat would coordinate the nonformal education activities that would be organized for specific public groups by the participating agencies.

#### 5. Institutional management and strengthening

- 2.58 The objective of this component is to work with the executive offices of Pró-Guaíba in coordinating and monitoring the program, support the preparation of subsequent phases and strengthen the institutional capacity for integral basin management. The component comprises four main activities: (i) establishing a geographical information system (SIGPROGB); (ii) preparation of an information and communications plan; (iii) development and training; and (iv) formulation of the master plan for management of the watershed.
- 2.59 SIGPROGB is being set up to compile, file and analyze special data. The system would serve as an instrument for planning the use of natural resources and monitoring the program. It will encompass 14 modules in which thematic data will be generated on scales of 1:250,000 and 1:50,000 for the entire watershed; 1:10,000 for urban areas and priority microwatersheds; and 1:2,000 for the city of Porto Alegre and the conservation units.
- 2.60 Eight laboratories would be established in the principal executing agencies: SPA, METROPLAN, FEPAM, FZB, CORSAN, the Education Secretariat, EMATER and the Municipality of Porto Alegre.
- 2.61 The information and communications plan is designed to systematically disseminate the results of the program internally among the executing agencies and in the community.
- 2.62 The purpose of the human resources training is to instruct the administrative and technical staff in activities relating to watershed management and in specific sector areas of interest in the program components. The objective is to hold a total of 240

events - courses, seminars, technical visits and in-service training - for approximately 3,600 beneficiaries.

2.63 Implementation of the master plan for integrated watershed management, on this sort of scale, entails a long process of studies, updating of analyses, technical consultations and consultations with the public and special interest groups. Moreover, actions and projects must be identified that, once ranked in order of priority, will be included in the different phases of a program with a planning horizon of several years.

2.64 In order to supplement the existing data and studies and prepare the subsequent phases of the program, the preparation of a master plan for control and environmental administration of the watershed will be contracted out. It will include updating biophysical and socioeconomic analyses, establishing strategies, identifying and analyzing options for environmental intervention, and prioritizing investments that will help resolve environmental problems. The projects selected as priorities will undergo feasibility studies, and the final designs of those slated for inclusion in phase II of the program will be prepared.

C. Program cost and financing

1. Total cost

2.65 The total cost of the program has been estimated at US\$220.5 million equivalent, according to the breakdown shown in Table II-1.



<b>TABLE II-1</b> <b>INVESTMENT COSTS BY CATEGORY AND SOURCE OF FUNDING</b> <b>(thousands of U.S. dollars)</b>					
CATEGORY/TOTAL BY FUND	OC	FSO	LOCAL	TOTAL	% OF TOTAL
ENGINEERING AND ADMINISTRATION	0	0	2,208	2,208	1.0
DIRECT COSTS	81,805	18,502	20,901	121,208	54.9
Sewers, Cachoeirinha/Gravataí	50,073	0	426	50,499	22.9
Sewers, Porto Alegre	24,633	0	3,521	28,154	12.7
Solid waste, Porto Alegre	1,399	0	576	1,975	0.8
Conservation units	1,000	5,600	5,728	12,328	5.5
Soil management and agROTOXIN control	4,740	12,902	10,610	28,252	12.8
ASSOCIATED COSTS	5,141	0	43,464	48,605	22.0
Industrial pollution control	1,165	0	5,895	7,060	3.2
Environmental monitoring network	2,053	0	7,799	9,852	4.4
Geographical information system	1,923	0	5,004	6,927	3.1
Human resources training	0	0	1,335	1,335	0.6
Public information plan	0	0	1,691	1,691	0.7
Environmental education	0	0	2,417	2,417	1.0
Guaíba watershed master plan	0	0	7,125	7,125	3.2
Studies, conservation units	0	0	1,537	1,537	0.6
Solid waste master plan	0	0	510	510	0.2
Acquisition of land	0	0	9,951	9,951	4.5
Resettlement of families	0	0	200	200	0
SUBTOTAL	86,986	18,502	66,533	172,021	78.0
UNALLOCATED	22,112	3,377	3,888	29,377	13.3
Contingencies	8,733	1,868	1,848	12,449	5.6
Price escalation	13,379	1,509	2,040	16,928	7.6
FINANCE CHARGES	1,102	221	17,779	19,102	8.6
Interest	0	0	16,054	16,054	7.2
Credit fee	0	0	1,725	1,725	0.7
Inspection and supervision	1,102	221	0	1,323	0.6
T O T A L	110,200	22,100	88,200	220,500	100.0
% FUNDING SOURCE/TOTAL PROJECT	50.0	10.0	40.0	100	--

## 2. Description of investment categories

### a. Engineering and administration

- 2.66 This category represents 1% (US\$2,208,000) of the total cost and consists of: (i) US\$1,994,000 to cover the costs of hiring a consulting firm that will support the executing unit in program administration; and (ii) US\$214,000 for additional staff and other costs attributable to the operation of the unit.

b. Direct costs

- 2.67 The direct costs represent 54.9% (US\$121,208,000) of the total cost. These costs were determined based on: (i) the budgets (updated to June 1992) of each of the projects under consideration; and (ii) unit prices, also updated to June 1992, based on quotes sought from manufacturers and suppliers and on comparisons with the construction costs of similar works.

c. Associated costs

- 2.68 This category accounts for 22% (US\$48,605,000) of the total program cost and includes costs of: (i) control of pollution and environmental monitoring; (ii) promotion of the program and training staff of the co-executing agencies; (iii) conducting the environmental education project and the studies and designs for the second stage of the program; and (iv) acquisition of land and relocation of families living in the areas where program works are to be carried out.

d. Unallocated costs

- 2.69 The costs in this category constitute 13.3% (US\$29,377,000) of the total cost and include contingencies (6% of the total) and cost escalation (7.6% of the total).

e. Finance charges

- 2.70 These costs represent 8.6% of the cost of the program and include interest during program execution (US\$16,054,000), the credit fee (US\$1,725,000) and inspection and supervision (US\$1,323,000).

3. Financing plan

a. IDB funds

- 2.71 IDB financing in an amount of US\$132.3 million is proposed that will cover 60% of the total program cost. Of that amount, US\$110.2 million (50%) will be a loan in foreign currency from the ordinary capital resources, and US\$22.1 million (10%) a local currency loan from the Fund for Special Operations.

b. Local counterpart funding

- 2.72 The local counterpart funding of US\$88.2 million equivalent will finance 40% of the program. This amount will be contributed by the government (US\$78.9 million), DMAE (US\$8.4 million) and the municipal government of Porto Alegre (US\$900,000).

### III. PROJECT EXECUTION

#### A. Basic arrangements for execution

- 3.1 The executing agency will be the Secretariat of Planning and Administration (SPA) of the State of Rio Grande do Sul, which, through an executing unit that has already been set up, will administer, coordinate and supervise program execution. The Pró-Guaíba Fund has been established within the secretariat. This fund will initially consist of the proceeds of the loan and the local counterpart and will be used to expedite program execution, supervision and control. The executing agency will channel resources through the fund to the co-executing agencies to finance the plans, projects and actions called for in the program. The Pró-Guaíba Fund was established by Decree-Law 9,893 of June 2, 1993.
- 3.2 For program execution, the Government of the State of Rio Grande do Sul, through SPA, will sign agreements and contracts with the co-executing agencies. These legal instruments will establish, *inter alia*: (i) the terms of transfer of the resources from the Pró-Guaíba Fund to the co-executing agencies; (ii) the source and amounts of the local counterpart funding; (iii) the terms that will govern the operation of the program; and (iv) the mutual obligations between the state government, the executing agency and the co-executing agencies. These documents have been pre-negotiated between the executing agency and the co-executing agencies and were reviewed by the Bank's project team. They constitute conditions precedent to the first disbursement. 5/

#### 1. The executing unit

- 3.3 The executing agency will carry out the program through an executing unit, which will have the following principal functions: (i) to administer, coordinate and generally supervise the program; (ii) to transfer resources from the Pró-Guaíba Fund to the co-executing agencies; (iii) to conduct the studies and projects for institutional support and strengthening; (iv) to maintain an accounting and financial system that ensures proper control of the program investments and operations; (v) to prepare and process with the Bank requests for disbursement of the loan proceeds; and (vi) to adopt the necessary measures to ensure that all provisions of the loan contract with the Bank are satisfactorily met. The executing unit will be headed by an executive secretary and supported by a management committee.

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5/ See proposed resolution.

- 3.4 The management committee will recommend specific rules and regulations and will evaluate program progress. It will be made up of the presidents and directors-general of the co-executing agencies and the executive secretary of the executing unit.
- 3.5 The executing unit consists of three units: technical, data processing, and financial-accounting/support. The technical unit will serve as a liaison between the executive secretary and the co-executing agencies. It will monitor each project and the progress of the program as a whole. The data processing unit will develop the Pró-Guaíba geographical information system (SIGPROGB) and automate the program planning and control functions. The financial-accounting and support unit will be responsible for: (i) program accounting; (ii) execution and auditing of the funds flows of the projects based on their execution schedules; and (iii) secretarial support and general services of the executing unit.
- 3.6 Throughout program execution, the executing unit will be supported by a consulting firm to be engaged as a condition precedent to the first disbursement. 6/

## 2. Execution of the program components

- 3.7 The components will be executed by the agencies that are by law directly responsible for acting in each of the specific areas of the program. The construction of works and permanent improvements entailed in the projects, and the procurement of equipment, materials and other goods, will be conducted through international public bidding, in accordance with the procedures agreed upon between the borrower and the Bank.
- 3.8 All the agencies involved in execution have the experience and capacity to perform the responsibilities assigned to them under the program. The following chapter analyzes the institutional and financial capabilities of CORSAN and DMAE, which are to pay to the State the portion of the loan proceeds each receives. The conclusions of the institutional analysis of the other participating agencies are noted as well.
- a. Prevention and control of residential and industrial pollution
- 3.9 CORSAN will execute the Cachoeirinha and Gravataí sewerage systems project through a project management unit reporting directly to the office of the president, with support from the agency's organizational structure. The financial conditions of the contract for transfer of funds to CORSAN will be identical to those of the Bank's loan, and recoveries will be used to repay the Bank.

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6/ See proposed resolution.

- 3.10 DMAE will conduct the Porto Alegre sanitary sewerage systems project through a project management unit that will report to the director general, with support from the department's technical and administrative structure. The financial conditions of the contract for the transfer of funds to DMAE will be identical to those of the Bank's loan, and recoveries will be used to repay the Bank.
- 3.11 DMLU will conduct the project involving the plan of basic actions for solid waste management in Porto Alegre, through a project management unit reporting directly to the director general, with support from all of the department's technical, operational and administrative units.
- 3.12 To finance the project, DMLU will sign a contract for transfer of funds with the executing agency for US\$1.7 million equivalent, and will receive from the Porto Alegre municipal government no less than US\$900,000 equivalent through budgetary appropriations. The conditions of the contract for transfer of funds to DMLU will be identical to those of the Bank's loan, and recoveries will be used to repay the Bank.
- 3.13 FEPAM will be responsible for the monitoring network and action plan for control of environmental pollution, through its technical department which will be supported by the agency's technical and administrative structure. FEPAM will sign a funds transfer agreement with the executing agency that will cover all project costs. The agreement will require FEPAM to meet the environmental licensing targets listed in paragraph 2.8. In addition, for execution of the monitoring network, FEPAM will sign an agreement with CORSAN and DMAE that will outline the latter agencies' participation in the project.
- 3.14 Lastly, METROPLAN, the state agency responsible for preparing and updating the integrated development plan of the Porto Alegre metropolitan region, will produce the study of the master plan for solid waste management in that region, through its technical department, which will hire a consulting firm to conduct the study. To that end, METROPLAN will enter into an agreement with the executing agency, whereby the government will transfer funds to METROPLAN to cover all costs of the study.
- 3.15 As a condition precedent to the first disbursement of the loan, the Bank must be presented with evidence that: (i) the loan contracts between the government and CORSAN, DMAE and DMLU have been signed (the drafts of these contracts are in PRA files); (ii) the general agreement that the executing agency (SPA) is to sign with FEPAM, METROPLAN and other institutions for the transfer of program funds has been signed (the draft of this agreement is on file in PRA); and (iii) FEPAM, CORSAN and DMAE have signed the agreement setting

out the terms of their participation in the monitoring network project. 1/

b. Soil management and control of toxic agricultural chemicals in priority microwatersheds

- 3.16 The works and improvements in the priority microwatersheds under this component will be financed by means of a permanent revolving fund, the value of which will be maintained from the beneficiaries' repayments. The farmers who participate in the program will process their applications through the municipality to EMATER, the agency responsible for providing the necessary technical assistance and that would contract for the services and inputs needed for execution. EMATER will administer the fund that will serve small farmers in order to encourage and facilitate the adoption of soil management and conservation technologies, control of pollution by toxic chemicals and reforestation. These works will have individual and collective benefits.
- 3.17 EMATER/RS will be responsible for: (i) administering the resources of the component; (ii) analyzing and evaluating the farmers' applications; (iii) approving operations and executing the contracts; (iv) collecting repayments; and (v) keeping the accounts of the fund. Moreover, EMATER/RS will: (i) work directly with the beneficiaries and provide technical assistance to complete the applications for works and improvements; and (ii) conduct technical evaluations and supervise the activities of the beneficiaries.
- 3.18 EMATER will call for bids to purchase lime and fertilizers to be given to the participating farmers. EMATER may delegate the procurement of the other goods and services to legally-established groups and nongovernmental organizations (NGOs) that are located within the priority subbasins. The procedures for executing this component will form part of the regulations of the permanent revolving fund, reviewed by the Bank, which will enter into effect prior to the disbursement of the funds of this component.

c. Consolidation of conservation units

- 3.19 The Fundação Zoobotânica (FZB), through a project management unit, will be responsible for: (i) the studies of parks and reserves; and (ii) consolidation of the Jacuí Delta Park, Porto Alegre Botanical Garden, and Sapucaia do Sul Zoological Park. To receive financing, FZB will sign an agreement with the executing agency.
- 3.20 The Secretariat of Agriculture and Provisioning (SAA) will conduct the project to consolidate the state parks of Itapoã and the Serra Geral Biological Reserve, through its renewable resources department (DRNR), that in turn will set up a unit to execute the

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1/ See proposed resolution.

project. DRNR is a technical department of the secretariat, with responsibility for coordination, promotion and preparation of activities relating to the use of renewable natural resources. To conduct the project, SAA will sign an agreement with the executing agency. 8/

d. Environmental education and awareness training

- 3.21 This component will be executed by the Education Secretariat (SE), the government department responsible for the intellectual, moral, civic and professional education of the state's citizenry.
- 3.22 The master plan for environmental education will be the responsibility of SE through its Environmental Education Committee (CEA/SE), set up in February 1992. This committee will plan and coordinate the actions of CEAs in nine core schools which will conduct pilot experiments to produce the necessary input for preparation of the environmental education master plan. SE will sign an agreement with the executing agency to receive the funds allocated to its project. 9/

e. Institutional management and strengthening

- 3.23 For the human resources training project, the executing agency will sign a services agreement with the Fundação para o Desenvolvimento de Recursos Humanos (FDRH), which is responsible for training state government staff and is attached to the executing agency. To produce the watershed management master plan, the executing agency will engage the services of a consulting firm. As a condition precedent to the first disbursement, the Bank must be presented with evidence that the services agreement has been signed between the executing agency and FDRH. 10/
- 3.24 The geographical information system (SIGPROGB) will be directly executed by the technical and administrative areas in the executing unit. The public information plan will be carried out by the advisory and public affairs unit of the executing agency, under the supervision of the executing unit.

B. Period of program execution

- 3.25 The period for execution of the program is four years from the effective date of the loan contracts (OC and FSO). This period is consistent with the scale of the program, the type of activities scheduled, the institutional capacity of the executing agency and the co-executing agencies and counterpart funding possibilities.

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8/ See proposed resolution.

9/ See proposed resolution.

10/ See proposed resolution.

C. Execution procedures

- 3.26 The works of the component of control of residential and industrial pollution will be contracted out to specialized construction companies, through international calls for tenders. The procurement of piping, materials, equipment and its assembly, and other goods will be conducted similarly through international public bidding.
- 3.27 The works of the component of soil management and control of toxic agricultural chemicals will be contracted out to farmers in the microwatersheds; goods and services will be acquired by EMATER and legally-constituted groups (cooperatives, NGOs and others). EMATER staff will be responsible for the technical assistance and extension activities. Equipment and vehicles will be acquired through calls for tenders.
- 3.28 The works for the parks and reserves component will be contracted out to specialized construction companies. For the environmental education component, supplies and equipment will be acquired through calls for offers from prequalified firms. Counterpart funds will be used to defray the travel and per diem expenses of Education Secretariat staff. Participation agreements will be signed with universities, municipalities and NGOs.
- 3.29 Equipment for the geographical information system in the institution-strengthening component will be procured through international public bidding.

D. Tendering schedule

- 3.30 The schedule of calls for bids and consulting services below includes 28 international public tender calls and six competitions to select and hire consultants.
- 3.31 The following is the schedule of bid calls envisaged for execution of the various components.



SCHEDULE OF CALLS FOR BIDS AND CONSULTING SERVICES		
AGENCY AND TYPE OF TENDER	YEAR 1	YEAR 2
	X X X X X X	X X X X X X
<b>A. <u>CORSAN - Sewerage - Cachoeirinha/Gravatá</u></b> 1. Materials Sewer systems 2. System construction: With house connections 3. Materials, equipment, construction: Pumping stations 4. Materials, equipment, construction: Treatment plants and discharge	X X X	X X X  X X X  X X X
<b>B. <u>DMAE - Sewerage - Porto Alegre Southern zone - Ipanema</u></b> 1. Materials, equipment, construction: Sewer systems and pumping stations 2. Materials, equipment, construction: Treatment plant and discharge <b><u>São João-Navegantes</u></b> 1. Electromechanical equipment: Treatment plant 2. Construction and assembly: Treatment plant and discharge	X X X   X X X	X X X   X X X
<b>C. <u>FEPAM - Industrial pollution control</u></b> 1. Equipment procurement and assembly Monitoring network and laboratories 2. Registry of industrial pollution sources	X X X  X X	
<b>D. <u>DMLU</u></b> 1. Civil works and equipment Special collection, Porto Alegre 2. Sundry equipment and materials Selective collection, schools 3. Recycling of solid waste Equipment, assembly, civil works 4. Materials, equipment, construction Waterproofing, leachate treatment	X X  X X  X X	X X X
<b>E. <u>METROPLAN - Studies</u></b> 1. Solid waste master plan for metropolitan region	X X	
<b>F. <u>SPA - Equipment</u></b> 1. Engineering and administration 2. Master plan for watershed management 3. Feasibility studies and designs for phase II projects 4. Vehicles 5. Computer hardware and software 6. Operation and maintenance of SIGPROGE 7. Aerial surveying 8. Office equipment and publicity	X X X X   X X X X X X X X	X X
<b>G. <u>FZB - Parks</u></b> 1. Works for Jacuí Delta Park 2. Works for Zoological Park 3. Works for Botanical Garden	X X X X X X	
<b>H. <u>EMATER</u></b> 1. Lime 2. Fertilizer	1st quarter each year (4) 2nd quarter each year (4)	

X - two months

E. Investment schedule

- 3.32 The following investment schedule is based on the programming of activities of each of the agencies responsible for each specific project.

TABLE III-10 INVESTMENT SCHEDULE (US\$000)						
SOURCE OF FUNDS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	TOTAL	%
IDB loan - OC	18,679	21,568	39,368	30,585	110,200	50
IDB loan - FSO	8,860	4,584	4,473	4,183	22,100	10
Local counterpart	22,308	25,452	23,420	17,020	88,200	40
TOTAL	49,847	51,604	67,261	51,788	220,500	100

F. Capacity of contractors and prequalification of firms

- 3.33 Contracts for the consulting services indicated will be awarded to firms following procedures prescribed in Brazilian legislation, and the cost of the services will be fully covered by local counterpart funding. However, the terms of reference for each contract are to indicate the minimum necessary staff, the engineering and laboratory equipment required, the nature and frequency of technical and administrative controls to be performed and the content and frequency of reports to be submitted. There are sufficient qualified consulting firms in Brazil to provide the consulting services envisaged in this program. The system of prequalification will be used for the six largest tender calls for construction works, including the sewage treatment plants and trunk and intercepting sewers.

G. Operation and maintenance

- 3.34 The agencies that are to implement the projects under the program will be responsible for administration, operation and maintenance of the works and equipment to be installed, which will form part of the systems for which they have responsibility. It has been verified that the executing agencies have the necessary staff and resources for this purpose.
- 3.35 Three of the four residential sewage treatment plants to be built will have a parallel staged anaerobic, facultative, and maturation pond configuration. The operation and maintenance of this type of facility is simple and well-known. Two of these plants will be operated and maintained by CORSAN and the third by DMAE. The fourth plant will use the activated sludge process; DMAE has experience in similar facilities, albeit of smaller capacity. Nevertheless, since both institutions have qualified staff in

sufficient numbers, there are expected to be no problems that would stand in the way of satisfactory performance of the additional responsibilities that would fall to them for operation and maintenance of the new works.

- 3.36 It is recommended that the loan contract include a provision whereby CORSAN, DMAE, FZB and DRNR must annually present to the Bank, within the first calendar quarter of each year for 10 years starting from the year following the completion and entry into service of the works, an annual operation and maintenance plan for those works, including a report on performance of the previous year's plan and on the state of repair of the systems. 11/

H. External auditing

- 3.37 The agreements and contracts between the executing agency and the co-executing agencies are to stipulate that the agencies participating in the program must undertake to keep and provide accounts on the use of funds pursuant to the accounting and auditing standards of the state general accounting and official auditing offices. It is recommended that the loan contract stipulate that, for the life of the contract, the financial statements of the project of CORSAN and of DMAE are to be submitted to the Bank each year, after having been audited by a reputable firm of independent auditors acceptable to the Bank. This firm is to conduct the audit under the supervision of the Treasury Department of the Ministry of Finance. The financial statements of the borrower are to be presented to the Bank each year throughout the life of the loan contract, after having been audited by a reputable firm of independent auditors acceptable to the Bank.

I. Special considerations

1. CORSAN

- 3.38 The state's environmental control authority has granted preliminary and installation permits for the projects of sanitary sewerage and treatment plants in Cachoeirinha and Gravataí.
- 3.39 In accordance with the explanations given in the description of the status of preparation of the projects, and bearing in mind that the pollution of the Gravataí River is coming from point and nonpoint sources and that this stage will resolve only part of the point-source problem, it is recommended that the contract require CORSAN to submit to the Bank, within 30 months from the effective date of the loan contract, technical and economic feasibility studies and final designs for the least-cost technically feasible alternative to replace the existing water supply intakes. This study would

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11/ See Recommendation.

form part of the master plan for management of the Guaíba River watershed. 12/

## 2. DMAE

3.40 DMAE has submitted the preliminary installation permits granted by FEPAM for the projects in the southern zone of Porto Alegre and São João-Navegantes.

3.41 Part of the municipal land needed for construction of the São João-Navegantes plant is occupied by a group of low-income families. The plan to relocate these families has been presented, and as a condition precedent to the awarding of the construction contract DMAE is to provide proof that the resettlement process has been completed. 13/

## 3. FEPAM

3.42 In connection with the action plan for control of industrial pollution, in view of its impact and importance in the context of the component as a whole, it is recommended that the contract require FEPAM, through SPA, to present to the Bank: (a) semiannual progress reports showing the number of industries licensed, in compliance with the targets set for each year, and estimated reductions in pollution to be achieved; (b) a comprehensive interim report, including an action plan, within 12 months from the effective date of the loan contract, in which the originally proposed goals will be reviewed; and (c) a final report for each of the four phases scheduled, within 42 months from the effective date of the loan contract, together with proof of which industries have set up effluent treatment and pollution control units and which goals have been actually achieved. 14/

## 4. FEPAM, CORSAN and DMAE

3.43 As regards the environmental monitoring network, it is recommended that a contractual commitment be included whereby FEPAM, CORSAN and DMAE, through SPA, agree to submit jointly to the Bank the duly signed inter-agency agreement setting out the terms and conditions of their joint participation in this project, prior to the first disbursement for the project. 15/

## 5. METROPLAN

3.44 It is recommended that within 30 months from the signature of the loan contract, METROPLAN, through SPA, submit to the Bank for

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12/ See Recommendation.  
13/ See Recommendation.  
14/ See Recommendation.  
15/ See Recommendation.

consideration the results of the master plan for solid waste management in the metropolitan region of Porto Alegre. 16/

6. Studies of subsequent phases

- 3.45 It is recommended that within 36 months after signature of the loan contract, the executing agency submit to the Bank for consideration the results of the watershed management master plan. 17/
- 3.46 The studies will include feasibility assessments and designs for the works and activities that would make up the subsequent stages, to ensure protection and management of the watershed.

J. Ex post evaluation

- 3.47 In order to assess achievement of targets, the socioeconomic impact of the program and the extent to which its objectives have been met, the borrower is to present to the Bank an ex post evaluation report using a methodology similar to that used for the ex ante appraisal, including a cost-benefit analysis and analysis of internal rate of return, and other pertinent sociocultural results. This report must be submitted at the end of the second year after the date of the final disbursement of the financing.
- 3.48 For purposes of the ex post evaluation required by the Bank, records must be kept of the following data:
- a. Pollution control: (i) population of each area served, number of sewer connections and population served, percentage of water treated; (ii) rates paid for sewerage service and comparison with the marginal cost for different customer categories; (iii) indicators of water quality in the Gravataí River and Lake Guaíba; and (iv) actual operation and maintenance costs of the sewer and sewage treatment systems.
  - b. Soil management and control of toxic agricultural chemicals: (i) level of adoption and execution of the practices programmed; (ii) socioeconomic data on the beneficiaries, output, productivity, farm production and maintenance costs; and (iii) execution of the support fund for farmers and recovery of investments.
  - c. Conservation units (UCs): (i) area actually protected; (ii) number of visitors per UC; (iii) actual cost of supervision, operation and maintenance of the UCs; and (iv) admission receipts as a percentage of operating costs.

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16/ See Recommendation.

17/ See Recommendation.

K. Environmental issues and consultation with the population

- 3.49 The program and its individual components have been designed to monitor and alleviate environmental problems and promote sustainable management of renewable natural resources in the Guaíba River watershed. The Environmental Management Committee (CMA) classified this operation in Category III at its meeting of November 26, 1991, and approved the environmental summary on March 9, 1993.
- 3.50 The preparation and design of the program have taken into account the CMA's recommendations, and contract conditions have been proposed to allow for verification of compliance with the environmental objectives and targets of the program.
- 3.51 The principal environmental effects of the program can be summarized as follows:
- a. Improvement in sanitation conditions in Porto Alegre and its metropolitan region (RMPA) by cleaning up creeks and doing away with open sewage canals, serving more than 400,000 inhabitants of the RMPA. Recreational activities should be enhanced in beach areas in the southern zone, which attract large numbers of the region's residents.
  - b. Improvement in the quality of the region's surface water. Intercepting sewers will keep raw sewage from flowing into the Gravataí River and Lake Guaíba. This will not have a major impact on the quality of Lake Guaíba, owing to the large volume of flow that enters it from the other tributaries in the drainage area. Nevertheless, improvements in the quality of raw water will be seen at the drinking water intakes of the São João, Moinhos de Vento and José Loureiro da Silva stations, located in the RMPA.
  - c. Improvement in sanitation conditions of the city of Porto Alegre by upgrading the refuse collection and disposal systems. This will cut down on odors and help with vector control in the surrounding area and in about 25 hectares of reclaimed landfill.
  - d. Decrease in the use of toxic agricultural chemicals due to the use of integrated pest control technologies, construction of facilities for packaging and disposal of toxic farm chemicals and the use of protective equipment.
  - e. The decrease in use of plant protection systems would lead to a 24% reduction in the total use of toxic chemicals by the third year. The estimated 719,000 kg being used on properties that would be served directly would drop to 547,000 kg.
  - f. The soil conservation systems will help check erosion, improve soil moisture and reduce nutrient depletion caused by washing

out of soil. This will open the way for increased lime use and better fertilizer approaches.

- g. An increase in knowledge of the watershed's ecosystems and their interrelationship will provide a basis for improving their management and protection. Habitats and species typical of the region, some of them endangered, will be preserved. Study and maintenance of gene banks for plants and animals that would make possible improved germplasm and the development of restocking programs. Important historical monuments will be restored. The recreational choices of the population in the metropolitan area will be expanded and will become vehicles for environmental education.
  - h. With the master plan for environmental education in the state and pilot environmental programs in designated core schools, environmental issues can be built into the curriculum and into the general education process.
- 3.52 During the preparation of the operation, consultations were held with the prospective beneficiary population, universities, technical agencies and NGOs.
- 3.53 The consultations with the population took place in the municipalities that would take part in the program. There were several working meetings with universities, technical agencies and NGOs that culminated in a plenary meeting in Porto Alegre on November 19, 1992. In all cases, the focus was on social groups that would be direct beneficiaries or are affected and with the most representative local NGOs. The NGOs will continue to participate throughout the program as members of the deliberative council that has been set up.

L. Participation of women

- 3.54 In Rio Grande do Sul, women have traditionally played an important role in public administration, especially in the areas of education, natural resources and environmental control. The program does not call for activities specifically targeted to women, but includes opportunities that will make it easier for women to play a part in resolving environmental problems, from the grass roots up to the highest levels. Training and support programs that would benefit women in rural and urban areas have been included as well.

M. Program risks

- 3.55 Execution of this program will require effective coordination between state and local public sector institutions, the private sector and the beneficiary communities. The task of coordination has been assigned to the Executive Secretariat of Pró-Guaíba, which through agreements and contracts determines the legal and administrative mechanisms that define the participation of each

organization. This arrangement, which is standard in multisector projects, could entail risks given the following circumstances: (i) ineffective organization and insufficient autonomy of the coordinating agency; (ii) lack of participation of one or more of the institutions involved, which could jeopardize achievement of the proposed pollution abatement targets, which address the combined impact of pollution from industry, households, and toxic agrochemicals; (iii) insufficient and belated allocation of the counterpart funds; and (iv) delay in tendering and contract awards for goods and services. Provisions have been made to lessen these risks, in the design of the structure of the Executive Secretariat of Pró-Guaíba and its committees. A consulting firm would work with the secretariat, with responsibilities for programming, supervision, financial management and evaluation of the program. Special care has been taken to ensure that all the institutions have prenegotiated and spelled out the respective spheres of authority and responsibility and the obligations falling to each under the program. These undertakings will be set out in agreements that must be formally executed as a condition precedent to the first disbursement.

- 3.56 The ultimate objective of management and reclamation of the Guaíba River watershed will require the achievement of short-, medium- and long-term goals that call for investments tentatively estimated at US\$1 billion. Any break in continuity would jeopardize attainment of the proposed objectives. This risk would be lowered to the extent that the public continues to take part in and support the program, and the political concord between the state and municipal governments endures.



#### IV. THE BORROWER, EXECUTING AGENCY AND CO-EXECUTING AGENCIES

- 4.1 The borrower will be the State of Rio Grande do Sul, which will supply local counterpart funding for the program equivalent to US\$88.2 million. The executing agency will be the Secretariat of Planning and Administration (SPA), through an executing unit set up for this purpose. The Federative Republic of Brazil will act as guarantor of the loan.
- 4.2 An analysis of the state's finances shows that with the measures it has brought in to boost government revenues and lower operating costs, and with the renegotiation of its debt to the federal government now complete, it will be able to meet its counterpart funding and loan repayment obligations.
- 4.3 CORSAN, DMAE and DMLU will repay to the state the portion of the loan proceeds received by each of them, on the same financial terms and conditions as the Bank's loan. The other co-executing agencies will receive funds in the form of transfers.

##### A. The borrower

##### 1. Income and expenditure

- 4.4 This section examines the most important budgetary issues. The budget data are expressed in constant currency of December 1992 and converted to U.S. dollars at the exchange rate on that date.
- 4.5 The state's most important source of revenue is the goods and services tax (ICMS), which brought in 65% of current revenues in the period 1989 to 1992. From 1990 to 1992, ICMS receipts suffered a 15% decline, from US\$2,034,700,000 in 1990 to US\$1,735,200,000 in 1992.
- 4.6 The drop in ICMS receipts was due to the national recession, which drove incomes down in those years, and to ongoing and steadily increasing tax evasion. To rectify this situation, the state adopted the following measures: (i) an increase in the ICMS rate on fuels and general goods, which should yield an average increase of 12% in tax receipts for 1993; and (ii) an amnesty program for fines and interest, giving a period of up to 20 years to pay taxes owing. The effects of these measures will be reflected in the budgets from 1993 forward.
- 4.7 On the expenditure side, in 1993 the state will implement a plan called the Administrative Reform of the State, which is expected to reduce operating costs by 20% in the next two years.

## 2. Current savings and surplus

- 4.8 As shown in Table IV-1, the state has obtained a positive balance on current savings to finance its investments in each of the years analyzed. However, current savings have shown considerable variations, dropping from US\$704.1 million in 1989 to US\$35.4 million in 1990, then recovering to US\$224.9 million in 1991 and US\$272.8 million in 1992.

TABLE IV-1 BUDGETARY INCOME AND EXPENDITURE - RIO GRANDE DO SUL (RS) (US\$ millions)				
	1989	1990	1991	1992
Current revenue	3,014.3	2,827.4	2,580.3	2,917.3
Current expenditure	2,310.2	2,792.0	2,355.4	2,644.5
Current savings	704.1	35.4	224.9	272.8
Capital receipts	166.2	700.9	271.7	359.0
Capital expenditure	832.5	892.3	558.4	808.3
Surplus (deficit)	37.8	(156.7)	(61.8)	(176.5)

- 4.9 Table IV-2 shows that in the last four years, with the exception of 1990, current savings have been sufficient to cover net debt amortization (defined as total annual amortization less rollover of bonds held by the public which mature in the year). In 1991 and 1992, current savings exceeded the net amortization payment by US\$172.6 million and US\$233.5 million respectively, indicating that the state would be able to supply the local counterpart funding for the program, which would average US\$20 million per year for each of the four years of execution.
- 4.10 The state reported a deficit in each of the years examined except 1989, in which there was a surplus of US\$37.8 million. The largest deficit was posted in 1992: US\$176.6 million, equivalent to 6% of current revenues that year. However, the state hopes to eliminate the deficit in 1993 by increasing current revenue owing to higher ICMS rates and the expected reduction in operating costs as its Administrative Reform Plan is implemented.

TABLE IV-2 NET AMORTIZATION OF STATE DEBT (US\$ millions)				
	1989	1990	1991	1992
TOTAL AMORTIZATION	265.9	328.4	327.9	444.5
- BOND ROLLOVER	112.1	174.7	275.6	405.2
= NET AMORTIZATION	153.8	153.7	52.3	39.3
CURRENT SAVINGS	704.1	35.4	224.9	272.8
AVAILABLE FOR INVESTMENT	550.3	-118.3	172.6	233.5

### 3. Indebtedness

- 4.11 The state debt (US\$2,353,000,000 in 1992) is broken down into domestic and external. The domestic debt (US\$2,101,000,000 in 1992) consists of state security issues (US\$1,629,000,000 in 1992) and loans contracted with the federal government (US\$472 million in 1992). The state's external debt comprises borrowings from multinational organizations and commercial banks (US\$252 million in 1992). Table IV-3 shows the status of the debt from 1989 to 1992.

TABLE IV-3 DEBT STATUS - RS (US\$ millions)				
	1989	1990	1991	1992
TOTAL DEBT	2,292	2,077	2,033	2,353
DOMESTIC DEBT	2,089	1,852	1,775	2,101
- Bonds	1,357	1,141	1,214	1,629
- Agreements - Current	490	697	545	293
- Agreements - Arrears	242	14	16	179
EXTERNAL DEBT	203	225	258	252
- Agreements - Current	203	159	128	95
- Agreements - Arrears	0	66	130	156

- 4.12 The state has consistently met its securities obligations. Payments on the external debt were current in 1989. Between that year and 1992, the state accumulated external debt arrears equivalent to US\$156 million, since that debt is affected by the negotiations under way between the country and commercial banks, and the state can only make the payments stipulated by the central bank. The state also had US\$179 million in arrears with the federal government in 1992. This situation came about because in 1990 the states began negotiations to reschedule their debt to the federal government. This process was concluded before the operation proposed herein was negotiated with the Bank.
- 4.13 As shown in Annex IV-1, except for 1990, the level of indebtedness of the state has remained within the limits established in Senate Resolution 36 of June 30, 1992. In general terms, that resolution

stipulates that the annual borrowings of a state must not exceed 27% of its "net revenues" (current revenue less transfers to municipalities), and that debt service must not exceed 15% of net revenues plus current savings.

B. CORSAN

1. Institutional analysis

a. Nature and objectives

- 4.14 CORSAN was created on December 21, 1965 by means of a state law. It is a joint stock company, in which the state of Rio Grande do Sul will always be the majority shareholder.
- 4.15 The principal functions of the company are: (i) to plan and execute new works and expansions of water and sewer works; (ii) to operate and maintain the state's water supply and sewerage services; and (iii) to set rate schedules and prices for the various services such that they cover amortization of investments, operating and maintenance costs and constitution of a reserve fund to finance future service expansions.

b. Basic organization

- 4.16 The highest authority of CORSAN is the General Assembly of Shareholders, which elects members of the supervisory board and the board of directors. The latter appoints the president and managing director, who heads the company. At the operational level, the president is supported by an organization and planning advisory unit and by the following departments: Development, Operations, Marketing, Finance and Administration.
- 4.17 From the analysis conducted, it is felt that the company's organizational structure is adequate and the distribution of functions and responsibilities is acceptable.

c. Administration

- 4.18 The processes for planning, programming, calling for tenders, supervising, operating and maintaining the projects under analysis within the program have been reviewed and analyzed. These processes, along with the information, control and collection systems, are adequate for execution and operation of the projects for which CORSAN would be responsible.

d. Personnel

- 4.19 As shown in Table IV-4, CORSAN's total staff increased 5% from 5,025 employees in 1989 to 5,321 in 1992. The relative percentage of professional and technical personnel, around 40% of the company's total, remained virtually unchanged during the period.

During those same years, the number of water connections increased 10% and the number of sewer connections 7%, denoting an increase in staff productivity.

TABLE IV-4 CORSAN STAFF BY LEVEL OF TRAINING				
STAFF	NUMBER OF EMPLOYEES			
	1989	1990	1991	1992
Professional	473	488	501	502
Technical	1,519	1,567	1,609	1,609
Other	3,033	3,127	3,212	3,210
Company total	5,025	5,182	5,322	5,321

e. Rates

- 4.20 CORSAN's rates system is governed by a federal government decree of November 1978, which requires that the company's rates generate sufficient income to cover its operating costs and yield up to a maximum rate of return of 12% on fixed investment. This rates policy is consistent with Bank policies.
- 4.21 To ensure that the company always has the necessary resources to meet its obligations, it is recommended that the eventual loan contract stipulate that the borrower and CORSAN must adopt all necessary measures to ensure that the net operating income from the rates charged in all the systems run by the company is sufficient to: (i) cover all costs of administration, operation, maintenance and depreciation of its restated fixed assets; and (ii) produce net internal generation sufficient to fund at least 40% of its annual investment plan.

f. Internal control

- 4.22 The company has in place administrative procedures to ensure proper internal control. To supplement these procedures, there is an internal audit office reporting directly to the president. The designated functions and activities of this office are sufficiently well-defined. It has adequate specialized personnel, manuals and systems, and it should be able to provide the necessary support for the new projects without difficulty.

g. External audit

- 4.23 The company's financial statements are audited by independent public accounting firms and by the state's official audit office. It is recommended that during the life of the loan contract the financial statements be submitted to the Bank after having been audited by a firm of public accountants acceptable to the Bank.

## 2. Financial analysis

4.24 The following is an analysis of CORSAN's past financial statements. The 1992 figures are preliminary; those of other years are taken from the financial statements audited by an independent firm. The statements are presented in constant currency of December 1992 and converted to U.S. dollars at the exchange rate at that date.

### a. Balance sheet

4.25 Table IV-5 summarizes CORSAN's balance sheets. Net fixed assets (net plant in service plus construction work in progress) is the largest asset item. In 1992 it amounted to US\$355.3 million, or 86.9% of the total assets of the company.

4.26 Customer accounts receivable have always been the largest item under current assets; as of December 31, 1992 the balance was US\$26.7 million equivalent, or 78% of total current assets.

4.27 The company has maintained an acceptable collection rate. However, since collection levels have been declining over the last three years, it is recommended that a clause be included in the eventual loan contract requiring CORSAN to maintain a minimum collection rate of 85% of balances owing.

TABLE IV-5 CORSAN BALANCE SHEETS (US\$ millions)						
	1990	%	1991	%	1992	%
<b>TOTAL ASSETS</b>	395.8	100.0	408.1	100.0	408.9	100.0
<b>NET FIXED ASSETS</b>	358.6	90.6	361.5	88.6	355.3	86.9
Plant in service, gross	364.4	92.1	381.4	93.5	401.6	98.2
Less: Depreciation	92.6	23.4	108.4	26.6	121.4	29.7
Plant in service, net	271.8	68.7	273.0	66.9	280.2	68.5
Construction in progress	86.8	21.9	88.5	21.7	75.2	18.4
<b>CURRENT ASSETS</b>	29.2	7.4	28.8	7.1	36.7	9.0
<b>OTHER ASSETS</b>	8.0	2.0	17.7	4.3	16.9	4.1
<b>NET WORTH AND LIABILITIES</b>	395.8	100.0	408.1	100.0	408.9	100.0
Net worth	177.1	44.7	121.7	29.8	112.9	27.6
Long-term liabilities	178.3	45.0	229.7	56.3	227.5	55.6
Current liabilities	40.5	10.2	56.7	13.9	68.5	16.8

4.28 CORSAN's long-term debt as of December 31, 1992 was US\$227.5 million, nearly twice its net worth. Its principal creditors are Banco do Estado do Rio Grande do Sul (BANRISUL), Caixa Econômica

Federal (CEF) and Fundo de Água e Esgotos (FAE). Both BANRISUL and FAE are state agencies.

- 4.29 Current liabilities in 1992 include US\$26 million in principal and interest owed (US\$8.5 million to FAE and US\$17.5 million to CEF). The state will capitalize CORSAN's overdue debt to FAE. In addition, CORSAN will reschedule its arrears to CEF with a 20-year repayment term and interest of 7.5% per annum. These measures must be adopted before the Loan Committee will consider the loan request. 18/

b. Income statement

- 4.30 Table IV-6 summarizes the net operating income of the company. Income increased in the period under consideration by 33%, from US\$132.3 million in 1990 to US\$176.3 million in 1992. Billings for water service accounted for 84%, on average, of annual operating revenues, and sewerage services for approximately 9%.

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18/ These measures were adopted initially prior to negotiation.

<b>TABLE IV-6</b> <b>CORSAH</b> <b>INCOME STATEMENTS</b> <b>(US\$ millions)</b>						
	1990	%	1991	%	1992	%
<b>REVENUES</b>	132.3	100.0	161.3	100.0	176.3	100.0
Water sales	113.9	86.1	135.0	83.7	144.4	81.9
Sewerage services	13.0	9.8	14.6	9.1	15.9	9.0
Other	5.4	4.1	11.7	7.3	16.0	9.1
<b>OPERATING EXPENSES</b>	108.2	81.2	141.6	87.8	154.6	87.7
Payroll	61.6	46.6	74.1	45.9	77.4	43.9
Materials and supplies	7.9	6.0	7.6	4.7	7.1	4.0
Contracted services	25.6	19.3	33.0	20.5	37.2	21.1
Depreciation	7.2	5.4	16.7	10.4	15.9	9.0
Wage demand	0.0	0.0	0.0	0.0	4.8	2.7
Other	0.9	0.7	1.3	0.8	2.0	1.1
<b>NET OPERATING INCOME</b>	24.1	18.2	19.7	12.2	21.7	12.3
<b>OTHER INCOME (EXPENDITURE)</b>	2.6	2.0	-1.0	-0.6	25.2	14.3
Other income	4.0	3.0	2.3	1.4	27.9	15.8
Other expenses	1.4	1.1	3.3	2.0	2.7	1.5
Net income (loss) before finance charges	26.7	20.2	18.7	11.6	47.0	26.7
<b>FINANCE CHARGES</b>	17.1	12.9	16.6	10.3	17.7	10.0
<b>NET INCOME BEFORE TAXES</b>	9.6	7.3	2.1	1.3	29.3	16.6
Income tax	-3.9	-2.9	0.0	0.0	-9.5	-5.4
<b>NET INCOME</b>	13.4	10.1	2.1	1.3	38.8	22.0

- 4.31 Net operating income in 1990 was equivalent to US\$24.1 million, in 1991 US\$19.7 million and in 1992 US\$21.7 million. Operating results have been positive throughout the period analyzed.

C. DMAE

1. Institutional analysis

a. Nature, objectives and functions

- 4.32 DMAE is a decentralized municipal agency with administrative, accounting and financial autonomy. Its objective is to oversee urban utility services, and to administer activities involving construction, improvement, operation and maintenance of water supply and sewerage services. Its main functions are: (a) to plan, execute and inspect all activities relating to construction, improvement, expansion, operation and maintenance of services; (b) to administer its assets and property; (c) to protect municipal water resources from pollution; and (d) to conduct activities pertaining to sewer and water supply systems.



b. Organization and administration

- 4.33 The senior management level of DMAE consists of a board of directors, executive office, and comptroller's office. In the executive office are a technical council, planning coordination unit, legal office, public information unit, and superintendency units for operations, development, commercial operations and administration. DMAE has adequate personnel and organizational structure and satisfactory operating and maintenance systems, and no difficulties are anticipated in execution and operation of the projects for which it will be responsible.

c. Rates

- 4.34 Municipal Law 170 of July 1990 stipulates that revenue from rates for systems operated by DMAE must be sufficient to cover all costs of administration, operation, maintenance and expansion of the systems. This law would be consistent with pertinent Bank policies.
- 4.35 It is recommended that the loan contract require the borrower and DMAE to adopt all necessary measures to ensure that the company's net operating income from the rates it charges in all of its systems will generate sufficient revenues to: (i) cover all costs of administration, operation, maintenance and depreciation of its restated fixed assets; and (ii) generate net internal resources sufficient to finance at least 40% of its annual investment plan.

d. Internal and external auditing

- 4.36 Internal audits are performed by an officer of the Office of the Comptroller, the government unit made up of representatives of the municipal and administrative secretariats, and the economic advisor of the mayor's office. The primary functions of such audits are to inspect the department's financial and accounting management, issue opinions on the annual balance sheets and budgets and monthly balance sheets, and implement and oversee compliance with the recommendations of the external auditors.
- 4.37 External audits of the department are conducted by the state's official audit office. The Office of the Comptroller representative furnishes all the information needed for the outside audits. It is recommended that DMAE's financial statements be presented each year after having been audited by a firm of external auditors acceptable to the Bank. 19/

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19/ See Recommendation.

## 2. Financial analysis

### a. Income

- 4.38 DMAE, as a government agency attached to the municipality of Porto Alegre, does not use accrual accounting, and its resources are administered through execution of its annual budgets. This accounting system means it is impossible to determine the level of capitalization of the agency and thereby establish the reasonable rate of return on its fixed assets that should be generated by its operations. Consequently, it is recommended that within 24 months from the date of signature of the loan contract, DMAE institute an accrual basis accounting system for recording its operations. 20/
- 4.39 DMAE obtains most of its income directly from sales of its services and the financial return on its liquid asset investments. Table IV-7 shows that the department's revenues rose from US\$31.1 million equivalent in 1989 to US\$36.9 million in 1992. Between 1990 and 1992, total income dropped by 20% (or US\$9 million equivalent) because the agency was unable to raise its rates sufficiently when the inflation index, which by law it had been able to use to adjust rates for inflation, ceased to be published.
- 4.40 The Porto Alegre city council approved the use of another inflation index, but the adjustments were not made to restore rates to the real levels that existed before the problem arose. Accordingly, average revenues from water billed dropped from US\$0.33 equivalent per m<sup>3</sup> in 1990 to US\$0.24 per m<sup>3</sup> in 1992, and average revenues for sanitary sewerage from US\$0.14 to US\$0.11 for the same years.

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20/ See Recommendation.

<p align="center"><b>TABLE IV-7</b>  <b>DMAE</b>  <b>BUDGET REVENUE AND EXPENDITURE</b>  <b>(US\$ millions)</b></p>								
	1989	I	1990	I	1991	I	1992	I
<b>REVENUES</b>	31.1	100.0	46.0	100.0	44.3	100.0	36.90	100.0
Operating revenues	21.92	70.6	38.03	82.6	34.10	77.0	31.33	84.9
- Water sales	17.56	56.6	29.66	64.4	26.92	60.8	24.54	66.5
- Sewerage service	4.09	13.2	7.87	17.1	6.71	15.1	6.41	17.4
- Other services	0.27	0.9	0.51	1.1	0.48	1.1	0.38	1.0
Investment income	7.45	24.0	6.03	13.1	5.16	11.6	2.34	6.3
Transfers	0.00	0.0	0.10	0.2	2.03	4.6	0.00	0.0
Other current revenues	1.68	5.4	1.86	4.0	3.00	6.8	3.23	8.8
<b>CAPITAL RECEIPTS</b>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<b>TOTAL INCOME</b>	31.05	100.0	46.02	100.0	44.30	100.0	36.90	100.0
<b>CURRENT EXPENDITURE</b>	24.31	78.3	31.23	67.9	33.64	75.9	31.69	85.9
Operating expenses	20.35	65.6	26.78	58.2	26.81	60.5	25.97	70.4
- Payroll	11.46	36.9	13.52	29.4	13.20	29.8	13.41	36.3
- Materials and supplies	3.02	9.7	3.99	8.7	3.59	8.1	2.74	7.4
- Contracted services	5.55	17.9	9.09	19.8	9.72	22.0	9.76	26.5
- Other operating exp.	0.33	1.1	0.17	0.4	0.30	0.7	0.06	0.2
Transfers to individuals	3.96	12.8	4.45	9.7	6.83	15.4	5.72	15.5
<b>CAPITAL EXPENDITURE</b>	5.51	17.7	11.76	25.6	14.09	31.8	6.22	16.9
Works and equipment	5.13	16.5	11.70	25.4	14.03	31.7	6.17	16.7
- Other investments	0.21	0.7	0.00	0.0	0.02	0.1	0.04	0.1
- Amortiz. dom. debt	0.13	0.4	0.01	0.0	0.01	0.0	0.01	0.0
Capital transfers	0.04	0.1	0.05	0.1	0.03	0.1	0.00	0.0
<b>TOTAL EXPENDITURE</b>	29.82	96.1	42.99	93.4	47.73	107.7	37.91	102.7
<b>SURPLUS (DEFICIT)</b>	1.23	3.9	3.03	6.6	(3.43)	-7.7	(1.01)	-2.7

4.41 The Porto Alegre city council is currently considering a law to increase the value of the real rates of services delivered by DMAE in order to ensure that average revenues from water and sewerage regain 1990 levels. That law is expected to be approved before the loan request is considered by the Loan Committee. 21/

4.42 DMAE's collection rate (83% of balances owing in 1992) is below the level required by the Bank. It is recommended that the eventual loan contract require DMAE to maintain a collection level of no less than 85% of average outstanding balances.

**b. Expenditures**

4.43 DMAE's expenditures are divided into current and capital expenditures, according to the budget classification. Current expenditures subdivide into operating expenditures and transfers to individuals. They were equivalent, on average, to 76.3% of the agency's total income during the period 1989-1992.

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21/ The recommendation was implemented prior to negotiation.

- 4.44 Capital expenditures (23.7% of total expenditures) are made up of outlays for construction projects and equipment and other investments and debt amortization. Debt repayments account for a very small amount, because the institution finances its own investments. DMAE paid the equivalent of US\$37.2 million for works and equipment during the period 1990-1992, which it financed from its current savings.

c. Surplus/deficit

- 4.45 Table IV-8 indicates that DMAE posted a surplus in 1989 and 1990 and a deficit in 1991 and 1992. The deficit was caused by the drop in operating income in those years. DMAE has a high savings capacity to finance its investments. Its current savings were on average 24% of its total resources during the period 1989 to 1991.

TABLE IV-8 DMAE BUDGETARY REVENUE AND EXPENDITURE (US\$ millions)				
	1989	1990	1991	1992
Current revenue	31.05	46.02	44.30	36.90
Current expenditure	24.31	31.23	33.64	31.69
Current savings	6.74	14.79	10.66	5.21
Capital receipts	0.00	0.00	0.00	0.00
Capital expenditure	5.51	11.76	14.09	6.22
Surplus (deficit)	1.23	3.03	(3.43)	(1.01)

D. DMLU

- 4.46 DMLU will execute and operate the solid waste disposal projects. The local counterpart funding of US\$900,000 and debt servicing of the loan of US\$1.7 million will be provided by the Porto Alegre municipal government.

1. Institutional analysis

a. Objective

- 4.47 DMLU is a decentralized municipal agency with administrative, accounting and financial autonomy. Its objective is to administer activities relating to the collection and disposal of urban solid waste and the construction, improvement, operation and maintenance of urban sanitation services.

b. Internal and external auditing

- 4.48 Internal audits are conducted by the unit of the Comptroller's Office, made up of three municipal auditors selected by the mayor. Their principal functions are to issue opinions on operational activities such as contracts, borrowing and other agreements, etc.
- 4.49 External audits of DMLU are conducted by the state's official audit office. It is recommended that the department's financial statements be presented each year after having been audited by the state's official audit office and by an external audit firm acceptable to the Bank.

2. Financial capacity

- 4.50 DMLU's direct rate and service revenues rose from covering 9% of total costs in 1989 to 19% in 1992. In accordance with the policy of achieving 100% coverage of costs, DMLU hopes to cover 34% of its total expenditures in 1993. The difference between its expenditures and income from rates and services is paid by the population through the property tax collected by the Porto Alegre municipal government. The municipality of Porto Alegre transfers to DMLU the difference it needs to cover its total expenditures.
- 4.51 It is recommended that the loan contract require the municipality of Porto Alegre and DMLU to undertake to ensure that rate revenues from the refuse collection service plus transfers to DMLU from the municipality of Porto Alegre are sufficient to cover all DMLU's costs of administration, operation, maintenance and debt service. 22/

E. Other co-executing agencies

- 4.52 The other co-executing agencies are maintained by the state budget. The Secretariat of Agriculture and Provisioning (SAA) and the Education Secretariat (SE) are part of the direct state administration. FEPAM, FZB and EMATER are indirectly state-controlled. The projects that they will be conducting under the program fall within their areas of expertise and experience, and these agencies have the staff, financial management and accounting controls needed for proper execution of the projects for which they would be responsible. Annex IV-1 contains an institutional analysis of each of the agencies mentioned.

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22/ See proposed resolution.

## V. PROJECT JUSTIFICATION

### A. Technical feasibility

- 5.1 From a technical standpoint, the program components and activities can be carried out by the participating institutions, they are feasible, and their inclusion is warranted. Brazil, and specifically the state of Rio Grande do Sul, have sufficient experience in pollution control, soil management, and agROTOXIN control programs, in setting up conservation units, and in environmental education.
- 5.2 According to the analysis conducted, the pollution control component projects are feasible primarily for the following reasons:
  - a. The projects will satisfy high-priority needs for basic sewer services in urban areas of Porto Alegre and its metropolitan region, where at present less than 5% of wastewater is being treated before final disposal. In addition, some outfalls of domestic and industrial sewage are upstream from intakes for drinking-water systems and beaches that in the past were used as recreation sites.
  - b. The conceptual design of the sanitary sewer projects in Cachoeirinha, Gravataí, São João-Navegantes, the southern zone of Porto Alegre and the plant to treat leachate from the sanitary landfill in the northern zone of Porto Alegre is sound and conforms to standard engineering practice. Final adjustments are now being made to the designs, as agreed during the analysis, and should be completed shortly.
  - c. The household and industrial pollution control component includes other projects and activities: an action plan for industrial pollution control, a basic action plan for solid waste management in Porto Alegre, a master plan for solid waste management in the metropolitan area, and an environmental monitoring network. All these components are sufficiently well-defined to be made part of the program and are in fact necessary complements thereto.
  - d. The proposed four-year disbursement term for funds allocated for the residential and industrial pollution control component is viewed as realistic, inasmuch as the major works projects would take an estimated 36 months to complete.
- 5.3 The soil management and agROTOXIN control component is technically viable for the following reasons:
  - a. The subbasins and set of microwatersheds to which priority is being ascribed were selected after biophysical diagnostic

assessments and a review of topical information, surveys, and agronomic and socioeconomic statistics.

- b. The chief problems stemming from inefficient management of soil and handling of toxic farm chemicals can be remedied through the use of proper technology. There also are packages of crop production practices and integrated pest management and control systems that have proven effective in Rio Grande do Sul, in neighboring states, and in the watershed.
- c. Rio Grande do Sul gained experience with this approach with the "Tatu" operation begun in 1965, carried out by a number of institutions under the direction of the Federal University. It continued in 1971 with the soil fertility project, the EMBRAPA soil conservation project in 1979, and the microwatershed management program headed up by EMATER in 1984, which paved the way for the state microwatershed program in 1987.
- d. Farmers have been consulted, have been involved in preparing the component, and have indicated their interest in taking part in it.

5.4 The conservation units component is technically viable for the following reasons:

- a. Where management plans have been instituted in conservation units and they have been properly controlled and monitored, biodiversity has been preserved, degraded ecosystems have been restored, and their integrity has been maintained with the help of the community.
- b. A more in-depth knowledge of the flora, fauna, and operation of ecosystems will make it possible to improve management plans, define use options more clearly, set limits for visits, and assure that an optimum balance is struck between the protective and recreational functions of the conservation areas.
- c. FZB and DRNR both have experience in managing and protecting conservation units and in updating inventories of flora and fauna. With the resources being allocated for incremental staff and equipment and given the funding available for operating expenses, the smooth operation of the program's conservation units is assured.

5.5 Project costs have been calculated by the entities concerned with direct input from consultants. According to the analyses performed, figures used were unit costs on the Brazilian market and price quotations from Brazil and abroad. Allowances for contingencies and escalation have been included in budgets.

5.6 Equipment and materials would be purchased and construction work carried out under contracts awarded through international public

tender calls. Since the contracting process for all the executing agencies has been grouped into 20 bid packages, it should attract Brazilian and international bidders and elicit competitive offers.

- 5.7 All of the participating entities have sufficient experience in implementing comparable projects. Nevertheless, for purposes of effective coordination with state authorities through the Rio Grande do Sul Secretariat of Planning and Administration and with the Bank, project management units will be set up in each of them. These units will report directly to senior management, and will have the support of all of the entity's technical, operations, and administrative units, as is the case with similar construction projects.

B. Institutional and financial feasibility

- 5.8 Responsibility for execution of the program will rest with an executing unit within the Secretariat of Planning and Administration. The structure being proposed for this unit will enable it to implement the program as envisaged. A consulting firm would be engaged to assist the unit in program administration and execution.
- 5.9 The co-executing agencies that would receive funding under the program to carry out projects and specified activities have the authority and capability to do so, and will be able to operate and maintain the program works.
- 5.10 According to income and expenditure projections for the execution period, the State of Rio Grande do Sul would be able to provide the US\$88.2 million in counterpart funding for the program as scheduled (see Annex V-1). 23/
- 5.11 The incremental recurrent costs generated by the Pró-Guaíba geographical information system (SIGPROGB) and the projects of FEPAM, FZB, and SAA would be about US\$3.5 million annually. These costs would be defrayed by the state through budgetary allocations to each agency. They are equivalent to a small percentage of the state's direct income (in 1992, 1% of current revenues), so there should be no difficulty in making the necessary funds available to the agencies in timely fashion.
- 5.12 To assess CORSAN's ability to honor the financial obligations deriving from its operations and from existing and future borrowings, financial projections were prepared of its income statement, statement of source and application of funds, and balance sheet. 24/

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23/ Final figures differ slightly from those used in the analysis, but the results remain unchanged.

24/ Final figures differ slightly from those used in the analysis, but the results remain unchanged.



- 5.13 It was assumed for the earnings projection that average revenue per cubic meter of water and sanitary sewerage was adjusted to obtain a minimum 7% return on fixed investment. To reach that figure, the average revenue per cubic meter of water would need to move gradually from the 1992 level of US\$0.54 to US\$0.58 in 1998 and remain there.
- 5.14 Operating revenues in the systems operated by CORSAN would rise from US\$176 million in 1992 to US\$239 million in 2002, as a result of an increase in volumes of water billed coupled with a rate increase.
- 5.15 In each year of the projection, net operating income would be sufficient to pay finance charges on the long-term debt. The company also would generate a profit, on which it would pay US\$31 million in income taxes over the projection period.
- 5.16 The projected statements of source and application of funds show that the company would be able to service its debt and attend to its other financial commitments. Furthermore, its operations would generate a total of US\$63.3 million between 1993 and 2002 to finance additional capital investments.
- 5.17 It was assumed in preparing the projections that average revenue for water and sewer services in 1994 would return to 1990 levels. To that end, DMAE would need to raise real rate revenues by 13% for the rest of 1993 25/ and by 20% in 1994.
- 5.18 In the aforementioned scenario, DMAE's billing revenues will rise from the US\$37 million posted in 1992 to US\$71 million in 2002. With these revenues it would be able to cover its administrative, operating, and maintenance costs and service its debt. Revenues from DMAE operations also would be high enough for it to honor its counterpart commitments for the loan received and produce a cumulative surplus of US\$100 million throughout the period.

C. Economic feasibility

1. Introduction

- 5.19 The economic analysis focused on the investment components of the sanitation, parks, and soil management programs. The basic objective was to determine whether the beneficiaries' willingness to pay was higher than the cost of the respective projects. Also determined through the calculations was the estimated percentage of benefits that would accrue to low-income groups, which in the case of Brazil the Bank has defined as those with per capita annual incomes of below Cr\$1,298,172 (January 1992), equivalent to

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25/ DMAE implemented the recommendation before the negotiations.

approximately US\$1,246. <sup>26/</sup> Economic efficiency prices were used in the analysis to take account of distortions in the economy; a standard conversion factor of 0.871 was used along with conversion factors for skilled labor (0.73) and unskilled labor (0.61) and for the principal agricultural inputs and products. The following paragraphs summarize the analyses; full details are available in a technical annex in PRA/ENV files.

2. Program to control pollution from household waste

- 5.20 For this program, an evaluation was performed of the projects involving sewer systems and sewage treatment plants in Cachoeirinha and Gravataí (CGR), sewer systems and sewage treatment facilities in the southern zone of Porto Alegre, and a sewage treatment plant in São João-Navegantes (SJN). Because of the meager volume of flow of the Gravataí River, which receives sewage from CGR, this project can be considered independently of the SJN and Ipanema projects as far as its impact on Porto Alegre's water supply intake and beaches are concerned. Initially the economic appraisal of the SJN and southern zone projects looked at the entire Porto Alegre area sanitation program, including outlays to improve open dumps and estimates of the cost of treating sewage produced in Ponta da Cadeia. Once the overall feasibility of the program had been verified, each project was analyzed to decide on the economic merits of including it in the first stage of the program.

a. Least-cost analysis

(i) Cachoeirinha-Gravataí

- 5.21 In the least-cost appraisal of types of sewage treatment for CGR, a comparison was made of conventional secondary treatment using the activated sludge process, extended aeration, and stage stabilization ponds (lagoons), which produce effluents of roughly identical quality. The following tables show the analysis findings for modules of 50 and 200 liters per second.

EQUIVALENT ANNUAL COST (US\$000) 50 liters/second				
PROCESS	INVESTMENT	OPERATION	MARKET P.	EFFICIENCY P.
Lagoons	689.2	39.1	124.5	101.9
Activated sludge	910.5	139.5	252.3	208.2
Extended aeration	754.2	140.7	234.3	193.2

EQUIVALENT ANNUAL COST (US\$000) 200 liters/second				
PROCESS	INVESTMENT	OPERATION	MARKET P.	EFFICIENCY P.
Lagoons	1,795.5	98.5	321.3	263.1
Activated sludge	2,387.4	236.8	532.9	439.5
Extended aeration	1,971.7	309.9	554.5	457.3

- 5.22 The present value of operating and investment costs for the stage lagoon process was up to 40% lower than those of the second-best option for modules of 50 to 200 liters per second.
- 5.23 The economic advantages of the lagoon option for sewage treatment hold true provided land is available and that its cost is not excessively higher than the amounts considered in the aforementioned analysis. Since Ipanema meets these conditions, the stage lagoon treatment option was adopted there as well.
- 5.24 As for the number of treatment plants, a comparison was made of costs (investment outlays plus operating costs) for a single plant located near Cachoeirinha, versus a plant for each municipality. The two-plant scenario was found to be 12% cheaper (equivalent annual cost at 12% of US\$6,488, versus US\$7,384), and was therefore selected.

(ii) São João-Navegantes

- 5.25 To select the process to be used in the treatment plant, a number of successive approximations were done over several years, to accommodate space constraints and restrictions on the site for effluent discharge. To begin with, a comparison was made of stabilization ponds (lagoons) and conventional secondary biological treatment plants. The lagoons were located on Ilha das Flores or on the right-hand shore of Lake Guaíba, in the municipality of El Dorado. The biological treatment plants would be sited in the SJN area or near Ponta da Cadeia. A landfill on the left side of the lake was considered as an alternative.
- 5.26 The earlier alternatives were dropped in favor of the SJN site, for a number of reasons. Because Ilha das Flores is part of the Jacuí Delta Park, which has been included as one subproject in the natural resources component, state environmental authorities objected to its being used for sewage treatment. The municipality of El Dorado would not allow the lagoons to be located in its jurisdiction. The cost of land in Ponta da Cadeia, which is very built up, made it less attractive from an economic standpoint; consideration was given to gaining land through a landfill on the left side of the lake - the cost of which would be similar to the cost of siting the plants in SJN - but the state authorities

rejected that alternative on grounds that it could pose a threat to the environment.

- 5.27 After the available SJN site had been selected, the analysis turned to seeking the optimum technical solution to minimize costs and space requirements, bearing in mind the possibility of treating there effluents from areas other than those considered in the first phase. On the basis of least-cost studies, the equivalent annual cost at efficiency prices of different combinations of treatment options was compared. The basic alternatives of extended aeration and conventional aeration were combined with alternatives to stabilize organic sludge through aerobic, anaerobic, or chemical treatment; natural and mechanical approaches were looked at for the drying of sludge. The following table shows the present value at efficiency prices of the various combinations examined.

TREATMENT	SLUDGE STABILIZATION	SLUDGE DRYING	PRESENT VALUE (US\$000)
Extended aeration	Aerobic	Natural	22,488
		Mechanical	25,225
Conventional aeration	Anaerobic	Natural	21,273
		Mechanical	24,204
Conventional aeration	Chemical	Natural	22,365
		Mechanical	26,315

- 5.28 The analysis showed that the least-cost alternative was to combine conventional aeration with anaerobic digestion and natural drying of sludge. To optimize this alternative, the final designs added a subalternative of a modified secondary biological treatment plant, which cut down on space requirements and cost.

b. Economic appraisal

(i) Cachoeirinha-Gravatá

- 5.29 The combined project (sewer systems plus treatment plants) yields benefits on a number of fronts. To begin with, sewer systems benefit both new users who connect to the system and their neighbors, thanks to the ensuing general improvement in the environment in the area. In the project under review here, it should be noted that if sewer systems are built but sewage treatment plants are not (i.e., raw sewage is discharged into the river), the analysis would have to take into account the environmental cost of the deterioration in water quality in the Gravatá River. The septic tanks now being used do provide some level of treatment (though less than what sewage treatment plants can offer) and leave the river better off than if raw sewage were dumped directly into it from the sewer system. It is difficult to quantify this cost, or the benefit that would ensue from building

the treatment plants, because in neither case would there be a long stretch of the river for which a standard is being breached or attained, which is the scenario that normally lends itself to the use of known procedures to put a value on changes in the quality of environmental goods.

5.30 The analysis described in the following paragraphs confirms that the amount the sewer users would be willing to pay would cover the full cost of the project (sewer system plus treatment plants), which is the pertinent comparison in the two-part assumption that the cost of the plants is lower than the environmental cost of not having them, and that the plants only alleviate the negative impact that would ensue if raw sewage were to be dumped into the river. However, the treatment plants would not be justified if the cost of building them were higher than the environmental cost of not building them, whether or not the beneficiaries' willingness to pay for sewers covered the costs of the system and treatment plants. Given the traditional problems in estimating a population's willingness to accept a lower quality of environmental goods, it is usually difficult to justify treatment plants as an alleviation measure exclusively. In this case, however, the economic feasibility of including treatment plants in the project can be ascertained by a more demanding test: include the plants if the environmental benefits calculated in relation to the "without sewerage project" scenario are higher than the cost of the plants. Such a comparison is more rigorous because the water quality of the river with sewer systems but without treatment plants would be inferior to the present (without project) situation, and the benefits of the plants would therefore be higher than those considered.

5.31 To estimate the benefits of the sewer systems, the dichotomous choice contingent valuation method was used, with follow-up questioning in the survey. Estimates were based on the findings of a survey of 250 people in the two localities in question. The estimated logistic model gives the probability of eliciting a positive response when the respondent is asked if he or she is willing to pay a named monthly amount to obtain the service. Using the model one can estimate the probability distribution of the willingness to pay of the individuals sampled. Since each individual's willingness to pay is a random variable for the researcher, the mean of the expected values of the sample is used to appraise the project.

5.32 The results of the model selected are as follows: 27/

$$\text{Pr}(s_i) = \text{Logit} [2.63 - 1.299 \ln(\$) + 0.723 \ln(\text{Income}) + 0.665 \text{Proxim} + .892 \text{Flood} - 0.029 \text{Age}]$$

(0.86) (-11.05) (3.3) (2.2) (2.6) (2.4)

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27/  $\text{Pr}(s_i) = \text{Logit}(XB) = 1 / (1 + \exp(-XB)).$

where  $\ln(\$)$  is the amount the family would be required to pay monthly, *Proxim* is a dummy variable showing whether the respondent lives close (<500 meters) to rivers or streams into which sewage is being discharged, *Flood* is a dummy variable indicating whether the area is prone to flooding, and *Age* is the age of the respondent. Using this model it was estimated that the families' mean willingness to pay was US\$14.46 monthly (exchange rate US\$1=CR\$1,372), or about 4% of average family income in the area. The figures in parentheses denote the "t" of the coefficients estimated.

- 5.33 The value thus arrived at was used to calculate aggregate willingness to pay of families served who actually install service hook-ups. It was estimated that 80% of the population would be connected at the start of the useful life of the project, but with the education programs planned, this figure should rise to 95% after 10 years. The appraisal shows that the beneficiaries' willingness to pay for the system would cover its costs and the cost of the sewage treatment plants, yielding an internal rate of return (IRR) of 17.8%, with a net present value at 12% of US\$28.7 million. The probability distribution for willingness to pay shows a 60% likelihood of an IRR over 12%. Included in the calculations were the costs and benefits anticipated in the second stage of the sewer system project, as shown in the table.
- 5.34 A contingent valuation study for improvements in water quality in the Gravataí River shows that the population of the municipalities in question would be prepared to pay, on average, US\$4.90 a month for water quality comparable to level II as defined in Brazilian legislation. The willingness to pay of a base of 100,000 families would be on the order of US\$5.88 million annually, which corresponds to US\$42.7 million in present value at efficiency prices, for an annual discount rate of 12%. The treatment plants would cost US\$4.75 million (US\$4.2 million capital investment plus US\$55,000 operating costs, present value); accordingly, an improvement in quality indexes (dissolved oxygen and coliforms) of about 11% should be enough to justify the plant investments, if it is granted that water quality is a good that yields diminishing marginal utilities to the beneficiaries. In other words, beginning with the current (without project) situation, the valuation of proportional increases of like magnitude in water quality should decline as the situation of the river improves. This means that an improvement in quality indexes equal to 11% ( $4.75/42.7$ ) of the total improvement for which willingness to pay has been gauged should yield a benefit higher than 11% of the total estimated benefit. The findings of different runs of the Gravataí River water quality models show that weighting percentage improvements in quality (coliforms) by the corresponding spans of the river produces a 27% improvement over what was suggested in the survey; this confirms the economic merit of including treatment plants in the project.

(ii) Southern zone 28/

- 5.35 Like the CGR project, this initiative calls for sewer systems and a sewage treatment plant to serve a population of 78,579 by year 32 of the project's useful life. The dumping of sewage is polluting the beaches of Porto Alegre, so for this project consideration also has to be given to costs associated with its environmental impact. The economic analysis here presented difficulties similar to the problems encountered with the Cachoeirinha-Gravataí project, and a similar procedure was adopted for the appraisal. Indeed, given the similarities in general conditions in the two areas, the same econometric model estimated for CGR was used here for the southern zone, the only difference being income level (average income in the southern zone is 1.93 times the CGR figure).
- 5.36 The findings of the evaluation show that the beneficiaries' willingness to pay for the system easily covers its cost and the cost of the treatment plant, with an IRR of 18.7% and net present value of US\$7.38 million discounted at 12%. If willingness to pay were considered as the sole random variable, the probability of obtaining an IRR of 12% or higher could be put at about 80%.
- 5.37 The same procedure used for the CGR project was followed to ascertain the economic merits of including a sewage treatment plant in Ipanema. Willingness to pay for improved water quality in the Guaíba River was estimated using a model described below which sets the willingness to pay of the Porto Alegre population for better-quality water in the Guaíba (such as to make its beaches safe for swimming) at US\$6.60 per family per month. With 350,000 families in Porto Alegre, the present value of this willingness to pay would stand at about US\$200 million at efficiency prices. Assuming that a treatment plant would cost approximately US\$1.4 million (US\$1.17 million capital cost plus US\$200,000 in operating costs at present value), an improvement in indexes on the order of 1% of the change in water quality that would allow for safe swimming would justify including the plant. While there are no runs of the Guaíba River water quality model that consider solely the effect of the Ipanema plant, it is evident that the impact of halting the dumping of sewage directly onto the beach from the area's 45,000 residents exceeds the 1% that would be needed to warrant including the treatment plant.

(iii) Porto Alegre

- 5.38 The Porto Alegre project includes only a treatment plant in São João-Navegantes (SJN), to treat sewage generated by 118,890 city residents. Two exercises were performed to assess this project: an evaluation of the two stages of the sanitation program, and an

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28/ The updated works budget is higher than the one used in the analysis, but the conclusions drawn still hold true.

evaluation of the plant at SJN, which is one component of the first phase. The two phases of the program would substantially restore water quality in Lake Guaíba, thereby avoiding the need for outlays to transfer the intake works of the city's present water supply system and producing benefits in the form of recreational use of the beaches of Porto Alegre and improvements in the general environment in the area.

- 5.39 Through a survey of 250 individuals employing the dichotomous choice contingent valuation approach with follow-up questioning, the benefits yielded by improvements in water quality on Porto Alegre beaches were estimated. The following model was estimated for the probability of the respondent being willing to pay a stated monthly amount to bring the water quality of Lake Guaíba up to a level that would allow for safe swimming:

$$Pr(si) = \text{Logit}[2.06 - 1.017 * \text{Ln}(\$) + 0.453 * \text{Ln}(\text{Income}) + 0.749 * \text{Educ} + 0.987 * \text{Conc} - 0.021 * \text{Age}]$$

(0.8) (-9.9)                      (2.5)                      (2.3)                      (1.2)                      (-2.1)

- 5.40 In the above model, Ln(\$ ) is the monthly payment requirement, Educ is a dummy variable indicating whether the respondent has more or less than a high school education, Conc is a dummy variable indicating the respondent's concern, if any, about pollution on Porto Alegre's beaches, and Age is the respondent's age.
- 5.41 The average willingness to pay calculated with the model is US\$6.60 per family per month, equivalent to about 1.5% of average family income in Porto Alegre. It was assumed for spreadsheet calculations that family income would rise by 1.8% yearly, on average.
- 5.42 To begin with, the overall program was evaluated, considering the second-stage costs (treatment of effluent produced at Ponta da Cadeia), programs to improve the open dump in the northern zone, and investments at Ipanema. The benefits considered in this case correspond to the indefinite postponement of investments to transfer affected Porto Alegre water system intake works and the willingness of Porto Alegre residents to pay for a substantial improvement in water quality along the city's beaches. The water quality models indicate that with the two stages, water quality levels would match the definition used in the survey, and accordingly, in this case all of the recreational benefits were imputed. The findings of this analysis show that the IRR of the program overall would be 28.6%, with net present value at 12% of US\$97 million. The IRR of the project exceeds 12% provided the willingness to pay for beach improvements is more than 40% of the value used, *ceteris paribus*; the probability of this being the case is over 80%.
- 5.43 A procedure similar to the one used for Cachoeirinha-Gravataí was followed to assess the impact of the São João-Navegantes plant. The net present value at 12% of the costs of building and operating this plant will be US\$10.7 million (US\$9.96 million in capital



outlays plus US\$740,000 for operation and maintenance, at present value). The present value of recreational benefits for beach users is about US\$162 million; accordingly, an improvement in water quality indexes of roughly 7% of the level suggested in the survey would be enough to justify the SJN project.

- 5.44 The modeling results show that with the SJN project and the Ipanema project, the average count in the beach area would drop from 45,000-75,000 coliforms per 100 ml to 3,000-4,000, whereas the level suggested in the survey was about 250 per 100 ml. The relative improvement with the project would be about 90% of the corresponding survey suggestion. Inasmuch as the SJN project would treat a volume approximately triple that of the Ipanema plant, there clearly is sufficient margin in quality improvement to assure that the SJN plant would be economically feasible, considering purely the anticipated recreation benefits.
- 5.45 The following table shows the internal rates of return for projects in the component involving control of pollution from domestic waste, for the baseline conditions used in the analysis:

PROJECT	IRR (%)
- Cachoeirinha-Gravataí (systems + treatment plant)	17.8
- Southern zone Porto Alegre (systems + treatment plant)	18.7
- Complete program in Porto Alegre (SJN + Ponta Cadeia + southern zone + landfill northern zone)	28.6

3. Component for soil management and conservation and control of toxic farm chemicals

- 5.46 A number of exercises were performed for the economic appraisal of this component. The first was an evaluation at market prices of five farm models representing the main variants existing in the area in terms of soil quality, farming practices, and crop distribution. While the initiatives are designed at the micro-watershed level, encompassing 75 farms each on average, investment decisions are taken at the individual farmer level. Farms 1 and 2 have deep soils and mechanized cropping methods, with an emphasis on rotation of soybean and wheat. Farms 3, 4, and 5 have shallower soil, use draught animals in crop production, and grow mainly pasture, grapevine, and other crops like tobacco. Acidity is the major limitation of the two prevailing soil types (average pH 4.0).
- 5.47 There is a large body of research describing efforts to determine optimum economic levels for the application of lime, which usually entail increased fertilization as well. The improvements in crop yields anticipated in the economic appraisal are the result of conservative estimates based on reported research findings and

results achieved in some parts of the state in which farmers are using similar technology packages.

- 5.48 Apart from investments to improve acidity conditions, the project envisages outlays for terracing and gully rehabilitation. Slope rectification and improved water management will not only help the soil retain moisture but will prolong the effect of lime.
- 5.49 The focus of the integrated pest control approach will be the introduction of bacilloviruses and wasps to control pests in corn, wheat, and soybean crops. The economic analysis assumed that the use of this integrated system would do no more than cut back on the use of toxic farm chemicals, with no effect on yield.
- 5.50 To simulate the set of effects to be obtained with the project in each farm model (change in production costs, yield, and regularity of acidity correction) a model called GUAIBA.EXE written in Fortran was used, showing the amount of costs covered through work of family members. <sup>29/</sup> Repayments by farmers to the permanent revolving fund were calculated at an interest rate of 12%, with a 10% subsidy that is subtracted when repayments are calculated.

FARM	AREA (ha)	ANNUAL INCOME w/o project (US\$)	ANNUAL INCOME w/project (US\$)	Credit (US\$)	IRR (%)
1	16.9	900	2,660	4,850	34.0
2	43.4	2,670	6,800	9,990	42.5
3	14.6	1,860	2,790	2,046	31.5
4	14.6	1,170	1,560	1,285	13.7
5	37.0	2,120	3,970	3,211	30.7

- 5.51 According to these figures, the rates of return of the investments would make them attractive to farmers. The return for farm 4 is lower because less intervention is envisaged and the crops in question yield lower returns; however, if the effect of the increase in use of family labor is factored in, the return could climb to 32.5%, were the full increase in such labor to be effectively reflected in the income increase. It should be kept in mind that even though this analysis reveals a considerable difference between the rate of return and the cost of funds, this alone does not mean that farmers would be willing to make the investments if extension services were not offered.
- 5.52 The GUAIBA.EXE model was used to assess the economic feasibility of the component, but in this case the cost of EMATER extension

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<sup>29/</sup> The GUAIBA.EXE user manual and results of runs for each farm model are on file in PRA/ENV.

services was imputed. The prices used for the evaluation were economic efficiency prices of the principal farm inputs and products. All prices were updated to June 1992; the average prices for agricultural products over the past five years were used as farm-gate prices. Soybean and wood (pulp) were treated as tradable products, and corn, wheat, beans, and maté as import substitutes. About 75% of the active ingredients in agrottoxins are produced in Brazil; because it was very difficult to obtain detailed information for individual products, averages were used to calculate conversion factors. Some 80% of the phosphorus and potassium used to produce compound fertilizers is imported, whereas urea is produced in the country. The following table shows results of the runs for a base case and four sensitivities.

(US\$ millions)					
CASE	NET BENEFITS (acctg. prices)	GOVERNMENT	FARMERS <25 ha	FARMERS >25 ha	IRR (%)
Base	20.51	-35.9	26.4	22.1	19.2
SCF = 0.92	18.4	-35.9	26.5	22.1	18.2
SPLab. = 0.71	18.3	-35.9	25.2	21.6	18.3
Costs +10%	12.9	-35.7	21.2	18.9	16.2
Prices -10%	7.82	-35.8	18.7	16.7	14.7

- 5.53 According to these figures, this component would yield a return to society at large. The IRR for the base case values is 19.2% with net benefits at 12% of US\$20.5 million. When the standard conversion factor (SCF) is raised from 0.87 to 0.92, the net benefits fall to US\$18.4 million and the IRR drops one point. When the shadow price of unskilled labor (SPLab) is raised from 0.61 to 0.71, the net benefits stand at US\$18.3 million and the IRR drops one point relative to the base case. An examination of sensitivities to 10% increases in cost and 10% reductions in product prices reveals that the latter would have the greater effect on rate of return, which would fall from 19.2% to 14.7%.

#### 4. Investments in Jacuí Delta Park, Itapoã Park, Botanical Garden, and Zoological Park

- 5.54 To perform an economic appraisal of investments in these parks, two surveys were administered to 250 respondents each. The dichotomous choice contingent valuation method with follow-up questioning was used to gauge, from their responses, their willingness to pay for a visit to each park. The estimated econometric models establish the likelihood of each respondent being prepared to pay (once the proposed facilities are explained) a stated sum for admission in order to see the park built.

##### Itapoã

$$\text{Pr}(si) = \text{Logit}[0.746 - 0.2728 * (\$/1000) + 0.016 * (\text{Income}/100000)]$$

(3.85) (-11.87)                      (1.43)

Jacuí Delta

$$\text{Pr}(si) = \text{Logit} [9.638 - 1.528 \cdot \text{Ln}(\$) + 0.21 \cdot \text{Ln}(\text{Income})]$$

(4.83) (-10.88) (1.57)

- 5.55 In the above model,  $\text{Ln}(\$)$  is the natural logarithm of the suggested amount and  $\$/1000$  is the suggested amount divided by 1,000. Income is the average monthly income of the family in question. Using the models, the willingness to pay was calculated as US\$5.80 for a visit to Itapoã Park (90% confidence interval US\$4.40-US\$11.10) and US\$3.50 for Jacuí Delta Park (90% confidence interval US\$3.02-US\$3.70), using an exchange rate of 1,340 cruzeiros to one U.S. dollar. From earlier studies it can be assumed that visits to these parks very likely would be limited by their carrying capacity on weekends and holidays (1,550 persons a day in Itapoã and 25,000 a day in Jacuí Delta). It also was estimated that the parks would reach their carrying capacity 150 days a year, and this figure was used in the economic analysis. Investments in Itapoã Park produce an IRR of 13%, and those in Jacuí Delta Park an IRR of 87%, but in the latter case the value of land was not included. Investments in Jacuí Delta Park are justified because the net present value at 12% is US\$52.5 million, and somewhere on the order of US\$35.7 million could be imputed as the cost of land (17,000 hectares at US\$2,100 per hectare), using values similar to those at hand for Itapoã Park.
- 5.56 In the case of the Botanical Garden and Zoological Park, exercises were conducted to assess the willingness of prospective beneficiaries to pay an amount that would yield an IRR of 12% for investments associated strictly with recreational benefits. Annual average numbers of visitors over the past 10 years (550,000 for the zoo and 100,000 for the botanical garden) were used to calculate the number of additional visits, along with increases in the area set aside for these purposes, estimated at 80% in both cases. According to the figures obtained, a willingness to pay of about US\$0.55 per visit would be needed for the zoo and US\$1.47 for the botanical garden; these amounts are well below those elicited for the two parks, indicating the economic feasibility of these investments.

5. Distributional analysis

- 5.57 For each project for which benefits were estimated, the share that would accrue to low-income groups was calculated. Subsequently, a weighted estimate was arrived at for the project overall.
- 5.58 Data compiled through surveys were used to estimate the percentage of the low-income population that would gain from each project in the sanitation and park components.

PROJECT	TOTAL BENEFITS (US\$ millions)	SHARE OF BENEFITS ACCRUING TO LOW-INCOME POPULATION (%)
CGR	87.7	75
Southern zone	18.9	25
SJN *	108.1	56
Itapoã Park	8.3	56
Jacuf Park	55.3	56
(*) 60% of total estimated benefits for two stages.		

- 5.59 For the soil conservation component, low-income groups were considered to be producers working farms of less than 25 hectares and wage-earners. It was further assumed that low-income groups would receive 25% of unassignable benefits. Using base-case figures, total benefits at efficiency prices would stand at US\$56.4 million, of which US\$29.8 million (53%) would go to low income earners.
- 5.60 According to these findings, it can be estimated that about 59% of the total benefits would accrue to low-income groups.

## **Predictive Modeling of Water Quality**

- 1.1 Predictive models of water quality were run as part of the Porto Alegre Sanitary Sewerage Master Plan. One of the purposes of the exercise was to ascertain the features of "with project" scenarios, including the treatment of liquid waste and final disposal in bodies of water.
- 1.2 The individual projects were configured using the results of these models, with due regard to principles of least cost and technical and economic feasibility. Specifically taken into account were the assimilation capacity of bodies of water that receive discharges, water uses, areas and water resources to be protected, and water quality targets.

### **1. Description of the Guaíba River and its main tributaries**

- 1.3 The four main tributaries forming the Guaíba River are the Jacuí, Caí, Sinos, and Gravataí rivers, whose annual volumes of flow into the Guaíba average, respectively, 888 m<sup>3</sup>/sec (84.6% of the total), 79 m<sup>3</sup>/sec (7.5%), 55 m<sup>3</sup>/sec (5.2%), and 28 m<sup>3</sup>/sec (2.7%), for a total flow of 1,050 m<sup>3</sup>/sec. The data in Annex I-2 show that the tributaries' minimum monthly volumes of flow are respectively 550 m<sup>3</sup>/sec, 45 m<sup>3</sup>/sec, 4 m<sup>3</sup>/sec, and 1 m<sup>3</sup>/sec, giving the Guaíba a minimum of 600 m<sup>3</sup>/sec, on average.
- 1.4 It is said of the Guaíba that it is a river that crosses a lake, which bears the same name. The main features of the lake, which at one end borders the Jacuí delta, near Porto Alegre, are: (a) length, 50 km; (b) width at the broadest point, 20 km; (c) surface area, 496 km<sup>2</sup>; (d) volume, 1.4 billion m<sup>3</sup>; and (e) connection at its lower edge with Lagoa dos Patos which ultimately joins the Atlantic. Average depth of the navigation channel ranges from 5 m to 7 m, reaching 64 m near Itapoã, between Lake Guaíba and Lagoa dos Patos.

### **2. Principal uses of Guaíba River water**

- 1.5 The Guaíba River is the chief source of water supply for Porto Alegre, which is home to the densest urban concentrations in the Guaíba basin and the state generally. Water from this river feeds six filtration plants. The river is also used for recreation (beaches south of Porto Alegre), navigation, and the discharge of liquid household and industrial waste.

### 3. Predictive models used

- 1.6 The predictive models QUAL2E and HAR03 were used. QUAL2E is a revised version of several earlier one-dimensional models, and is normally used in water quality simulations for dendritic river systems and lakes where a complete mix takes place. The HAR03 model can simulate in more than one dimension, and can be run for situations occurring in rivers, lakes, and estuaries.
- 1.7 The QUAL2E model was used for the Gravataí, Sinos, and Cai rivers, and the HAR03 model for the Guaíba River and Lake Guaíba. No modeling was done for the Jacuí River, but since its water quality is acceptable and it has strong assimilation capabilities, its volume of flow and quality parameters were used as input for the simulations performed for the system downstream.

### 4. Simulation results

- 1.8 In conformity with directives from the Special Environmental Secretariat of the Office of the President (SEMA), the National Environmental Council (CONAMA), and the State Foundation for Environmental Protection (FEPAM), water quality targets for the Guaíba River envisage a permanently safe water supply to the public and acceptable conditions at beach resorts. The chief, though not only, intake works to be protected are those supplying the filtration plants of Moinhos de Vento, José Loureiro da Silva, Francisco de Lemos Pinto, and Tristeza, and the most popular beaches such as Tristeza, Assunção, Pedra Redonda, Ipanema, Espírito Santo, Guarujá, Belém Novo, Lami, and Itapoã.
- 1.9 Quality restrictions as far as the critical parameter is concerned pertain to fecal coliform concentrations, which are not to exceed the following limits in 80% of at least five monthly samples:

Water supply intakes: 4,000/100 ml  
Water at beach resorts: 1,000/100 ml

- 1.10 According to a CONAMA resolution, the quality rating for water for primary-contact recreational use is as follows: (a) Excellent: fecal coliform count does not exceed 250/100 ml in 80% or more of a set of samples taken at one site over five weeks or, if only a total coliform count is practicable, 1,250/100 ml, also in 80% or more of a set of samples taken at one site over five weeks; and (b) Very Good and Satisfactory when samples taken as aforesaid give counts not exceeding 500/100 ml for fecal coliforms or 2,500/100 ml for totals, and 1,000/100 ml for fecal coliforms or 5,000/100 ml for totals, respectively.

- 1.11 For other water uses the above-mentioned resolution prescribes a fecal coliform limit of 1,000/100 ml in 80% or more of at least five monthly samples or, if only a total coliform count is practicable, 5,000/100 ml, also in 80% or more of at least five monthly samples, when the watercourse is rated Class 2. A fecal coliform limit of 4,000/100 ml in 80% or more of at least five monthly samples corresponds to Class 3, in which only the navigation channel has been placed.
- 1.12 The solutions were examined for a horizon extending through 2025, with phased implementation. The first stage would run from 1995 to 2002. To optimize the solutions from the technical and economic standpoint, it was considered when structuring the first stage that: (a) the quality of water for direct-contact recreational uses should approximate the Satisfactory classification, leaving to subsequent stages improvements to warrant classifications of Very Good and Excellent; and (b) the quality of water for human consumption should be equivalent to that of Class 3 watercourses, rather than Class 2 as prescribed in the regulations, deferring to a later phase improvements to take it to the prescribed higher classification.
- 1.13 The model was run for different scenarios that included volumes of flow, treatment levels, combinations of treatment plants, and siting of final disposal works. The findings were used to formulate a first implementation phase that would last until 2002.
- 1.14 The investments planned for this first stage, given the state's priorities, would be barely a fifth of what would be needed, according to CORSAN and DMAE calculations, to bring about a significant improvement. It is hoped in this phase to reduce fecal coliform concentrations by about one order of magnitude in critical areas, i.e. water supply intakes and beaches downstream from Porto Alegre.
- 1.15 This initiative is a first and, one might say, modest effort to control and reduce pollution in the lower Guaíba River basin, which is the site of the most severe degradation, notably in the form of elevated fecal coliform counts. However, it has the merit of offering a solution acceptable to the parties involved. After more than 10 years of assessments, studies, and designs, which invariably elicited some objection, a consensus has been reached among the state, the municipality, and the environmental control authority.
- 1.16 The following table summarizes the results of the predictive model for the "with project" and "without project" scenarios; the four pages of maps following the table depict these situations graphically. The "without project" scenarios are shown for current conditions and conditions in the year 2025. The "with project"



alternatives correspond to the first stage of works and to the year 2025, by which time all the works envisaged in the planning horizon would be operational.

<b>PREDICTIVE MODEL OF GUAÍBA RIVER WATER QUALITY</b> <b>SUMMARY OF RESULTS</b> <b>FIRST STAGE</b> <b>(fecal coliforms per 100 ml)</b>				
Scenarios				
Plant	Without project		With project	
	1992	2025	Stage I	Final stage
<b>Delta</b>				
Pintada	4,71E+03	6,51E+03	3,16E+02	3,16E+02
CORSAN	9,16E+03	9,20E+05	7,87E+02	7,50E+02
MV São João	1,21E+05	2,30E+06	1,11E+04	6,60E+03
<b>Left bank</b>				
Parque Marinha	2,22E+05	6,02E+05	2,20E+05	1,25E+03
Cap. Menino Deus	2,01E+05	6,24E+05	1,99E+04	1,22E+03
Cap. Tristeza	2,99E+05	1,16E+06	2,98E+04	9,77E+02
Assunção	1,34E+05	4,43E+05	1,23E+04	7,61E+02
Pedra Redonda	8,71E+04	2,90E+05	8,24E+03	5,11E+02
Ipanema	7,47E+04	1,44E+05	4,19E+03	2,63E+04
Espírito Santo	5,08E+4	1,20E+05	3,47E+03	2,17E+02
Guarujá	4,36E+04	1,28E+05	3,37E+03	2,10E+02
Belém Novo	6,19E+03	6,61E+03	6,16E+02	5,41E+02
Lami	2,29E+02	1,62E+05	2,20E+01	1,00E+00
Itapoã	6,75E+02	3,04E+03	6,50E+01	4,00E+00
Das Pombas	1,11E+03	4,96E+03	1,08E+02	6,00E+00
<b>Right bank</b>				
Guaíba	2,21E+04	1,51E+06	2,19E+03	1,51E+03
Vila Nova	4,28E+03	4,56E+03	4,20E+02	4,14E+02
Alegria	1,81E+03	4,65E+03	1,84E+02	5,90E+01
B. do Ribeiro	7,35E+02	5,93E+03	7,20E+01	4,40E+01

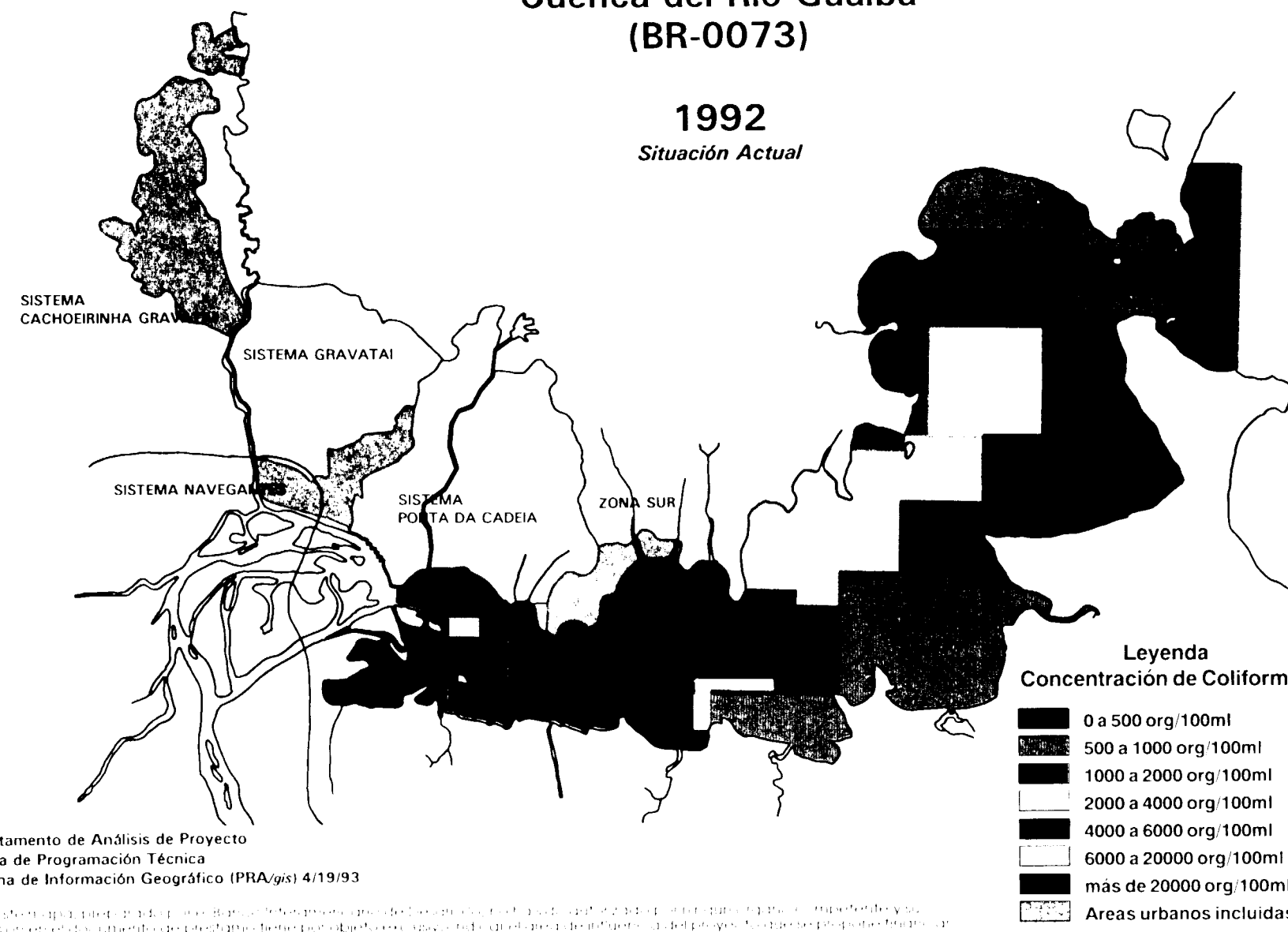
- 1.17 The results of the model show the coliform reductions that could be achieved – about one order of magnitude – in water supply intakes in the lower watershed and on beaches once the first stage of works was complete. While it is true that the positive impact would be localized along a fairly narrow strip, in most cases water quality would be restored to conditions approximating those prescribed in the CONAMA resolution mentioned earlier.
- 1.18 The maps also show that, without the works, a significant deterioration could be expected in 2025, and that water quality would improve substantially when all of the works planned through that year had been completed. The map for the first stage depicts the anticipated change in water quality. It is evident that, owing to the level of investment, the first stage would improve water quality along a strip of a few hundred meters adjacent to water

system intakes and recreational beaches, whereas the stage culminating in 2025 would restore water quality for several thousand meters around the Guaíba River and Lake Guaíba.

# BRASIL

## Programa de Manejo Ambiental de la Cuenca del Rio Guaiba (BR-0073)

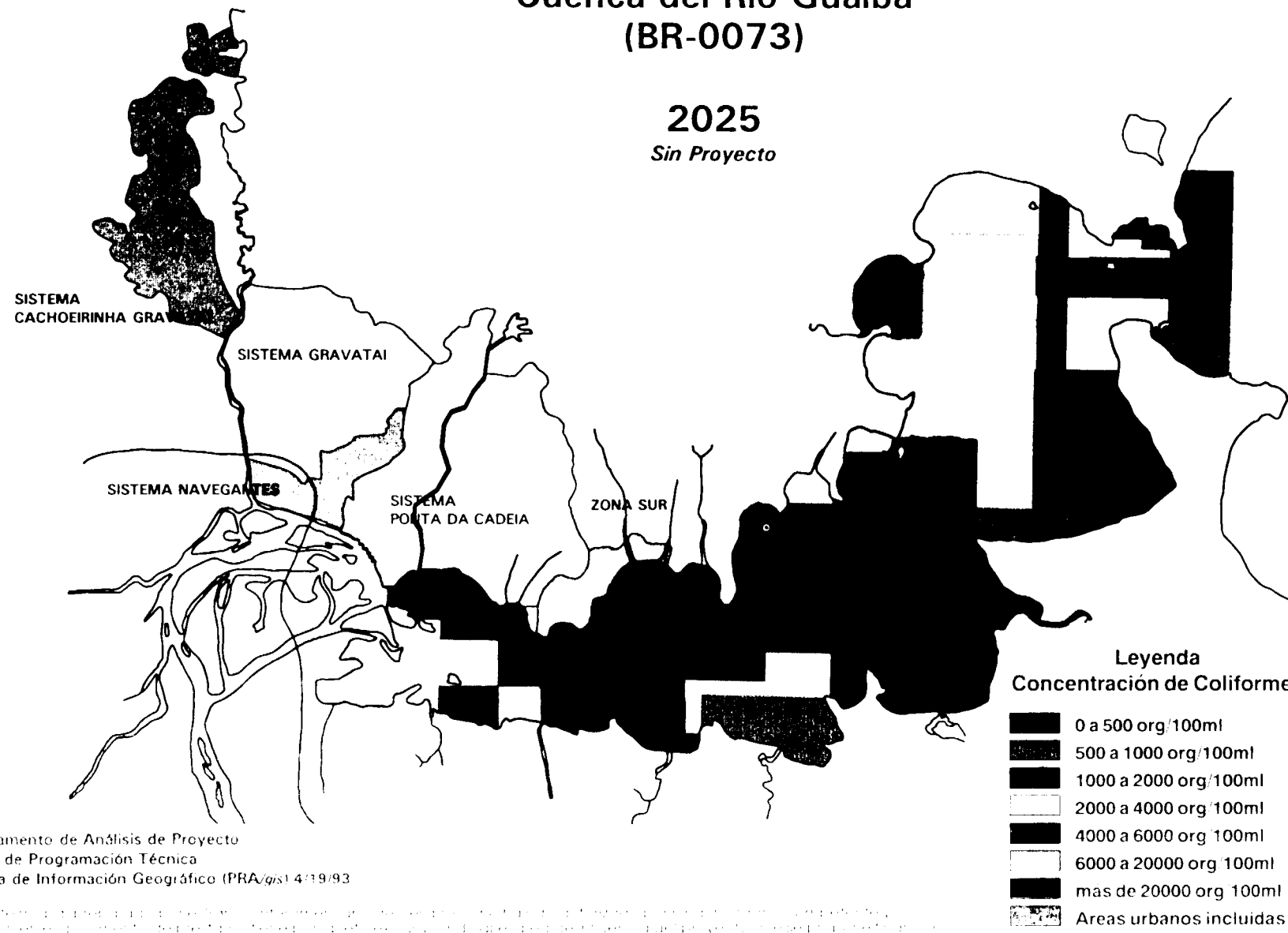
**1992**  
*Situación Actual*



# BRASIL

## Programa de Manejo Ambiental de la Cuenca del Rio Guaiba (BR-0073)

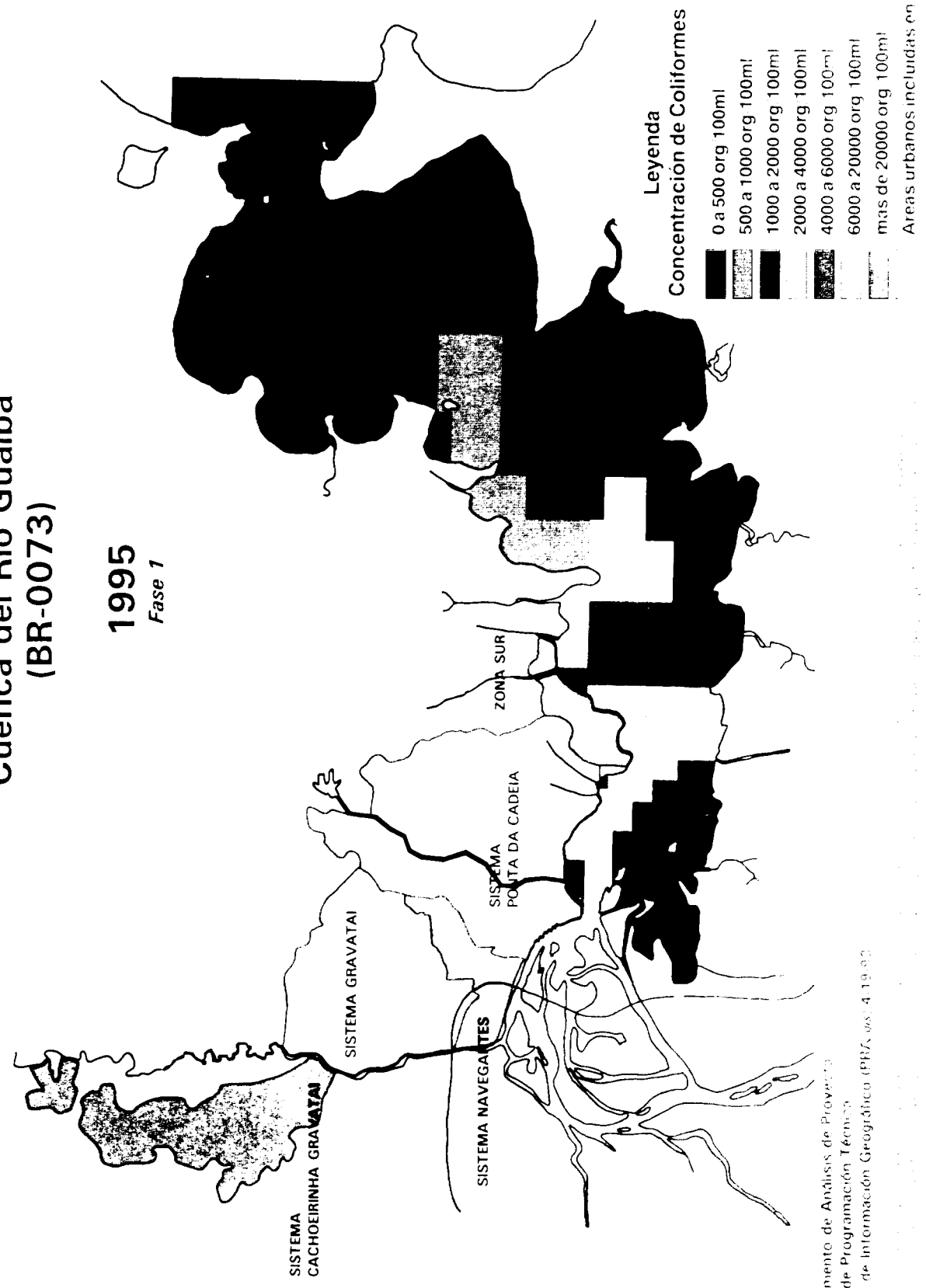
**2025**  
*Sin Proyecto*



# BRASIL

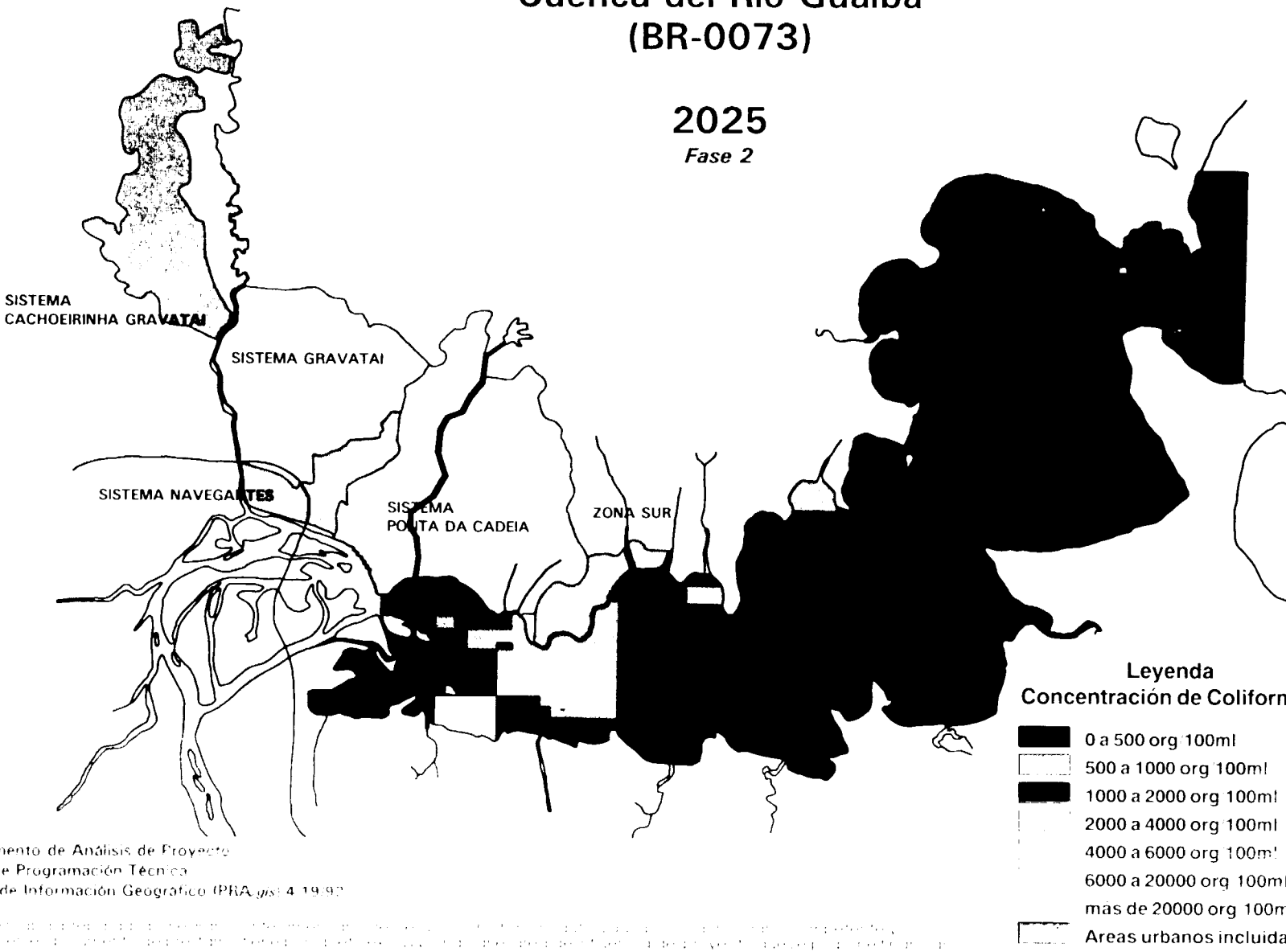
## Programa de Manejo Ambiental de la Cuenca del Rio Guaiba (BR-0073)

1995  
Fase 1



**BRASIL**  
**Programa de Manejo Ambiental de la**  
**Cuenca del Rio Guaiba**  
**(BR-0073)**

**2025**  
*Fase 2*



Documento de Análisis de Proyecto  
de Programación Técnica  
de Información Geográfica (IPRA) p. 4-19-92

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## INSTITUTIONAL ANALYSIS OF FEPAM, FZB, EMATER, SAA AND SE

### A. FEPAM

#### 1. Nature and functions

The Fundação Estadual de Proteção Ambiental [State Environmental Protection Foundation] (FEPAM) was established in 1990 under state law, replacing the Environment Department of the Secretariat of Health and the Environment. It is an agency created under private law, attached to the aforesaid secretariat. As the technical arm of the State Environmental Protection System (itself a part of the National Environmental System), FEPAM's mandate is to perform inspections, issue licenses, and carry out studies and projects to protect and preserve the environment of the state.

#### 2. Organization

FEPAM has a board of directors, a supervisory board, a president who serves also as chief executive officer, and two departments, one for technical affairs and the other for administration. Members of the board of directors and supervisory board, as well as the president and the directors of the technical and administrative areas, are appointed by the state governor. The board of directors is the supreme authority of the foundation; its chief functions are to: (i) approve the by-laws; (ii) determine general policy and guidelines; and (iii) approve work plans.

The supervisory board serves an audit function. The president and chief executive officer directs the foundation's work, with the support of the technical and administrative departments. FEPAM's planning and administrative systems are adequate for the agency to perform its mandate and appropriate for the projects that would be implemented under the program.

#### 3. Staff

In 1992, FEPAM had 238 employees (149 professional level, 40 technical staff, and 49 support staff), which were transferred over from the former Environment Department. The foundation is a new institution, with a further 60 jobs to be filled. With the program, about 45 of these would be staffed, giving the agency the human resource complement it needs to carry out its projects effectively.

#### 4. Revenue sources

FEPAM is funded chiefly through government transfers under the state budget. It also derives some income directly from

environmental licensing and fines. In 1991, it received US\$100,200 for 934 licenses issued, and US\$16,000 in fines levied. With the program, the share of these direct revenues as a percentage of total income would rise, owing to a considerable increase in the number of environmental permits to be issued.

#### 5. Internal and external audit

Internal audits of the foundation are conducted by the state's general accounting office, which audits all agencies deemed to be part of direct government administration. External audits are performed by the official state audit office, an arm of the state legislative assembly. It is being recommended that FEPAM's financial statements be submitted during the first half of each year throughout the life of the loan, after having been audited by a firm acceptable to the Bank.

### B. Fundação Zoobotânica

#### 1. Nature and functions

The Fundação Zoobotânica (FZB) was created by state law in 1972 and began operations in 1974. It is an agency constituted under private law, attached to the Secretariat of Agriculture and Provisioning, and maintained by the public authorities. It has its own assets and administrative and financial autonomy. Its main function is to administer, inspect, and maintain parks and ecology reserves, to construct and improve facilities therein, and to carry out studies and projects.

#### 2. Basic organization

FZB consists of a board of directors, a supervisory board, a president, three divisions, and two departments (administration and finance). Members of the boards and the president are appointed by the state governor. The board of directors is the supreme authority of the foundation, whose chief function is to approve work plans, budgets, and the acquisition of land. The supervisory board examines and approves the financial statements and audits accounting reports.

The president administers the foundation with the support of the above-mentioned departments and divisions. One division oversees the Zoological Park, one the Botanical Garden, and one the Museum of Natural Sciences. The Finance Department draws up and monitors the budget and oversees disbursements, accounting, calls for tenders, and administration of the agency's financial agreements. The Administrative Division is in charge of personnel administration, maintenance, and general services. FZB's organization and distribution of functions is adequate for the work it performs.



### 3. Financial management

The foundation's finances are managed by its Finance Department following the state's financial administration system (AFE Manual) and uniform chart of accounts established by Decree 32,313. FZB produces monthly, quarterly, and yearly financial statements. Annual statements are examined and approved by the supervisory board, the board of directors, the state general accounting office, and the official state audit office, in that order. The foundation draws up a five-year investment plan, quarterly financial programs, and monthly disbursement schedules. The financial administration procedures, manuals, and systems in place are adequate for the foundation's work.

### 4. Staff

In 1992, the FZB staff roster stood at 270, down from 294 in 1989. This was due largely to attrition, owing to lower levels of government funding in light of severe fiscal restraints in these years. The program would restore staff numbers to their previous level, allowing the agency to operate effectively and to carry out and maintain the projects envisaged in the program.

### 5. Internal and external audit

Internal audits are performed by the state general accounting office, following procedures set out in Law 4,320 and Decree 2,300, and in the office's manuals, directives and standards. External audits are conducted by the official state audit office. The internal and external audit procedures in place are adequate.

## C. EMATER

### 1. Nature and functions

The Associação Rio-Grandense de Empreendimentos de Assistência Técnica e Extensão Rural [Rio Grande Association for Technical Assistance and Rural Extension] (EMATER/RS) is a nonprofit association constituted under private law. It was founded in 1977 by decree, as part of the Brazilian Technical Assistance and Rural Extension System (SIBRATER), which groups state entities to harmonize federal and state government agricultural policy. In 1989, the Government of the State of Rio Grande do Sul decided to shoulder the full operating and maintenance costs of EMATER/RS, and made it the chief executing agency of government technical assistance and rural extension programs.

The main function of EMATER/RS is to pursue the development and modernization of agriculture in Rio Grande do Sul, in concert with the other agencies that are working to foster and increase agricultural production, particularly on small family farms.

## 2. Organization

EMATER/RS consists of an administrative and technical board, a supervisory board, an executive office, and state coordination units. The administrative and technical board is a standard-setting and deliberative body which establishes EMATER/RS policy and approves five-year and annual programs and their budgets. The supervisory board examines the accounts rendered by the association and issues opinions thereon.

The executive offices include a president and two directors, one technical and one administrative. Support is provided to these offices by four state coordination units (for planning, operations, systems development, and administration and finance), and nine regional coordination units. The association's organization and distribution of functions is adequate for its goals and objectives.

## 3. Administrative procedures

EMATER/RS operations are recorded using the chart of accounts followed by members of SIBRATER. For the procurement of goods and services it follows the procedures prescribed in Law 2,300. The association's administrative manuals and procedures appear to be adequate.

## 4. Staff

At the beginning of 1992, EMATER/RS had 2,145 employees (1,564 professional and technical, 581 administrative and support staff). Fifteen percent of these employees are at headquarters in Porto Alegre and the rest in the regions. EMATER/RS will assign 568 staff members to the program (92 at headquarters and 476 local and regional). These numbers should be sufficient for proper execution of the program.

## 5. Internal and external audits

Internal audits are performed by the state general accounting office under the terms of Law 4,320. External audits are conducted by the official state audit office, central government audit office, Ministry of Agriculture and Agrarian Reform, and private auditors. The agency's internal and external audit systems are deemed adequate.

## D. Secretariat of Agriculture and Provisioning (SAA)

The Secretariat of Agriculture and Provisioning would carry out the conservation units project through its Department of Renewable Natural Resources (DRNR). The operating capabilities of this department to execute the project are examined in the following paragraphs.

1. Nature and functions of DRNR

DRNR is a technical unit of the Secretary of Agriculture and Provisioning, whose principal function is to coordinate, provide guidance for, and execute activities involving the use of renewable natural resources. It has a director and four divisions dealing with public conservation units, soil and water conservation, forestry, and education, promotion and training.

2. Administrative and planning systems

The department programs its activities following guidelines from the State Agricultural Planning Coordination Unit of the Secretariat of Agriculture and Provisioning. This unit has five divisions plus information processing and agricultural information services. DRNR sets its own program, in conformity with the program of the Agriculture Secretariat, which is in turn part of the state government plan. The department also draws up annual budgets in accordance with the projects to be carried out in its sphere of responsibility.

DRNR does not have an autonomous administrative structure; its resources are administered by the Administrative Department of the Agriculture Secretariat, which has divisions concerned with budget and finance, personnel, property and materials, and general services.

3. Staff

In 1992 the department had 185 employees (106 professional and technical, 79 administrative and support staff). This staff complement should be adequate for the work to be performed by the department under the program.

4. Internal and external audit

Like other departments of the Agriculture Secretariat, DRNR is subject to internal audits by the state general accounting office and external audits by the official state audit office.

E. Secretariat of Education (SE)

1. Nature and functions

The Education Secretariat is part of the direct administration of the state, with a mandate to provide the citizens of the state with academic, moral, civic, and professional education.

## 2. Organization

The Secretariat consists basically of: (i) the office of the Secretary and advisors; (ii) departments in charge of general services, finance, human resources, and education; (iii) regional education offices; and (iv) learning establishments.

The general services office centralizes, oversees, coordinates and inspects all administrative services. The finance department prepares, administers, and controls budgets and funds flows. The human resources department takes care of staff matters, and the education department is responsible for curriculum matters and teaching materials.

There are 28 regional education offices throughout the state, which represent the Education Secretariat in the regions and perform extension services. Their role is to administer education policy so as to standardize the state education system in their area. Under these offices are the schools, at which the state's people receive instruction.

## 3. Internal and external audit

The administrative and accounting procedures of the Secretariat are examined by the state general accounting office, and external audits are performed by the state official audit office.

## STATE OF RIO GRANDE DO SUL

### Basis for income and expenditure projections

The assumptions underlying the income and expenditure projections for the State of Rio Grande do Sul (Table A) for the program execution period were based on historical data and the income and expenditure budget for 1993. Those assumptions are as follows:

1. It was estimated that tax revenues would rise 15% in 1993 since that year would see both implementation of a rate increase in the goods and service tax approved in 1992, and entry into effect of measures taken by the state government to make tax collection more efficient. In subsequent years, tax revenues are expected to increase by 4% per annum, in accordance with the rate of growth in state GDP as projected by the government.
2. Income on assets would fall from US\$674 million equivalent to US\$200 million in 1993. This amount is expected to remain constant each year throughout the projected period.
3. It was estimated that in 1993 the state would receive transfers from the federal government in the amount of US\$374 million. Commencing in 1994 those transfers would also increase at a rate of 4% per annum. The "other income" heading would increase by 4% per annum.
4. Capital revenues would be derived from the rollover of securities maturing each year, the Bank's loan, and other loan agreements already concluded. The rollover of securities is a common practice by the state treasury.
5. For 1993, operating expenses would be reduced 5% as a result of cost-cutting measures under the state's administrative reform plan. Beginning in 1995, operating expenses are expected to increase at a rate of 3% per annum.
6. State transfers to the municipalities would total US\$1.1 billion equivalent in 1993. Beginning in 1994, such transfers would increase by 4% per annum.
7. Capital transfers would remain steady during the period covered by the projections, at US\$100 million yearly.
8. Projected payments of principal and interest on the debt were computed on the basis of current maturity dates.
9. The program investments are those included in the investment schedule referred to in the project report, and the funds to be

applied to investments in other construction would be those remaining after meeting the aforementioned expenses.

The financial projections presented in Table B are based on the terms of the rescheduling of the State of Rio Grande do Sul's debt to the federal government, under a memorandum of understanding concluded by the state and the Ministry of Finance on August 26, 1993. It is established therein that the total amount of the state's debt to the federal government is to be refinanced over a 20-year period at a rate of 6% in real terms. The difference between the two projections is presented as a surplus in Table B and totals US\$198 million equivalent for the period.

TABLE A  
STATE OF RIO GRANDE DO SUL  
(millions of US\$)

	1992 REAL	1993	1994	1995	1996	1997	TOTAL
TOTAL REVENUES	3276	3257	3375	3387	3475	3593	17087
CURRENT REVENUES	2917	2781	2885	2993	3105	3221	14985
-Taxes	1843	2119	2204	2292	2384	2479	11478
-Income on assets	674	200	200	200	200	200	1000
-Transfers	315	374	389	405	421	438	2027
-Other income	85	88	92	96	100	104	480
CAPITAL REVENUES	359	476	490	394	370	372	2102
-Rollover of securities	319	405	420	347	310	330	1812
-IDB loan	0	0	25	27	45	32	129
-Other	40	71	45	20	15	10	161
TOTAL EXPENDITURES	3453	3257	3375	3387	3475	3593	17087
CURRENT EXPENDITURES	2645	2602	2655	2743	2835	2931	13766
-Operating expenses	1095	1040	1040	1071	1103	1136	5390
-Transfers	1079	1100	1144	1190	1238	1288	5960
-IDB interest/fees	0	0	1	3	5	8	17
-Other	471	462	470	479	489	499	2399
CAPITAL EXPENDITURES	808	655	720	644	640	662	3321
-IDB program	0	0	49	52	69	45	215
-Investments	111	110	116	115	120	125	586
-Transfers	253	100	100	100	100	100	500
-Debt amortization	444	445	455	377	351	392	2020
SURPLUS (DEFICIT)	-177	0	0	0	0	0	0

**TABLE B**  
**STATE OF RIO GRANDE DO SUL**  
(millions of US\$)

	1992 REAL	1993	1994	1995	1996	1997	TOTAL
<b>TOTAL REVENUES</b>	<b>3276</b>	<b>3257</b>	<b>3377</b>	<b>3386</b>	<b>3474</b>	<b>3596</b>	<b>17090</b>
<b>CURRENT REVENUES</b>	<b>2917</b>	<b>2781</b>	<b>2885</b>	<b>2993</b>	<b>3105</b>	<b>3221</b>	<b>14985</b>
-Taxes	1843	2119	2204	2292	2384	2479	11478
-Income on assets	674	200	200	200	200	200	1000
-Transfers	315	374	389	405	421	438	2027
-Other income	85	88	92	96	100	104	480
<b>CAPITAL REVENUES</b>	<b>359</b>	<b>476</b>	<b>492</b>	<b>393</b>	<b>369</b>	<b>375</b>	<b>2105</b>
-Rollover of securities	319	405	420	347	310	330	1812
-IDB loan	0	0	27	26	44	35	132
-Other	40	71	45	20	15	10	161
<b>TOTAL EXPENDITURES</b>	<b>3453</b>	<b>3214</b>	<b>3340</b>	<b>3358</b>	<b>3436</b>	<b>3544</b>	<b>16892</b>
<b>CURRENT EXPENDITURES</b>	<b>2645</b>	<b>2575</b>	<b>2629</b>	<b>2716</b>	<b>2809</b>	<b>2904</b>	<b>13633</b>
-Operating expenses	1095	1040	1040	1071	1103	1136	5390
-Transfers	1079	1100	1144	1190	1238	1288	5960
-IDB interest/fees	0	0	2	3	6	8	19
-Other interest/fees	165	217	215	212	210	207	1061
-Other expenses	306	218	228	240	252	265	1203
<b>CAPITAL EXPENDITURES</b>	<b>808</b>	<b>639</b>	<b>711</b>	<b>642</b>	<b>627</b>	<b>640</b>	<b>3259</b>
-IDB program	0	0	50	52	67	52	221
-Other investments	111	110	116	115	120	125	586
-Transfers	253	100	100	100	100	100	500
-Debt amortization	444	429	445	375	340	363	1952
<b>SURPLUS (DEFICIT)</b>	<b>-177</b>	<b>43</b>	<b>37</b>	<b>28</b>	<b>38</b>	<b>52</b>	<b>198</b>

PROPOSED RESOLUTION 1/

BRAZIL. LOAN /OC-BR TO THE STATE OF RIO GRANDE DO SUL  
Guaíba Watershed Environmental Management Program  
(First Stage)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the State of Rio Grande do Sul, as Borrower, and with the República Federativa do Brasil, as Guarantor, for the purpose of granting the former a loan to cooperate in the execution of the first stage of a program for the rational development, rehabilitation, and environmental management of the Guaíba watershed, hereinafter referred to as the "Program". This financing shall be subject substantially to the following conditions:

1. Amount and Currencies: Up to US\$110,200,000, or its equivalent in other currencies, except that of the República Federativa do Brasil, which are part of the ordinary capital resources of the Bank, to pay for goods and services acquired through international competition in the member countries of the Bank and for such other purposes as may be specified in the loan contract. Payments of amortization and interest shall be made in the currency or currencies specified by the Bank, in a quantity equivalent to the corresponding amount owed, calculated in units of account in terms of dollars of the United States of America, in accordance with provisions to be included in the loan contract.
2. Source of Funds: The ordinary capital resources of the Bank.
3. Guarantee: Joint and several guarantee of the República Federativa do Brasil.
4. Credit Fee: 0.75% per annum on the undisbursed portion of the financing, commencing to accrue 60 days after the date of the loan contract and payable in dollars of the United States of America on the same dates as the interest.

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1/ The provisions contained in this Appendix I and in Appendices II, III, and IV will be final only when the Board of Executive Directors has approved the loan proposal.



5. Amortization: The Borrower shall amortize the loan in a period of 25 years from the date of the loan contract, by means of semiannual, consecutive and, insofar as possible, equal installments. The first installment shall be paid on the first interest payment date, six months after the date scheduled for the last disbursement of the financing.
6. Interest: The Borrower shall pay interest semiannually on the daily outstanding balances of the loan. The first payment shall be made six months after the date of the contract. The Bank shall determine the rates of interest to be applied during the life of the loan, in accordance with the lending rate policy of the Bank.
7. Disbursement: The term for disbursement of the financing shall expire four years after the effective date of the loan contract.
8. Special Conditions:
  - (a) The Program shall be executed and the resources of the loan used in their entirety by the Secretaria de Planejamento e Administração ("SPA"), which shall coordinate the work of the following co-executing agencies: (i) Companhia Riograndense de Saneamento ("CORSAN"); (ii) Departamento de Águas e Esgotos de Porto Alegre ("DMAE"); (iii) Departamento de Limpeza Urbana de Porto Alegre ("DMLU"); (iv) Associação Riograndense de Empreendimentos de Assistência Técnica e Extensão Rural ("EMATER"); (v) Fundação Estadual de Proteção Ambiental Luís Henrique Roessler ("FEPAM"); (vi) Fundação Zoobotânica ("FZB"); (vii) Secretaria de Agricultura e Abastecimento ("SAA"); and (viii) Secretaria da Educação ("SE"). The Fundação para o Desenvolvimento de Recursos Humanos ("FDRH") and the Fundação de Planejamento Metropolitano e Regional ("METROPLAN") will also take part in implementing the Program.
  - (b) The resources of the loan, together with the resources of loan \_\_\_/SF-BR, shall be used to participate in the execution of a Program the total cost of which is estimated at the equivalent of US\$220,500,000. Consequently, the loan and guarantee contracts shall contain appropriate provisions to ensure that such resources as may be necessary, in addition to the two loans, for the complete execution of the Program shall be duly provided, in an amount estimated at the equivalent of US\$88,200,000, in accordance with a schedule of investments satisfactory to the Bank.
  - (c) Prior to the first disbursement of the financing, the Borrower shall demonstrate to the satisfaction of the Bank that:
    - (i) A consulting firm has been engaged to assist the executing unit, in accordance with terms of reference agreed upon by the Bank and the Executing Agency.

- (ii) The Government of the State of Rio Grande do Sul has entered into separate contracts with CORSAN, DMAE, and DMLU, for transfer to those entities of the proceeds of the Bank's financing, including the funding allocated for contingencies and price escalation. The financial terms and conditions for the transfer of the ordinary-capital funds to the three aforementioned subborrowers, and for the transfer of FSO resources to CORSAN, shall be identical to those of the contracts for the Bank's loans. The contracts with DMAE and DMLU, to which the Municipal Government of Porto Alegre will be a party, shall contain the commitments referred to in letters (f) and (g) as well as in numerals 5 and 8 of Appendix III, and finally in paragraph 9.01 of Appendix IV.
  - (iii) A general agreement has been signed between SPA, on the one hand, and FEPAM, FZB, EMATER, CORSAN, and METROPLAN on the other, to allow the use of financial resources for implementation of the Program.
  - (iv) A general agreement has been signed between SPA, on the one hand, and SAA and SE, on the other, governing the execution of the Program.
  - (v) SPA and FDRH have entered into a services agreement for staff training.
  - (vi) An inter-agency agreement has been duly signed to set out the terms and conditions for joint participation of SPA, FEPAM, CORSAN, and DMAE in the environmental monitoring network sub-program.
- (d) As a condition for the first disbursement of the financing for each of the sub-programs listed below, the Borrower shall provide evidence satisfactory to the Bank of the following:
- (i) Sub-program for Porto Alegre domestic sewage collection and treatment: an agreement between the Departamento de Esgotos Pluviais (DEP) of the Municipality of Porto Alegre and DMAE setting out the responsibilities of the two parties so as to ensure proper operation and maintenance of the combined storm sewer and waste disposal works.
  - (ii) Sub-program for soil conservation and control of agrototoxic chemicals: the Operating Regulations of the Permanent Revolving Fund for Support to Small Farmers.
- (e) In the acquisition of machinery, equipment, and other goods for the Program, and in the awarding of construction contracts, the system of public bidding shall be followed in each case in which the value

of such acquisitions exceeds the equivalent of US\$250,000 and the value of construction contracts exceeds the equivalent of US\$1,000,000. The bidding shall be subject to the procedures to be attached as an annex to the loan contract.

- (f) The Borrower, through the Executing Agency and in matters falling within its authority, shall take appropriate measures accepted by the Bank in order that the rates for all CORSAN services produce revenues at least sufficient to cover all operating expenses of CORSAN, including those related to administration, operation, maintenance, and depreciation of its restated fixed assets. If the application of the foregoing does not generate sufficient resources to cover the timely service of all the obligations of CORSAN and contribute a percentage of the annual capital investment plan for the aforementioned services, CORSAN and the Borrower shall, in their respective spheres of authority, take the necessary measures, including rate increases, to obtain the additional resources required to that end.
- (g) The Borrower, through the Executing Agency and in matters falling within its authority, shall take appropriate measures acceptable to the Bank in order that the rates for all DMAE services produce revenues at least sufficient to cover all operating expenses of DMAE, including those related to administration, operation, maintenance, and depreciation of its restated fixed assets. If the application of the foregoing does not generate sufficient resources to cover the timely service of all the obligations of DMAE and a percentage of the annual investment plan for the aforementioned services, the Borrower, through the Executing Agency, and DMAE shall, in their respective spheres of authority, take the measures required for DMAE to obtain the additional resources required to that end.
- (h) The Borrower, through the Executing Agency and in areas falling within its authority, shall take the measures needed to ensure that the Municipality of Porto Alegre and DMLU adopt such measures as are required in order for solid-waste collection fee revenues plus budgetary transfers to DMLU from the Porto Alegre Municipal Government to cover all administrative, operating, and maintenance expenses of DMLU and service its debt.
- (i) The Bank shall establish such inspection procedures as it deems necessary to assure the satisfactory execution of the Program, and the Borrower and the Guarantor shall extend all cooperation which is required for the most effective accomplishment of this purpose. From the amount of the financing the sum of US\$1,102,000 shall be allocated for credit to the income accounts of the Bank to meet expenses of general inspection and supervision.

PROPOSED RESOLUTION 1/

BRAZIL. LOAN /SF-BR TO THE STATE OF RIO GRANDE DO SUL  
Guaíba Watershed Environmental Management Program  
(First Stage)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the State of Rio Grande do Sul, as Borrower, and with the República Federativa do Brasil, as Guarantor, for the purpose of granting the former a loan to cooperate in the execution of the first stage of a program for the rational development, rehabilitation, and environmental management of the Guaíba watershed, hereinafter referred to as the "Program". This financing shall be subject substantially to the following conditions:

1. Amount and Currencies: Up to the equivalent of US\$22,100,000 in cruzeiros-reais which are part of the Bank's Fund for Special Operations, to cover local expenses and for such other purposes as may be specified in the loan contract. Payments of amortization and interest shall be made in cruzeiros-reais.
2. Source of Funds: The Fund for Special Operations.
3. Guarantee: Joint and several guarantee of the República Federativa do Brasil.
4. Amortization: The Borrower shall amortize the loan in a period of 25 years from the date of the loan contract, by means of semiannual, consecutive and, insofar as possible, equal installments. The first installment shall be paid on the first interest payment date, six months after the date scheduled for the last disbursement of the financing.
5. Interest: 3% per annum, payable semiannually on principal amounts outstanding accrued on daily basis. The first payment shall be made six months after the date of the loan contract.

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1/ The provisions contained in this Appendix II and in Appendices I, III, and IV will be final only when the Board of Executive Directors has approved the loan proposal.

6. Disbursement: The term for disbursement of the financing shall expire four years after the effective date of the contract.
7. Special Conditions:
- (a) The Program shall be executed and the resources of the loan used in their entirety by the Secretaria de Planejamento e Administração ("SPA"), which will coordinate the work of the following co-executing agencies: (i) Companhia Riograndense de Saneamento ("CORSAN"); (ii) Departamento de Águas e Esgotos de Porto Alegre ("DMAE"); (iii) Departamento de Limpeza Urbana de Porto Alegre ("DMLU"); (iv) Associação Riograndense de Empreendimentos de Assistência Técnica e Extensão Rural ("EMATER"); (v) Fundação Estadual de Proteção Ambiental Luís Henrique Roessler ("FEPAM"); (vi) Fundação Zoobotânica ("FZB"); (vii) Secretaria de Agricultura e Abastecimento ("SAA"); and (viii) Secretaria da Educação ("SE"). The Fundação para o Desenvolvimento de Recursos Humanos ("FDRH") and the Fundação de Planejamento Metropolitano e Regional ("METROPLAN") will also take part in implementing the Program.
  - (b) The resources of the loan, together with the resources of loan \_\_\_/OC-BR, shall be used to participate in the execution of a project the total cost of which is estimated at the equivalent of US\$220,500,000. Consequently, the loan and guarantee contracts shall contain such provisions as the Bank deems appropriate to ensure that such resources as may be necessary, in addition to the two loans, for the complete execution of the Program shall be duly provided, in an amount estimated at the equivalent of US\$88,200,000, in accordance with a schedule of investments satisfactory to the Bank.
  - (c) Prior to the first disbursement of the financing, the Borrower shall demonstrate to the satisfaction of the Bank that:
    - (i) A consulting firm has been engaged to assist the executing unit, in accordance with terms of reference agreed upon by the Bank and the Executing Agency.
    - (ii) The Government of the State of Rio Grande do Sul has entered into separate contracts with CORSAN, DMAE, and DMLU, for transfer to those entities of the proceeds of the Bank's financing, including the funding allocated for contingencies and price escalation. The financial terms and conditions for the transfer of ordinary-capital funds to the three aforementioned subborrowers, and for the transfer of FSO resources to CORSAN, shall be identical to those of the contracts for the Bank's loans. The contracts with DMAE and DMLU, to which the Municipal Government of Porto Alegre will be a party, shall contain the commitments referred to in letters (f) and (g) as well as in numerals 5

and 8 of Appendix III, and finally in paragraph 9.01 of Appendix IV.

- (iii) A general agreement has been signed between SPA, on the one hand, and FEPAM, FZB, EMATER, CORSAN, and METROPLAN on the other, to govern the use of financial resources for implementation of the PRÓ-GUAÍBA sub-programs.
  - (iv) A general agreement has been signed between SPA, on the one hand, and SAA and SE, on the other, governing execution of the PRÓ-GUAÍBA sub-programs.
  - (v) SPA and FDRH have entered into a services contract for staff training.
  - (vi) An inter-agency agreement has been duly concluded to set out the terms and conditions for joint participation of SPA, FEPAM, CORSAN, and DMAE in the environmental monitoring network sub-program.
- (d) Prior to the first disbursement of the financing for each of the sub-programs listed below, the Borrower shall provide evidence satisfactory to the Bank of the following:
- (i) Porto Alegre sewer and domestic sewage treatment system: an agreement between the Departamento de Esgotos Pluviais of the Municipality of Porto Alegre (DEP) and DMAE setting out the responsibilities of the two parties to ensure proper operation and maintenance of the combined storm sewer and waste disposal works.
  - (ii) Management and control of pollution caused by agrotoxic chemicals: the Operating Regulations of the Permanent Revolving Fund for Support to Small Farmers.
- (e) In the acquisition of machinery, equipment, and other goods for the Program, and in the awarding of construction contracts, the system of public bidding shall be followed in each case in which the value of such acquisitions exceeds the equivalent of US\$250,000 or the value of construction contracts exceeds the equivalent of US\$1,000,000. The bidding shall be subject to the procedures to be attached as an annex to the loan contract.
- (f) The Borrower, through the Executing Agency and in matters falling within its authority, shall take appropriate measures acceptable to the Bank in order that the rates for all CORSAN services produce revenues at least sufficient to cover all operating expenses of CORSAN, including those related to administration, operation, maintenance, and depreciation of its restated fixed assets. If the application of the foregoing does not generate sufficient resources

to cover the timely service of all the obligations of CORSAN and a percentage of the annual investment plan for the aforementioned services, CORSAN and the Borrower shall, in their respective spheres of authority, take the necessary measures, including rate increases, to obtain the additional resources needed to that end.

- (g) The Borrower, through the Executing Agency and in matters falling within its authority, shall take appropriate measures acceptable to the Bank in order that the rates for all DMAE services produce revenues at least sufficient to cover all operating expenses of DMAE, including those related to administration, operation, maintenance, and depreciation of its restated fixed assets. If the application of the foregoing does not generate sufficient resources to cover the timely service of all the obligations of DMAE and a percentage of the annual investment plan for the aforementioned services, the Borrower, through the Executing Agency, and DMAE shall, in their respective spheres of authority, take such measures as may be required for DMAE to obtain the additional resources needed to that end.
- (h) The Borrower, through the Executing Agency and in areas falling within its authority, shall take the measures needed to ensure that the Municipality of Porto Alegre and DMLU adopt such measures as are required in order for solid-waste collection fee revenues plus budgetary transfers to DMLU from the Porto Alegre Municipal Government to cover all administrative, operating, and maintenance expenses of DMLU and service its debt.
- (i) The Bank shall establish such inspection procedures as it deems necessary to assure the satisfactory execution of the Program, and the Borrower and the Guarantor shall extend all cooperation which is required for the most effective accomplishment of this purpose. From the financing, the equivalent of US\$221,000 in cruzeiros-reais shall be allocated for credit to the income accounts of the Bank to meet expenses of general inspection and supervision.

RECOMMENDATIONS

- A. It is recommended that the following conditions, to be met to the Bank's satisfaction, be included in the loan and guarantee contracts, as applicable, in addition to those set forth in the proposed resolutions:
1. Unless the parties agree otherwise:
    - a. Prior to initiating each call for public bids or, if there is no need for public bids, prior to the acquisition of the goods or the initiation of the works, the Borrower, through the Executing Agency, shall submit to the Bank:
      - (i) the general plans, specifications, budgets and other documents needed for the acquisition or construction and, where applicable, the specific requirements and other documents needed for the call for bids; and
      - (ii) in the case of works, evidence that it has the legal possession, easements or other pertinent rights to the lands required for construction of works for the Program.
    - b. Before the construction contract for the São João Navegantes waste treatment works is awarded, the Borrower, through the Executing Agency, shall demonstrate to the Bank that the plan for the resettlement of families affected by those works has been concluded.
  2. The Bank may recognize as part of the local counterpart resources of the Program expenditures up to the equivalent of US\$450,000 in , incurred prior to [date of Resolutions DE- and DE- ] but after , provided that requirements substantially similar to those set forth in the resolutions and in the loan contracts have been fulfilled.
  3. For the procurement of goods and services by beneficiaries of the soil conservation and agrotxin control sub-program, the Executing Agency shall, directly or through the co-executing agency, require that the beneficiaries satisfy at least the following conditions: (a) the beneficiary shall use the goods and services funded with proceeds of the financing exclusively to implement the project for which financing has been approved; (b) the Borrower or, as applicable, the Executing Agency, and the Bank, accompanied by an EMATER representative, may examine the goods, work premises and construction sites of the project; (c) the beneficiary shall provide the Executing Agency with



such information as the latter may reasonably request concerning the beneficiary's project and financial situation; (d) the beneficiary shall take such measures as may be necessary in order for the costs of construction and services contracts, and of all goods acquired for the project, to be reasonable, such costs to be as a general rule the lowest market costs, taking into account factors of quality, efficiency, and other relevant considerations; and (e) the beneficiary shall insure, and continue to insure, the goods against risks, in amounts consistent with standard business practices, to the extent possible in the country.

4. The progress reports to be submitted by the Borrower to the Bank every six months shall contain detailed information on progress achieved in the following areas: (i) control of industrial pollution; (ii) the environmental monitoring network, and (iii) restoration of solid-waste landfill areas in the northern zone, and efficiency of leachate treatment processes.
5. The Borrower, through the Executing Agency, shall take the steps necessary, in areas falling under its authority, such that CORSAN and DMAE maintain a level of collections at least equal to 85% of the balances outstanding of the accounts relating to the services they provide. For this purpose, balances outstanding are considered those unpaid accounts which became due during the respective fiscal year, plus accounts owed from previous years. The Borrower, through CORSAN and DMAE, shall present each year, within 120 days following the close of each fiscal year and for 10 years as from the first year of the loan contracts, reports on the collection percentages achieved by CORSAN and DMAE.
6. The Borrower, through the Executing Agency, shall take such measures as may be necessary for SPA to submit to the Bank, within 30 months after the signature of the loan contracts, the results of the Master Plan for Control and Environmental Management of the Guaíba Watershed (PDCAA) and the Master Plan for Solid Waste Management in the Porto Alegre Metropolitan Region (PDRS). The PDCAA is to include, as well as other studies, technical and economic feasibility studies of the source of water supply to the Cachoeirinha-Gravatá systems, to replace current sources, and the plans for the lowest-cost scenario.
7. The Borrower shall submit the following reports to the Bank: (a) within 12 months after the date of the loan contracts, a report providing a complete action plan, with a review of the targets originally proposed by FEPAM; and (b) within 42 months after the date of the above-mentioned contracts, a complete final report, stating which industries have established units

to treat and control liquid waste pollution and which targets and objectives have been actually achieved.

8. The Borrower, through the Executing Agency, shall in those areas falling within its authority take the necessary measures in order for DMAE to demonstrate, within 24 months after the date of the loan contracts, that it has established an accrual accounting system for recording its operations.
9. The Borrower, through the Executing Agency, shall submit within 36 months after the date of the loan contracts the findings of the feasibility studies and the designs for works projects to be implemented and action to be taken in subsequent stages to protect and manage the watershed. The report shall set forth the components (specific works projects and actions) that would comprise the following phases, including potential sources of financing and an implementation timetable. The Borrower shall further undertake that it shall execute the following stages on the basis of the findings of the studies or any other viable alternative.
10. Within 42 months after the date of the loan contracts, the Borrower, through the Executing Agency, shall submit to the Bank a complete final report on: (a) the sub-program for establishment of the environmental monitoring network, and (b) the sub-program for restoration of solid-waste landfill areas in the northern zone of Porto Alegre, in both cases as specified in section VII of Appendix IV.
11. The Borrower, through the Executing Agency or the co-executing agencies, shall: (a) maintain the works and equipment involved in the Program in accordance with generally accepted technical standards; and (b) submit to the Bank, each year for 10 years following completion of the first of the Program works, within the first quarter of the calendar year, a maintenance report on the works and equipment for the preceding year and the maintenance plan for the current year, in accordance with the provisions set forth in section VI of Appendix IV. If the inspections conducted by the Bank, or reports it receives, reveal that the actual maintenance is below the agreed-upon levels, the Borrower, through the Executing Agency or the co-executing agencies, shall take the appropriate action to have the deficiencies fully corrected.
12. Beginning with the first year from the effective date of the loan contracts, and annually through the second year following the date of the last disbursement of the financing, the Borrower shall submit to the Bank for approval the comparative annual data referred to in paragraph 8.02 of Appendix IV.

13. Within three years from the date of the final disbursement of the financing, the Borrower shall submit to the Bank an ex post evaluation report on the results of the Program, following the methodology and guidelines indicated in section VIII of Appendix IV.
  14. The financial statements of the Program, of CORSAN and of DMAE, shall be presented annually to the Bank during execution of the Program, after having been audited by a reputable independent public accounting firm such as would reasonably be acceptable to the Bank. The accounting firm shall audit the statements under the supervision of the Secretaria do Tesouro Nacional, Ministry of Finance. The financial statements of the Borrower shall be presented annually to the Bank, throughout the life of the loan contracts, after having been audited by a reputable independent public accounting firm such as would reasonably be acceptable to the Bank.
- B. The loan contracts shall include an annex substantially similar to Appendix IV of this document ("The Program").

## ANNEX A

### The Program

#### I. Purpose

- 1.01 The general objective of the Program is to set in place in the Guaíba watershed conditions necessary for rational use of the basin's renewable natural resources, and to restore environmental quality in the most polluted urban and rural areas, so as to improve the living conditions of the population in the watershed.
- 1.02 To achieve the aforementioned objective, the first stage of the program seeks to accomplish the following: strengthen the capabilities of institutions concerned with environmental management; control and lower household and industrial pollution in urban areas; institute better soil conservation, fertilization, and agROTOXIN handling practices in priority microwatersheds; help consolidate the system of protected areas in the watershed; and set up formal and nonformal environmental awareness and education programs.

#### II. Description

- 2.01 The Program consists of four subprograms: (a) domestic sewage collection and treatment in the cities of Cachoeirinha, Gravataí and Porto Alegre; (b) solid waste management in Porto Alegre; (c) soil conservation and control of agROTOXIC chemicals; and (d) consolidation of parks and reserves.
- 2.02 The following supplementary activities will be conducted under the Program: (a) planning and action for industrial pollution control; (b) improvement and expansion of the environmental monitoring network; (c) preparation of a master plan for solid waste management in the Porto Alegre metropolitan area; (d) environmental education; (e) institutional management and strengthening; (f) establishment of a public information plan; (g) human resources training; and (h) studies and designs for the next stages of the program.

#### Subprograms

- 2.03 The subprogram to supply the cities of Cachoeirinha and Gravataí (co-executing agency CORSAN) and Porto Alegre (co-executing agency DMAE) with sanitary sewer systems entails the construction of sewer systems, outfalls, and treatment plants.

- 2.04 The Porto Alegre solid-waste management subproject to be implemented by DMLU as co-executing agency will provide financing for construction work and the purchase of equipment for: (a) solid waste collection in areas without ready access and in industrial establishments; (b) selective solid waste collection in schools in Porto Alegre; (c) recycling of waste using simple technologies and unskilled manpower; and (d) tertiary treatment of leachate produced in the northern zone of Porto Alegre and monitoring of results.
- 2.05 The subproject for soil conservation and control of toxic farm chemicals is subdivided into five subcomponents: (a) soil management and conservation per se; (b) forestation and reforestation; (c) control of pollution caused by agricultural chemicals; and (d) rural extension services and environmental education. Provision is being made in this subproject for a financing facility for construction of works and other activities on small rural properties in the Guaíba watershed area. EMATER will be the co-executing agency.
- 2.06 The object of the park and reserve consolidation subproject, to be implemented by FZB and SAA as co-executing agencies, is to protect, oversee, and upgrade the infrastructure of five conservation units - the Jacuí Delta Park, Botanical Garden, Zoological Park, Itapuã Park, and Serra Geral Biological Reserve - through the purchase of equipment and land and the execution of civil works.

#### Supplementary activities

- 2.07 The action plan for industrial pollution control, for which FEPAM will be co-executing agency, encompasses 85,950 square kilometers of the watershed. The main activities envisaged are: (a) survey of industrial pollution sources and establishment of an environmental information system; (b) register of industrial pollution sources; (c) classification of industrial pollution sources according to their polluting potential; and (d) design and implementation of an action plan to bring industrial pollution sources under the framework of environmental legislation, with the goal of lowering organic loads by about 50%. To execute this component, consultants will be hired and equipment purchased.
- 2.08 The subproject to upgrade and expand the environmental monitoring network is intended to supplement the three stations, equipment, and civil works belonging to the co-executing agencies FEPAM, CORSAN, and DMAE. It will entail approximately 80 stations for the core network, 40 stations for special hydrologic studies, and 25 groundwater monitoring wells, along with 55 sediment sampling stations. The expanded network will also have pluviometric, fluviometric, climatological and piezometric stations and stations for monitoring air resources.

- 2.09 The solid waste master plan for the Porto Alegre metropolitan area, which is the responsibility of METROPLAN, will be drawn up by consultants. It will be a preliminary instrument for: (a) producing a diagnostic assessment; (b) proposing solutions and alternatives; (c) devising a plan; and (d) setting investment priorities.
- 2.10 The environmental education component to be conducted by SE as co-executing agency entails the following: (a) preparation of a master plan for environmental education; (b) institution of a pilot project in the so-called "environmental education cores" in a total of nine schools; (c) equipping of the core schools; (d) organization of refresher courses for communications instructors and professionals; and (e) initial work on adapting the curriculum of the state's public education system.
- 2.11 The Pró-Guaíba Geographical Information System (SIGPROG), for which SPA will be responsible, is designed to provide institutional strengthening for the execution of the Program, through purchases of equipment and materials, cadastre surveys, and the hiring of consultants. The system is to be structured around eight SIGPROB laboratories to be set up in the main co-executing agencies, i.e., SPA, METROPLAN, FEPAM, FZB, CORSAN, SE, EMATER, and the Porto Alegre Municipal Government.
- 2.12 The work entailed in the Public Information Plan, which is also SPA's responsibility, will be contracted out. The purpose of this plan is to ensure that the results of the Program are made known internally, in state government offices, and in the community at large.
- 2.13 The human resources training activities that will fall to FDRH as co-executing agency will instruct administrative and technical staff in watershed management and in sector-specific activities for the various Program components.
- 2.14 To supplement the information and studies now available and prepare the next stages of the Program, SPA is to engage consultants to draft a master plan for monitoring and environmental management of the Guaíba watershed. This plan will: (a) update biophysical and socioeconomic diagnostic assessments; (b) establish strategies; (c) identify and analyze environmental intervention options; and (d) set priorities for investments to help resolve environmental problems.

### III. Total cost of the Program and financing plan

- 3.01 The estimated total cost of the Program is the equivalent of US\$220.5 million. A breakdown by investment category and source of funding is given in the following table.

INVESTMENT COSTS BY CATEGORY AND SOURCE OF FUNDING  
(thousands of U.S. dollars)

CATEGORY	TOTAL BY SOURCE OF FUNDING				
	OC	FSO	LOCAL	TOTAL	% OF TOTAL
ENGINEERING AND ADMINISTRATION	0	0	2,208	2,208	1.0
DIRECT COSTS	81,805	18,502	20,901	121,208	54.9
Sewers, Cachoeirinha/Gravatá	50,073	0	426	50,499	22.9
Sewers, Porto Alegre	24,633	0	3,521	28,154	12.7
Solid waste, Porto Alegre	1,399	0	576	1,975	0.8
Conservation units	1,000	5,600	5,728	12,328	5.5
Soil management and agrototoxic control	4,740	12,902	10,610	28,252	12.8
ASSOCIATED COSTS	5,141	0	43,464	48,605	22.0
Industrial pollution control	1,165	0	5,895	7,060	3.2
Environmental monitoring network	2,053	0	7,799	9,852	4.4
Geographical information system	1,923	0	5,004	6,927	3.1
Human resources training	0	0	1,335	1,335	0.6
Public Information Plan	0	0	1,691	1,691	0.7
Environmental education	0	0	2,417	2,417	1.0
Guaíba watershed master plan	0	0	7,125	7,125	3.2
Studies, conservation units	0	0	1,537	1,537	0.6
Solid waste master plan	0	0	510	510	0.2
Acquisition of land	0	0	9,951	9,951	4.5
Resettlement of families	0	0	200	200	0
SUBTOTAL	86,986	18,502	66,533	172,021	78.0
UNALLOCATED	22,112	3,377	3,888	29,377	13.3
Contingencies	8,733	1,868	1,848	12,449	5.6
Price escalation	13,379	1,509	2,040	16,928	7.6
FINANCE CHARGES	1,102	221	17,779	19,102	8.6
Interest	0	0	16,054	16,054	7.2
Credit fee	0	0	1,725	1,725	0.7
Inspection and supervision	1,102	221	0	1,323	0.6
TOTAL	110,200	22,100	88,200	220,500	100.0
% FUNDING SOURCE/TOTAL PROGRAM	50.0	10.0	40.0	100	--

IV. Procurement

- 4.01 (a) When goods to be procured or services to be contracted for the Program, including those relating to transportation and insurance, are to be financed in whole or in part with foreign exchange from the financing, the procedures and specific requirements for the bidding or other forms of contracting shall permit the unrestricted participation of suppliers of goods and services from member countries of the Bank. Consequently, no conditions that would prevent or restrict the offer of goods or the participation of contractors from such countries shall be established in such procedures or specific requirements.

- (b) For the purposes of the provisions set forth in Annex B, "Tender Procedures", Section B, paragraph 3.04, of the loan contracts, the system of prequalification or registry of bidders shall be utilized in tender procedures for the execution of sewer mains, intercepting sewers and treatment plants.

V. Consulting services

- 5.01 With respect to consulting services to be financed with local counterpart resources:
  - (a) Before calling for tenders for consulting services to be financed with local counterpart resources, the Borrower, through the Executing Agency, shall determine with the Bank the terms of reference for the services.
  - (b) Before finalizing any consulting contract, the Borrower, through the Executing Agency, shall provide the Bank with the names and background information on the firms selected and the cost of their services.

VI. Maintenance

- 6.01 The purpose of the maintenance will be to conserve the works and equipment of the Program in accordance with generally accepted technical standards.
- 6.02 The first annual maintenance report shall correspond to the fiscal year subsequent to that in which the first work of the Program went into operation.
- 6.03 The annual maintenance report shall include: (i) details of the organization responsible for maintenance, the personnel involved, and the number, type, and condition of the maintenance equipment; (ii) the location, size, and condition of the repair and storage facilities and maintenance shops; (iii) information pertaining to the resources spent on maintenance the previous year, the amount being spent for maintenance during the current year, and the amount to be allocated in the budget for the following year; and (iv) a report on the operating efficiency achieved in maintenance and on maintenance conditions, based on an assessment system with indicators to be proposed by the Borrower through the Executing Agency.

VII. Report on the environmental monitoring network and rehabilitation of solid-waste landfill areas

- 7.01 For the environmental monitoring network, the report shall provide information on the implementation stage, operation of the system, and results achieved in the first 12 months.



- 7.02 For the subproject to rehabilitate solid-waste landfill areas, the report shall contain, in addition to the information noted above, the efficiency achieved in the leachate treatment process.

VIII. Ex-post evaluation

- 8.01 To allow for an assessment of the socioeconomic impact of the Program and the extent to which its objectives have been accomplished, the Borrower, through the Executing Agency, shall provide the Bank with an ex-post evaluation report, using the same methodology employed in the ex-ante analysis. The report is to include a cost-benefit analysis and an analysis of rate of return, along with a description of other important socioeconomic effects. It shall be presented at the end of the second year after the date of final disbursement of the financing.

- 8.02 For purposes of the ex-post evaluation report, the Borrower, through the Executing Agency, shall keep records of the following data:

1. Pollution control

- (a) Population of each subarea of the Program, number of water and sewer connections, and percentage of the population with water and sewer service.
- (b) Sewer service rates and a comparison with marginal cost by customer category.
- (c) Water quality indicators for the Guaíba River.
- (d) Actual costs of operating and maintaining the sewer system and of household sewage treatment.

2. Soil management and control of agrototoxic chemicals

- (a) Extent to which envisaged practices have been adopted and implemented.
- (b) Socioeconomic information on beneficiaries, output, productivity, costs, and economic results of properties in the microwatersheds.
- (c) Report on financial activity of the EMATER project Permanent Revolving Fund.

3. Conservation units

- (a) Surface area effectively protected.
- (b) Number of visits per conservation unit.

(c) Actual cost of supervising, operating, and maintaining conservation units.

(d) Ratio of admission fee revenues to operating costs.

IX. Rate of return

9.01 For purposes of Appendix I, Special Condition 8(f) and condition 7(g) of Appendix II, respectively, the net internal generation of funds of CORSAN and DMAE shall be sufficient to contribute annually a portion of their investment plan corresponding to not less than 40%. Net internal generation shall mean internal generation less debt service. Internal generation shall mean total operational revenues minus operational costs, not including depreciation and amortization costs, financial expenses, and non-operational results.