CHAPTER 3

CURRENT ENVIRONMENTAL MANAGEMENT SYSTEM IN THE STUDY AREA

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3.1 Legal Framework for Aquatic Environmental Conservation

With industrial growth and the concentration of the population in the urban area, there has been a gradual increase in wastewater giving rise to water pollution problems. In this situation, the Federal government and the Rio Grande do Sul state established many regulations as a means to counteract water pollution. The federal and state legislation concerning water pollution are summarized in **Table 3.1-1**.

The first legislation related to water quality preservation, Decree No. 24673 (Water Code), was established in 1934 and stipulates water resource protection measures for public health and aquatic life preservation. This decree was revised in 1938 and referred to now as Decree No.852. In 1961, Decree No. 49974A (National Health Code) was set out to legally control effluents from factories, stipulating that wastewater could be discharged into the water resources only after treatment, while Decree No. 50887 stipulates the first environmental standards for water quality using the following indices: Coliform, BOD, DO and pH.

In the decade from the late 1970's, many legislation concerning water quality conservation were established. Norm No.013 (1976) is the first legislation that classifies water resources according to principal use and establishes the water quality criteria and standards for the four (4) classes in freshwaters. This norm was revised in 1986 as Resolution CONAMA No.20, stipulating new water quality criteria and standards that classify water resources, including brackish water and saltwater areas, into nine (9) classes.

For national policies for environmental control, Law No. 6938 (Policy on Environment) was established in 1981, and Decree No.88351 in 1983 (this includes the setting up of CONAMA and SISNAMA). The requirements for Environmental Impact Assessment and the licensing system were also established.

A new federal constitution introducing a special chapter on environment was promulgated in 1988. Further, new environmental departments such as SEMA, CONAMA and IBAMA were established under Law No.8028 in 1990. This law is the amended version of Law No.6938 in 1981, which took place during the full-scale

restructuring of the federal government after the inauguration of the Collor Administration.

In Rio Grande do Sul state, Law No. 8676 was established in 1988 for the demarcation of water area use, while SSMA Technical Rule No.01/89-DMA, approved in accordance with Norm No. 05/SSMA in 1989, determines the criteria and standards for effluents.

In the 1990's, Law No.10350 (1994) was established prior to the legislation (Law No. 9433, 1977) for the federal water resource system and deals with the state water resource system, the water resource council, infractions and penalties. Law No.10.350 is detailed in Decree No. 36.055 (1995) and Decree No. 37.033 (1996).

With respect to the classification of waters in the state, Technical Rule No.003/95, which classifies the waters in the southern part of the Patos Lake estuary, was approved in consideration of CONAMA Resolution No.20/86 under Norm SSMA No.07 (1995).

In July 1999, the Rio Grande do Sul state government restructured the Secretary of Health and Environment (SSMA) which is now known as the Secretary of Environment (SEMA).

Table 3.1-1 Historical Review of Legislation

Year	Legislation	Federal or State Level	Details
1934	Decree No.24.673 Water Code 10.07.1934	Federal	Introduces water resource protection for public health and aquatic life preservation.
1938	Law No.852 11.11.1938	Federal	Introduced some modifications into the Water Code.
1940	Decree No.2.848 Penalty Code 12.07.1940	Federal	Introduces penalties for contaminating water sources used for public supply.
1961	Decree No.49.974-A National Health Code 21.01.1961	Federal	Obliges new industries to present a liquid waste disposal plan to authorities, and allows the discharge only of treated wastewater into water resources.
	Decree No.50.877 29.06.1961	Federal	Establishes the first environmental standards for water quality, including pH, DO, BOD and coliform.
1967	Law No.5.357 17.11.1967	Federal	Stipulates penalties for oil discharge from boats, ships and maritime terminals.
1973	Decree No.73.030 30.10.1973	Federal	Establishes The federal agency for environmental control, SEMA (Secretaria Especial do Meio Ambiente).
1975	Norm No.003/SEMA 11.04.1975	Federal	Establishes water quality standard for mercury for coastal waters and public water supply sources.
1976	Norm No.013 15.06.1976	Federal	Classifies water resources according to principal uses. Establishes water quality criteria and standards for freshwater areas. Enforces effluent standards.
1981	Law No.6.938 31.01.1981	Federal	Approves the national environmental policy. Establishes SISNAMA (Sistema Nacional de Meio Ambiente) and CONAMA (Conselho Nacional de Meio Ambiente). Establishes the requirements for Environmental Impact Assesment and the Permit System.
	Decree No.30.132 13.05.1981	State	State water resources system including Hydrographic Basin Committees was organized and water resources council of Rio Grande do Sul (CRH-RS) was created.
1983	Decree No.88.351 06.01.1983	Federal	Details the principles of national environmental policies.

Year	Legislation	Federal or State Level	Details
1984	Resolution CONAMA No.003 05.06.1984	Federal	The executive secretariat of CONAMA was required to review Norm No.013, in relation to water quality standards and criteria.
1985	Resolution CONAMA No.004	Federal	Establishes the criteria for the identification of ecological reserves.
1986	Resolution CONAMA No.1 23.01.1986	Federal	Stipulates the basic criteria for Environmental Impact Assessment application and implementation.
	Resolution CONAMA No.20 18.06.1986	Federal	Stipulates new water quality criteria and standards and classifies water resources by class according to main uses. Includes standards for brackish water and saltwater. Reviews freshwater standards and effluent standards.
1988	Law No.8.676 14.07.1988	State	The obligation of demarcation of fishing, leisure or recreation areas in the municipalities with maritime, lacustrine or fluvial margins was determined.
	Federal Constitution 05.10.1988	Federal	A special chapter on environment was introduced into the Constitution.
1989	Law No.7.735 22.02.1989	Federal	SEMA was extinguished and IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renovaveis) was created with broader objectives.
	Norm No.05/SSMA 16.03.1989	State	SSMA Technical Rule No.01/89-DMA, which determined criteria and standards for the emission of liquid effluents, was approved.
	Law No.8.850 08.05.1989	State	The Fund of Investment in Water Resources of Rio Grande do Sul (FRH-RS) was created.
1990	Law No.8.028 12.04.1990	Federal	SEMA was instituded as a direct assistance for the President. IBAMA passed to be under SEMA supervision. SEMA :Central organism CONAMA:Consulting and deliberative organism IBAMA : Executive organism
1991	Decree No.003	Federal	The new structure of IBAMA was approved.

Year	Legislation	Federal or State Level	Details
1992	Temporary Measure October 1992	Federal	The Ministry of Environment was created.
1993	Law No.10.010 08.12.1993	State	CORSAN (Companhia Riograndense de Saneamento) was authorized to exempt the users of low income from paying water and sewerage charges, and to chancel the debits of social charges previous to 1992.
1994	Law No.10.330 27.12.1994	State	The State System of Environmental Protection (SISEPRA), that attributes the planning, implementation, execution and control of the environmental policy of the State and determines other procedures, was established. The superior organism of the System is the State Council of Environment : CONSEMA (Conselho Estadual do Meio Ambiente).
	Law No.10.350 30.12.1994	State	The State Water Resources System was instituted, including the Water Resources Council and infractions and penalties. The creation of Hydrographical Basin Management Committees and Hydrographi- cal Region Agencies were proposed.
1995	Decree No.36.055 04.07.1995	State	The Water Resources Council of the Rio Grande do Sul State was established.
	Norm SSMA No.07/95 NT No.003/95 24.05.1995	State	The Technical Rule NT No.003/95, which establishes the classification of waters in an area of the south part of the Patos Lake Estuary, was approved considering the dispositions of the CONAMA Resolution No.20/86.
1996	Decree No.37.033 21.11.1996	State	The grant of water use right in the State, foreseen in the Law No.10.350/94, was regulated. The surface and underground waters in the domain of the State can only be utilized after a grant given by DRH (Departamento de Recursos Hidricos) and FEPAM (Fundacao Estadual de Protecao Ambiental).
1997	Law No.9.433	Federal	The Federal Water Resources System was instituted.
1999	03.08.1999	State	The SSMA was extinguished and the State Secretary of Environment, SEMA (Secretario do Meio Ambiente) was newly created.

3.2 Water Quality Standard

3.2.1 Water Quality Standards in the Federal Level (CONAMA No.20)

CONAMA Resolution No.20 established on June 18, 1986 has classified the waters into nine (9) classes; five (5) for fresh waters, two (2) for salt waters and two (2) for brackish waters, depending on the purpose of water uses.

It also established standards and conditions attended in each class, including conventional parameters such as pH, BOD, DO and Number of Coliform Groups, and toxic substances such as heavy metals and organic pollutants as shown in **Tables 3.2-1** and **3.2-2**.

These standards were based on international criteria and standards as well as Brazilian experiences.

Table 3.2-1 Water Quality Standards for Each Class of Water Area (CONAMA No.20)

Fresh Waters

Class	Item / Purpose of Water Use	Standard Values					
		pH	BOD	TDS	DO	No. of Coliform Groups	Turbi -dity
Special	- Public water supply without previous or with simple desinfection - Natural balance protection of aquatic life	-	-	-	-	Zero for Total Coliforms	-
Class 1	- Public water supply after simplified treatment - Aquatic life protection - Primary contact recreation - Irrigation of green vegetables eaten in raw form and fruits consumed with peel - Natural or/and intensive growing of species for human feeding	6.0 | 9.0	3 mg/l or less	500 mg/l or less	6 mg/l or more	[Recreation] not good when 80% of samples 1,000MPN/100ml or less F.C. or 5,000MPN/100ml or less T.C. [Irrigation] zero coliform [Other Uses] 80% of samples 200MPN/100ml or less F.C. or 1,000MPN/100ml or less T.C.	40 NTU
Class 2	- Public water supply after conventional treatment - Aquatic life protection - Primary contact recreation - Irrigation of green vegetables and fruits trees - Natural or/and intensive growing of species for human feeding	6.0 | 9.0	5 mg/l or less	500 mg/l or less	5 mg/l or more	[Recreation] equal to Class 1 [Other Uses] 80% of samples 1,000MPN/100ml or less F.C. or 5,000MPN/100ml or less T.C.	100 NTU
Class 3	- Public water supply after conventional treatment - Irrigation of several culture - Animal growing	6.0 | 9.0	10 mg/l or less	500 mg/l or less	4 mg/l or more	80% of samples 4,000MPN/100ml or less F.C. or 20,000MPN/100ml or less T.C.	100 NTU
Class 4	- Navigation - Aesthetic - Other uses	6.0 | 9.0	-	-	2 mg/l or more	-	-

[Note] F.C. : Fecal Coliforms

T.C. : Total Coliforms

Salt Waters

Class	Item / Purpose of Water Use	Standard Values			
		pH	BOD	DO	No. of Coliform Groups
Class 5	- Primary contact recreation - Aquatic life protection - Natural or/and intensive growing of species for human feeding	6.5 | 8.5 △pH≦2	5 mg/l or less	6 mg/l or more	[Recreation] equal to Clas 1 [Growing of Species for Human Feeding] mean≦14 MPN/100ml F.C. and 10% of samples≦ 43MPN/100ml F.C. [Other Uses] 80% of samples: 1000MPN/100ml or less F.C.
Class 6	- Commercial navigation - Aesthetic - Secondary contact recreation	6.5 | 8.5 △pH≦2	10 mg/l or less	4 mg/l or more	80% of samples: 4000MPN/100ml or less F.C. or 20000MPN/100ml or less T.C.

Brackish Waters

Class	Item / Purpose of Water Use	Standard Values			
		pH	BOD	DO	No. of Coliform Groups
Class 7	- Primary contact recreation - Aquatic life protection - Natural or/and intensive growing of species for human feeding	6.5 | 8.5	5 mg/l or less	5 mg/l or more	[Recreation] equal to Class 1 [Growing of Species for Human Feeding] mean≦14 MPN/100ml F.C. and 10% of samples≦ 43 MPN/100ml F.C. [Other Uses] 80% of samples 1000MPN/100ml or less F.C. or 5000MPN/100ml or less T.C.
Class 8	- Commercial navigation - Aesthetic - Secondary contact recreation	5.0 | 9.0	-	3 mg/l or more	20% of samples: 4000MPN/100ml or less F.C. or 20000MPN/100ml or less T.C.

Table 3.2-2 Environmental Quality Standards for Water Pollution (CONAMA No.20)

Item	Standard Values			
	Class 1 and Class 2	Class 3	Class 5	Class 7
Aluminum (Al)	0.1 mg/l	0.1 mg/l	1.5 mg/l	-
Ammonia(as un-ionized) (NH_3)	0.02 mg/l	-	0.4 mg/l	0.4 mg/l
Arsenic (As)	0.05 mg/l	0.05 mg/l	0.05 mg/l	0.05 mg/l
Barium (Ba)	1.0 mg/l	1.0 mg/l	1.0 mg/l	-
Beryllium (Be)	0.1 mg/l	0.1 mg/l	1.5 mg/l	-
Boron (B)	0.75 mg/l	0.75 mg/l	5.0 mg/l	-
Benzene	0.01 mg/l	0.01 mg/l	-	-
Benzo (a) pyrene	0.01 µg/l	0.01 mg/l	-	-
Cadmium (Cd)	0.001 mg/l	0.01 mg/l	0.005 mg/l	0.005 mg/l
Cyanides (CN)	0.01 mg/l	0.2 mg/l	0.005 mg/l	0.005 mg/l
Lead (Pb)	0.03 mg/l	0.05 mg/l	0.01 mg/l	0.01 mg/l
Chloride (Cl)	250 mg/l	250 mg/l	-	-
Residual Chlorine (Cl)	0.01 mg/l	-	0.01 mg/l	-
Cobalt (Co)	0.2 mg/l	0.2 mg/l	-	-
Copper (Cu)	0.02 mg/l	0.5 mg/l	0.05 mg/l	0.05 mg/l
Trivalent Chromium (Cr)	0.5 mg/l	0.5 mg/l	-	-
Hexavalent Chromium (Cr)	0.05 mg/l	0.05 mg/l	0.05 mg/l	0.05 mg/l
1.1 dichloroethane	0.3 µg/l	0.3 µg/l	-	-
1.2 dichloroethane	0.01 mg/l	0.01 mg/l	-	-
Tin (Sn)	2.0 mg/l	2.0 mg/l	2.0 mg/l	-
Phenols (C_6H_5OH)	0.001 mg/l	0.3 mg/l	0.001 mg/l	0.001 mg/l
Soluble Iron (Fe)	0.3 mg/l	5.0 mg/l	0.3 mg/l	-
Fluorides (F)	1.4 mg/l	1.4 mg/l	1.4 mg/l	1.4 mg/l
Total phosphate (P)	0.025 mg/l	0.025 mg/l	-	-
Lithium (Li)	2.5 mg/l	2.5 mg/l	-	-
Manganese (Mn)	0.01 µg/l	0.5 mg/l	0.1 mg/l	-
Mercury (Hg)	0.2 µg/l	0.002 mg/l	0.1 µg/l	0.1 µg/l
Nickel (Ni)	0.025 mg/l	0.025 mg/l	0.1 mg/l	0.1 mg/l
Nitrate (N)	10 mg/l	10 mg/l	10 mg/l	-
Nitrite (N)	1.0 mg/l	1.0 mg/l	1.0 mg/l	-
Ammonia Nitrogen (N)	-	1.0 mg/l	-	-
Silver (Ag)	0.01 mg/l	0.05 mg/l	0.005 mg/l	-
Pentachlorophenol	0.01 mg/l	0.01 mg/l	-	-
Selenium (Se)	0.01 mg/l	0.01 mg/l	0.01 mg/l	-
Total dissolved solids	500 mg/l	500 mg/l	-	-
Detergents (LAS)	0.05 mg/l	0.5 mg/l	-	-

Item	Standard Values			
	Class 1 and Class 2	Class 3	Class 5	Class 7
Sulfites (SO_4)	250 mg/l	250 mg/l	-	-
Sulfides (as undissociated H_2S)	0.002 mg/l	0.3 mg/l	0.007 mg/l	0.002 mg/l
Thallium (Tl)	-	-	0.1 mg/l	-
Tetracloroethylene	0.01 mg/l	0.01 mg/l	-	-
Trichloroethylene	0.03 mg/l	0.03 mg/l	-	-
Carbon tetrachloride	0.003 mg/l	0.003 mg/l	-	-
2.4.6 trichloropheno	0.01 mg/l	0.01 mg/l	-	-
Total Uranium (U)	0.02 mg/l	0.02 mg/l	0.5 mg/l	-
Vanadium (V)	0.1 mg/l	0.1 mg/l	-	-
Zinc (Zn)	0.18 mg/l	5.0 mg/l	0.17 mg/l	0.17 mg/l
Aldrin	0.01 µg/l	0.03 µg/l	0.003 µg/l	0.003 µg/l
Chlordane	0.04 µg/l	0.3 µg/l	0.004 µg/l	0.004 µg/l
DDT	0.002 µg/l	1.0 µg/l	0.001 µg/l	0.001 µg/l
Dieldrin	0.005 µg/l	0.03 µg/l	0.003 µg/l	0.003 µg/l
Endrin	0.004 µg/l	0.2 µg/l	0.004 µg/l	0.004 µg/l
Endosulfan	0.056 µg/l	150 µg/l	0.034 µg/l	0.034 µg/l
Heptachlor epoxi	0.01 µg/l	0.1 µg/l	0.001 µg/l	0.001 µg/l
Heptachlor	0.01 µg/l	0.1 µg/l	0.001 µg/l	0.001 µg/l
Lindane	0.02 µg/l	3.0 µg/l	0.004 µg/l	0.004 µg/l
Methoxychlor	0.005 µg/l	30 µg/l	0.03 µg/l	0.03 µg/l
Dodecachlor + nonachlor	0.001 µg/l	0.001 µg/l	0.001 µg/l	0.001 µg/l
PCB’s	0.001 µg/l	0.001 µg/l	-	-
Toxaphene	0.01 µg/l	5.0 µg/l	0.005 µg/l	0.005 µg/l
Dimeton	0.1 µg/l	14 µg/l	0.1 µg/l	0.1 µg/l
Guthion	0.005 µg/l	0.005 µg/l	0.01 µg/l	0.01 µg/l
Malathion	0.1 µg/l	100 µg/l	0.1 µg/l	0.1 µg/l
Parathion	0.04 µg/l	35 µg/l	-	0.04 µg/l
Carbaryl	0.02 µg/l	70 µg/l	-	-
Organophosphate	10 µg/l	100 µg/l	10 µg/l	10 µg/l
Compounds & total carbamates in terms of parathion	-	-	-	-
2.4-D	4.0 µg/l	20 µg/l	10 µg/l	10 µg/l
2.4.5 TP	10 µg/l	10 µg/l	10 µg/l	10 µg/l
2.4.5 T	2.0 µg/l	2.0 µg/l	10 µg/l	10 µg/l

3.2.2 Water Quality Standards in the State Level

(1) Patos Lake

CONAMA Resolution No.20/86 stipulates the water quality standards not only for freshwater areas, but also for saltwater and brackish water areas. At present, however, the water quality standards from the northern to the central water sections of Patos Lake have not been established because these areas have not yet been classified by use.

On the other hand, SSMA (State Secretary of Health and Environment) through Norm No.07/95 based on the technical rule, NT No.003/95 (May 24, 1995), classified the waters in the south part of the Patos lake estuary into three (3) classes as brackish waters according their uses, considering the dispositions of the CONAMA Resolution No.20/86 and established standards and conditions for each class as shown in **Table 3.2-3**, **Figure 3.2-1** and **Table 3.2-4**.

(2) Rivers

The water quality standards for the small rivers and small lakes flowing into the mouth of the Patos Lake were established under SSMA NT No. 003/95 and shown in **Table 3.2-5**, according to the classified use of the sections of these water bodies.

As for other inflow rivers, no actions are being taken regarding the establishment of water quality standards even though surveys and investigations are being carried out on some of these inflow rivers.

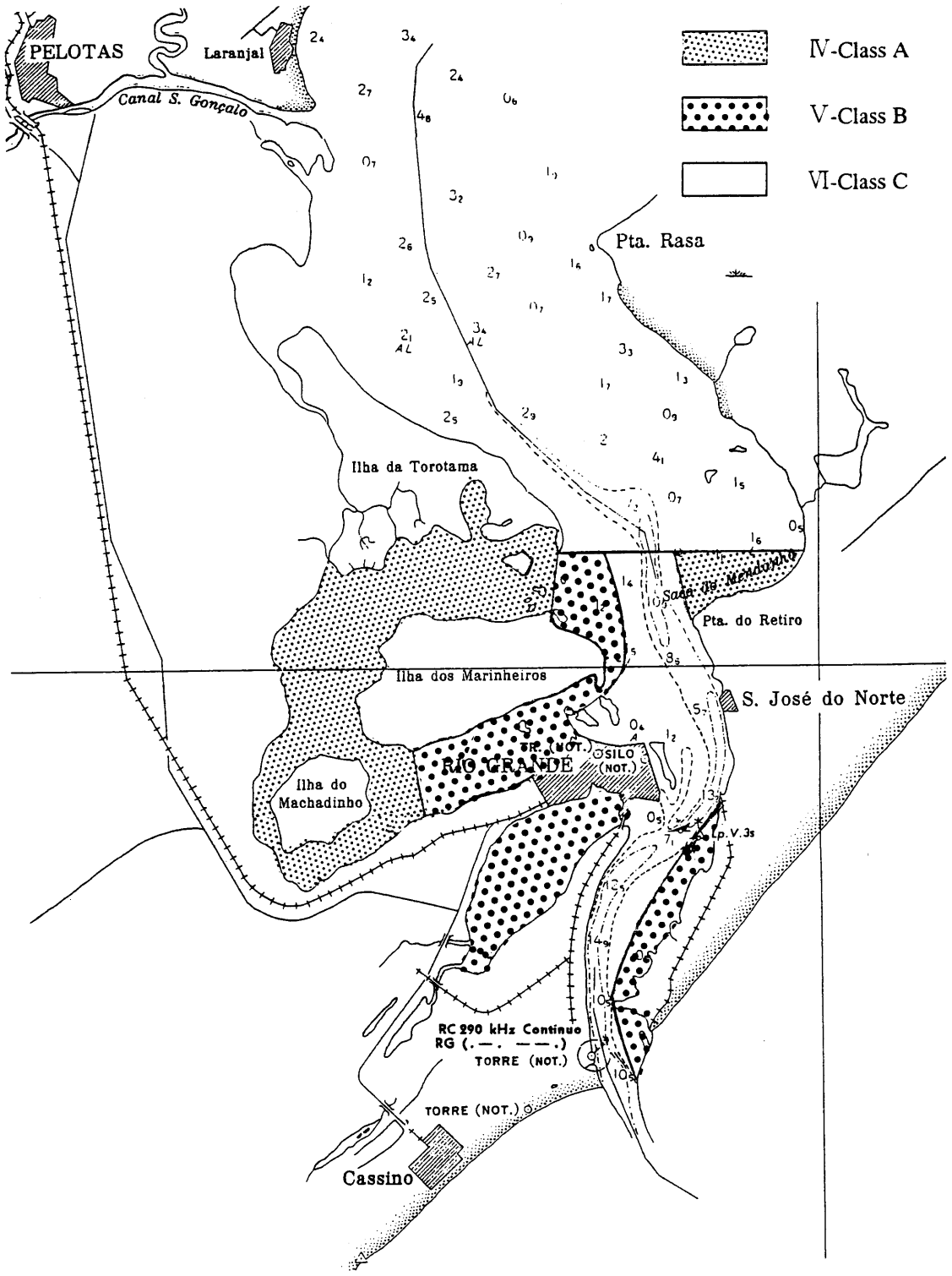
One of the issues under study at the moment is the FEPAM's (Henio H. Leito et al) proposal to classify the 4 rivers (Rio Gravatai, Rio dos Sinos, Rio Cai, Rio Taquari) flowing into Guaiba Lake as shown in **Table. 3.2-6**, in accordance with the classification specified by the CONAMA Resolution No. 20/86.

This proposal was made based on the results of the monitoring activities carried out within the period of 1990-1996, and mainly with the aim to monitor contamination by human excreta.

Table 3.2-3 Water Quality Classification of the Patos Lake Estuary (SSMA NT No.003/95)

Brackish Waters

Classification	Beneficial Uses	Water Areas	Standard Values
Ⅳ- Class A	a) Natural balance protection of aquatic life	Saco do Justino Saco do Arraial Saco do Martins Saco da Quiteria Saco da Agulha Saco da Tuna Saco do Boto Saco do Mendanha	Not admit any type of discharges
Ⅴ- Class B	a) Aquatic life protection b) Primary contact recreation c) Natural and/or intensive growing of species for human feeding	Saco do Mangueira Other shallow areas less than 1 meter	Floating materials, Oil and greases, Substances producing color, odor, turbidity and disapproved deposits : virtually absent Coliforms : same as Class 7 of CONAMA 20 BOD : 3mg/l or less DO : 6mg/l or more pH : 6.5 – 8.5 Harmful substances : max. contents are shown in **Table 3.2-4**
Ⅵ- Class C	a) Aquatic life protection b) Primary and secondary contact recreation c) Navigation	Areas more than 1 meter	Same as Class 7 of CONAMA 20



THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig.3.2-1**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Water Quality Classification of the Patos Lake Estuary (SSMA NT No.003)**

Table 3.2-4 Environmental Quality Standards for Water Pollution (SSMA NT No.003/95)

Substance	Value	Unit
Aluminum (Al)	0.1	mg/l
Non Ionizable Ammonia (NH_3)	0.02	mg/l
Arsine (As)	0.05	mg/l
Barium (Ba)	1.0	mg/l
Beryllium (Be)	0.1	mg/l
Boron (Bo)	5.0	mg/l
Benzene	0.01	mg/l
Benzo pyrene	0.00001	mg/l
Cadmium (Cd)	0.001	mg/l
Cyanide (CN)	0.005	mg/l
Lead (Pb)	0.01	mg/l
Chloride (Cl)	19.3	g/l
Residual Chlorine (Cl)	0.01	mg/l
Cobalt (Co)	0.2	mg/l
Copper (Cu)	0.02	mg/l
Trivalent Chromium (Cr)	0.5	mg/l
Hexavalent Chromium (Cr)	0.05	mg/l
1.1 dichloroethane	0.0003	mg/l
1.2 dichloroethane	0.01	mg/l
Stannum (Sn)	2.0	mg/l
Index of Phenols (C_6H_5OH)	0.001	mg/l
Iron (Fe)	0.3	mg/l
Fluoride (F)	1.4	mg/l
Total phosphate	*	*
Lithium (Li)	2.5	mg/l
Manganese (Mn)	0.1	mg/l
Mercury (Hg)	0.0001	mg/l
Nickel (Ni)	0.025	mg/l
Nitrate (N-NO_3)	10.0	mg/l
Nitrite (N-NO_2)	1.0	mg/l
Silver (Ag)	0.005	mg/l
Pentachlorophenol	0.01	mg/l
Selenium (Se)	0.01	mg/l

Substance	Value	Unit
Tense-active substances that react with the methylene blue (LAS)	0.5	mg/l
Sulphate	2.7	g/l
Sulphide (as non dissociated H_2S) (S)	0.002	mg/l
Thallium (Tl)	0.1	mg/l
Tetrachloroethene	0.01	mg/l
Trichloroethene	0.03	mg/l
Carbon tetrachloride	0.003	mg/l
2.4.6 trichlorophenol	0.01	mg/l
Uranium (U)	0.02	mg/l
Vanadium (V)	0.1	mg/l
Zinc (Zn)	0.17	mg/l
Aldrin	0.003	µg/l
Chlordane	0.004	µg/l
DDT	0.001	µg/l
Dieldrin	0.003	µg/l
Endrin	0.004	µg/l
Endosulfan	0.034	µg/l
Heptachlor epoxide	0.001	µg/l
Heptachlor	0.001	µg/l
Lindane (gama-BHC)	0.004	µg/l
Methoxychlor	0.03	µg/l
Dodecachlor + Nonachlor	0.001	µg/l
Polychlorinated biphenyl (PCB's)	0.001	µg/l
Toxaphene	0.005	µg/l
Demeton	0.1	µg/l
Guthion	0.005	µg/l
Malathion	0.1	µg/l
Parathion	0.04	µg/l
Carbaryl	0.02	µg/l
Organophosphate composts and total carbamates	10.0	µg/l
2.4-D	4.0	µg/l
2.4.5 TP	10.0	µg/l
2.4.5 T	2.0	µg/l

* Until the determination of a new standard, phosphate new discharges shall not be allowed, unless the water quality non alteration is confirmed, during the installation of the enterprise.

Table 3.2-5 Water Quality Classification of Small RiversFlowing into the Patos Lake Estuary (SSMA NT No.003/95)

Fresh Waters

Classification	Beneficial Uses	Water Areas	Standard Values
Ⅰ - Special Class	a) Domestic water supply without previous decontamination or with a simple one b) Preservation of the natural balance of aquatic communities	Arroio-Lagoa da Borracha System	Not admit any type of discharges
Ⅱ - Class 1	a) Domestic water supply after simplified treatment b) Aquatic life protection c) Primary contact recreation d) Irrigation of green vegetables eaten in raw form and fruits consumed with peel e) Natural and/or intensive growing of species for human feeding	Lagoa da Quinta Arroio Cabecas Arroio Martins Banhado do Vinte e Cinco Other water bodies which drain estuarine area	Same as Class 1 of CONAMA 20
Ⅲ- Class 2	a) Domestic water supply after conventional treatment b) Aquatic life protection c) Primary contact recreation d) Irrigation of greenery and fruits e) Natural and/or intensive growing of species for human feeding	Arroio Vieira	Same as Class 2 of CONAMA 20

Table 3.2-6 Proposed Water Quality Classification of Four Rivers Flowing into Guaiba Lake

Points	Monitoring Values (average values in dry seasons)			Proposed Classification
	DO (mg/l)	BOD (mg/l)	Fecal Coliform	
1. Rio Gravatai				
Arr. Chico Lom	5.16	2	353	2
P. dos Negros	6.48	1.75	175	1
Gravatai (P. Canoas)	5.59	1.75	1,805	3
Cachoeirinha	4.3	6.33	24,464	4
Foz, POA	3.06	9.76	160,000	4
2. Rio dos Sinos				
Nascente	9.44	2.3	167	1
Balne･rio	8.33	1	1,109	2
R. rolante	8.89	2	1,227	3
Olhos d'･gua	6.64	1.11	1,063	2
Taquara	6.58	1.23	1,424	3
Sta. Cristina	6.88	1.39	8,006	4
C. Bom	6.47	1.39	4,389	4
A. Schmidt	6.45	1.83	5,828	4
N. Hamburgo	5.98	1.89	11,570	4
Arr. Pe･o	4.32	6.89	12,861	4
Arr. Luiz Rau	3.65	9.25	30,262	4
S. Leopoldo	5.47	2.61	23,964	4
Canal J. Correa	4.47	2.91	30,016	4
Arr. Port･o	4.22	7.37	2,548	3
Sapucaia	5.25	2.21	6,721	4
Esteio	3.61	3.78	14,052	4
Canoas	3.7	3.11	5,974	4
3. Rio Cai				
P. Inferno (Canela)	9.78	2	151	1
Arr. Pinhal	8.97	1.93	4,293	4
S. Sebasti･o Ca	8.49	2.22	1,518	3
Montenegro	7.66	2.44	2,985	3
Montante POL	7.37	1.47	513	2
POL	7.47	1.93	576	2
Jusante POL	7.26	1.53	521	2
Foz, Morretes	7.41	1.53	367	2
4. Rio Taquari				
Nascentes	9.62	1.5	91	1
Bom Jesus	8.68	1.17	42	1
N. Roma/N. P･dua	8.98	1	437	2
Sta. Teresa	8.67	1.33	284	2
Roca Sales	8.05	2	1,410	3
Lajeado	7.63	2.33	4,454	4
Foz, Triunfo	8.28	3.5	251	1

Source: FEPAM

3.3 Effluent Standard

3.3.1 Effluent Standards in the Federal Level (CONAMA No.20)

The CONAMA Resolution No.20/86 also established the minimum conditions for the direct and indirect effluent discharge into water resources as shown in **Table 3.3-1**, emphasizing that effluent discharge could not provoke in the water resources characteristics different from its classification.

Table 3.3-1 Effluent Standards (CONAMA No.20)

Parameter	Standard Values	Parameter	Standard Values
pH	5-9	Soluble Iron (Fe)	15 mg/l
Temperature	40 ℃	Fluorides (F)	10 mg/l
Settable Solids	1 ml/l (1 hour in Inhoff Cone)	Soluble Manganese (Mn)	1.0 mg/l
		Mercury (Hg)	0.01 mg/l
		Nickel (Ni)	2.0 mg/l
Mineral Oils	20 mg/l	Silver (Ag)	0.1 mg/l
Vegetable Oils or Animal Fats	50 mg/l	Selenium (Se)	0.05 mg/l
		Sulfides (S)	1.0 mg/l
Ammonia (N)	5.0 mg/l	Sulfites (SO_3)	1.0 mg/l
Total Arsenic (As)	0.5 mg/l	Zinc (Zn)	5.0 mg/l
Barium (Ba)	5.0 mg/l	Organophosphate Compounds and Total Carbamates	1.0 mg/l in terms of paration
Boron (B)	5.0 mg/l		
Cadmium (Cd)	0.2 mg/l		
Cyanides (CN)	0.2 mg/l	Carbon Sulfide	1.0 mg/l
Lead (Pb)	0.5 mg/l	Trichloroethylene	1.0 mg/l
Copper (Cu)	1.0 mg/l	Chloroform	1.0 mg/l
Hexavalent Chromium (Cr)	0.5 mg/l	Carbon Tetrachloride	1.0 mg/l
		Dichloroethylene	1.0 mg/l
Trivalent Chromium (Cr)	2.0 mg/l	Other Organophosphate Compounds (Pesticides, Solvents)	0.05 mg/l
Tin (Sn)	4.0 mg/l		
Phenols (C_6H_5OH)	0.5 mg/l		

3.3.2 Effluent Standards in the State Level (SSMA Norm No.05)

In Rio Grande do Sul state, the criteria and standards for the emission of liquid effluents were elaborated in 1989 through SSMA Norm No.05/89 based on the technical rule SSMA NT No.01/89-DMA.

The standards cover general parameters of temperature, odour, foams, floating materials,

sediment solids, pH, hardness, oils/greases and fecal coliforms, and the maximum concentration for toxic substances such as Cd, Pb, Hg, As and Phenols as shown in **Table 3.3-2**.

The standards also cover the discharge of effluents containing organic loads and suspended solids from factories and enterprises. **Table 3.3-3** shows the standards for organic loads and suspended solids depending on the volume of discharge, which is the maximum daily discharge originated from the treatment system. The standards for new factories and enterprises, however, are more stringent than those for old establishments.

As a general criteria, effluent standards at the polluting sources located in critical areas are determined by multiplying the figures of arsine (As) and zinc (Zn) in **Table 3.3-2** and those in **Table 3.3-3** by 0.9.

Table 3.3-2 Effluent Standards for General Parameters and Toxic Substances (SSMA NT No.01/98)

Parameter	Standard Values
1. General Parameters	
Temperature	<40 ℃
Color	It shall not cause an accentuated change in color of the receptor body at the discharge point.
Odour	Free from unpleasant odour.
Foams	Absent.
Floating materials	Absent.
Sedimentable Solids	≦1.0 ml/l in test of one hour in "Imhoff Cone".
pH	Between 6.0 and 8.5
Hardness ($CaCO_3$)	≦200 mg/l
Oils and Greases : Vegetal or Animal ($CaCO_3$)	≦30mg/l
Mineral	≦10mg/l
Fecal Coliforms	≦300MPN/100ml
2. Maximum Concentration of Toxic Substances	
Phenols	0.1 mg/l
Fluorides (F)	10 mg/l
Total Phosphorus (P)	1.0 mg/l
Total Nitrogen (N)	10 mg/l
Sulphides (S)	0.2 mg/l
Aluminum (Al)	10 mg/l

Parameter	Standard Values
Barium (Ba)	5.0 mg/l
Boron (B)	5.0 mg/l
Cobalt (Co)	0.5 mg/l
Stannum (Sn)	4.0 mg/l
Iron (Fe)	10 mg/l
Lithium (Li)	10 mg/l
Manganese (Mn)	2.0 mg/l
Molybdenum (Mo)	0.5 mg/l
Vanadium (Va)	1.0 mg/l
Arsine (As)	0.1 mg/l
Cadmium (Cd)	0.1 mg/l
Lead (Pb)	0.5 mg/l
Cyanide (CN)	0.2 mg/l
Copper (Cu)	0.5 mg/l
Hexavalent Chromium (Cr^{+6})	0.1 mg/l
Total Chromium (Cr)	0.5 mg/l
Mercury (Hg)	0.01 mg/l
Nickel (Ni)	1.0 mg/l
Silver (Ag)	0.1 mg/l
Selenium (Se)	0.05 mg/l
Zinc (Zn)	1.0 mg/l
Organophosphate Composts and Carbamates	0.1 mg/l
Surfactants	2.0 mg/l
Other Substances/ Elements	The limit for each specific case shall be fixed by the Environment Dpt.

Table 3.3-3 Effluent Standards for Organic Loads and Suspended Solids (SSMA NT No.01/98)

Discharge (m^3/day)	BOD (mg/l)	COD (Cr) (mg/l)	SS (mg/l)
1. Existing pollution sources			
Q<20	Q≦200	Q≦450	Q≦200
20<Q<200	Q≦150	Q≦450	Q≦150
200<Q<1,000	Q≦120	Q≦360	Q≦120
1,000<Q<2,000	Q≦ 80	Q≦240	Q≦ 80
2,000<Q<10,000	Q≦ 60	Q≦200	Q≦ 70
10,000≦Q	Q≦ 40	Q≦160	Q≦ 50
2. Pollution sources to be established after April 1989			
Q<200	Q≦120	Q≦360	Q≦120
200<Q<1,000	Q≦ 80	Q≦240	Q≦ 80
1,000<Q<2,000	Q≦ 60	Q≦200	Q≦ 70
2,000<Q<10,000	Q≦ 40	Q≦160	Q≦ 50
10,000≦Q	Q≦ 20	Q≦100	Q≦ 40

3.4 Water Quality and Hydrological Monitoring

Various water quality and hydrological monitoring activities have been carried out in Patos Lake and its basin by federal and state government agencies in cooperation with universities（UNISINOS、IPH-UFRGS、FURG）. The conditions that affected the implementation of the main water quality and hydrological monitoring activities that were recently carried out for a comparatively longer period of time are summarized in **Table 3.4-1**. Main hydrological stations in the coastal area of Patos Lake are shown in **Fig. 3.4-1**.

3.4.1 Water Quality Monitoring for Rivers

Water quality monitoring for rivers in the hydrographic basin of Patos Lake has been conducted by several agencies such as FEPAM, DMAE, CORSAN, UNISINOS periodically or as the need arises. Target water areas and frequency of their monitoring are described in below.

FEPAM (Fundacao Estadual de Protecao Ambiental Henrique Luiz Rossler/RS) monitors the water quality of 20 parameters in four rivers; Gravatai River, Sinos River,

Cai River and Taquari River, out of five major rivers flowing into Guaiba Lake every month at 47 points as a total

DMAE (Departamento Municipal de Agua e Esgoto) monitors the water quality at sources of potable water to Porto Alegre city and their tributary streams every three months at 22 points.

CORSAN (Companhia Rio Grandense de Saneamento) monitors the water quality at sources of potable water to cities except Porto Alegre as well as the three startions along Jacui River.

UNISINOS (Universidade do Vale do Rio dos Sinos) mainly monitors Camaqua River as the need arises.

Table 3.4-1 Present Situation of Water Quality and Hydrological Monitoring in the Hydrographic Basin of Patos Lake

Item	Executing Authority	Purpose and/or Target Area	Number of Monitoring Points	Remarks
1. Water Quality				
1) Source of Water Supply	DMAE	Sources of water supply to Porto Alegre and its tributary streams	22 points	4/year
	CORSAN	Sources of water supply except Porto Alegre and its tributary streams	3 points (Jacui)	1-2/mon.
2) River	FEPAM	Monitoring of 4 main rivers flowing into Guaiba lake		
		Rio Gravatai	15 points	1/mon.1992-
		Rio Sinos	17 points	1/mon.1990-
		Rio Cai	8 points	4/year 1990-
		Rio Taquari	7 points	4/year 1990-
3) Lake	DMAE	Monitoring of Guaiba lake	9 points	1/mon.
	AGLM	Monitoring in Mirim lake	15 points	3-4/mon. 1997-
	FEPAM	Monitoring of Coliform in 5 beaches of Patos lake	16 points	
4) Factory	FEPAM	Monitoring of effluents from 2418 factories and enterprises	main 100 factories	
5) Sewerage	CORSAN			
2. Hydrology				
1) Meteorology	INMET	In and around Porto Alegre		
	CPRM	In the hydrographic basin		
	DRHS	Around Patos lake		1998-
		Wind : Santa Rita	1 point	
		Rain:Santa Rita, Sao Lourenco, Barra Falsa, Cristovao Pereira	4 points	
	EMBRAPA	Pelotas	1 point	
	PSRG	Rio Grande (pilot station)	1 point	
2) River Flow	CPRM	In the hydrographic basin		
3) Water Level	DRHS	Around Patos lake Santa Rita, Sao Lourenco, Barra Falsa, Cristovao Pereira, Farol de Itapua	5 points	1998-
	PSRG	Rio Grande (pilot station)	1 point	

(Note) DMAE: Municipal Department of Water Supply and Sewage Treatment

CORSAN: State Public Corporation for Water Supply and Sewage Treatment

FEPAM: State Foundation for Environmental Protection

AGLM: Agency of Lagoa Mirim

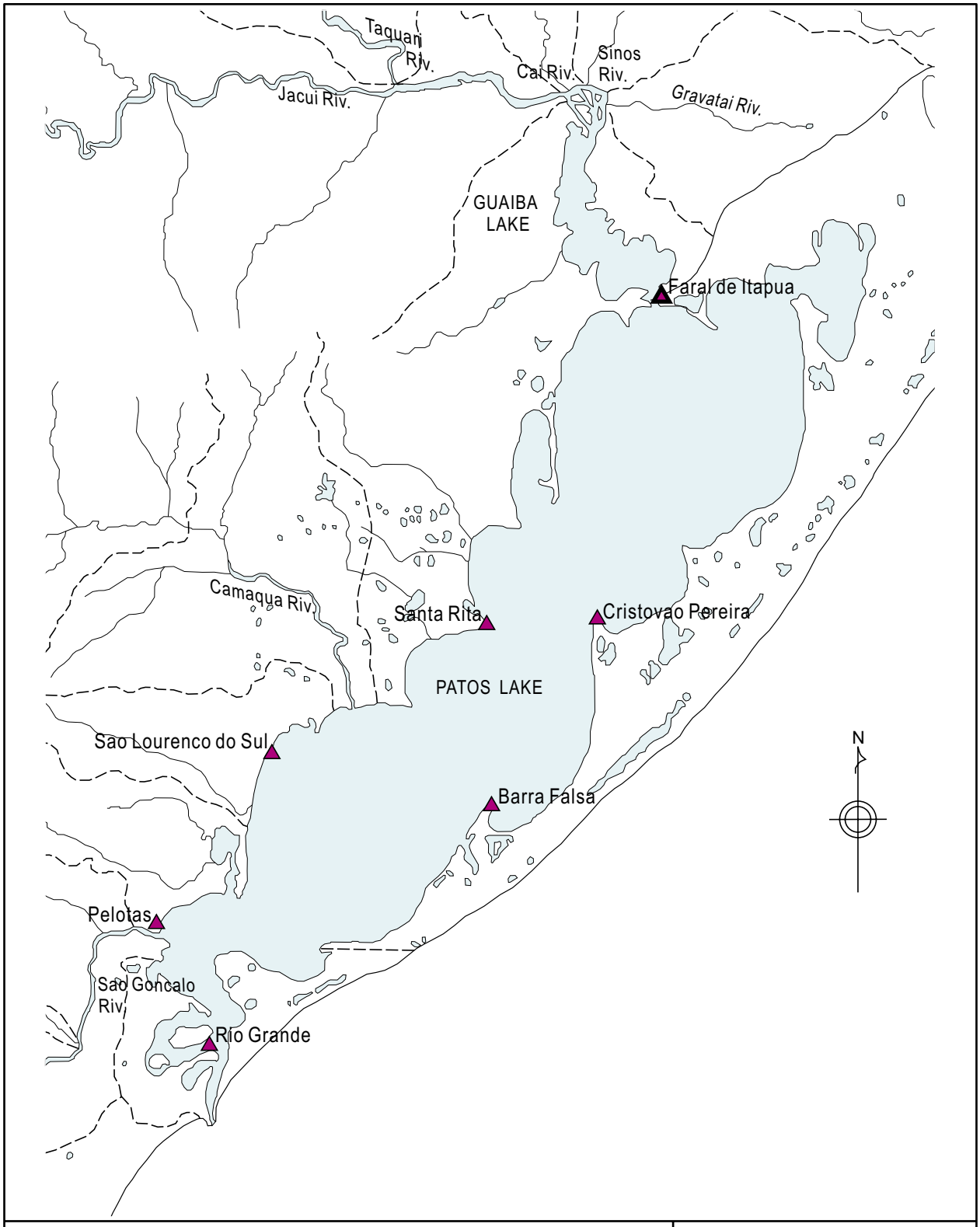
INMET: Federal Institute of Meteorology

CPRM: Reseach Corporation for Mineral Resources

DRHS: Department of Water Resources and Sanitation

EMBRAPA: Federal Reseach Institute for Agriculture and Farming

PSRG: Pilot Station at Rio Grande



THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL

JAPAN INTERNATIONAL COOPERATION AGENCY
KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL

Fig. 3.4-1

Main Hydrological Monitoring Points in the Coastal Area of Patos Lake

3.4.2 Water Quality Monitoring for Lakes

With the exclusion of the headstream and rivers in the Patos Lake basin, the study covers Guaiba Lake, Patos Lake and Mirim Lake as they represent the prevailing conditions of water bodies in the study area.

Every month DMAE monitors the water quality of Guaiba Lake from 9 monitoring stations, using 18 parameters. Agencia da Lagoa Mirim has been monitoring the water quality of Mirim Lake since 1997 from 15 stations (including Sao Goncalo canal), using 29 parameters.

On the one hand, there are no records that would indicate that Patos Lake—the main focus of this study—is being regularly monitored. The monitoring activities carried out in some parts of the lake focus on 5 coastal areas that are designated by FEPAM for swimming: 4 within the lake and 1 on the seacoast. Monitoring is carried out from 16 stations in summer to determine fecal coliform levels in the water. These 5 coastal areas are as listed below.

1. Tapes:	Camping Municipal
	Clube Nautico Taipense
	Camping Pinvest e Salva Vidas
2. Arambare:	Frente ao Arroio Velhaco – Foz
3. Sao Lourenco:	Praia das Nereidas – Frente ao Hotel Figueiras
	Praia das Ondinhas – Frente a Rua Princesa Isabel
	Camping Municipal
4. Pelotas:	Em frente a Rua J.Antonio Assuncao
	Em frente a Av.Rio Grande do Sul
	Na rotula do chafariz, entre a Rua M.da Fontoura e Martha do Lago
	Balneario dos Prazeres, chegando pela rua principal 200m a direita
	Balneario dos Prazeres, em frente ao Camping Municipal
5. Rio Grande:	Cassino – Querencia, em frente a Estacao de aquacultura da FURG
	Cassino – Em frente a Rua Buenos Aires
	Cassino – Em frente ao Terminal Turistico
	Cassino – 500m ao sul dos molhes

3.4.3 Effluent Water Quality Monitoring for Factories and Enterprises

At present, SEDAPI (Study and Reporting for Industrial Effluent Section) of Industrial Pollution Control Division, FEPAM monitors the effluent of a total of 2,418 factories and enterprises in the State of Rio Grande do Sul as shown in **Table 3.4-2**. The monitoring activities for the effluent of 418 of these factories and offices cover items enumerated in **Table 3.4-3**. The effluent of the remaining 2,000 is only monitored irregularly, at least once a year.

Agencies that analyze the quality of effluents from factories and enterprises are restricted to those registered with FEPAM. The results of the analysis (analysis tables) carried out by these agencies are managed by and in the custody of the factories and enterprises concerned, and are inspected by the officials of FEPAM.

The following are the current problems in the supervision and monitoring of effluent from factories and enterprises:

1) Owners of factories and enterprises are not aware of cognizant of the importance of and the measures for environmental conservation, e.g. putting the electricity in the treatment facility off at night to curtail maintenance expenses.
   To prevent such conditions from taking place, the owners should be required to regularly partake in environmental education seminars as a prerequisite in the issuance of the license to operate.

2) Most factories and enterprises only have one caretaker. These establishments are mostly left unsupervised therefore when the caretaker is on leave.

3) SAP (Planning Section) of Industrial Pollution Control Division, FEPAM has few staff, resulting in the inefficient implementation of monitoring activities.

4) The disposal of sludge resulting from sewage treatment is the most pressing problem to date. At present, it is not known as to where about half of the sludge produced is disposed of.
   The results of the questionnaire survey carried out by FEPAM on the use of the designated sludge disposal area show 20% of the enterprises independently dispose sludge in this area, 13% of enterprises state they use the area but did not specify the disposal measure adopted. In terms of unlicensed disposal areas, 7% of the respondents indicate using such areas for sludge disposal, 5% pointed the use of warehouses for sludge disposal, while 3% stated recycling measures. The remaining

50% of the respondents were unclear of their sludge disposal measures.

Table 3.4-2 Details of Factories and Enterprises Monitored by SEDAPI (as of September 1999)

Classification	Discharge (m^3/day)	No.
A	Q<20	94
B	20<Q<100	139
C	100<Q<500	90
D	500<Q<1,000	40
E	1,000<Q<10,000	36
F	10,000<Q	4
Recycle		7
Special Factories		8
Sub-total		418
Irregularly monitored factories & enterprises		2,000
Total		2,418

[Note] The effluent of the 418 factories and enterprises regularly monitored is estimated to amount to 60% of the total effluent discharged by all factories and enterprises.

Table 3.4-3 Monitoring Items and Frequency for Effluent Water Quality of Factories and Enterprises Conducted by SEDAPI

Class / Items	A	B	C	D	E	F
	Q<20 (m^3/day)	20<Q<100 (m^3/day)	100<Q<500 (m^3/day)	500<Q <1,000 (m^3/day)	1,000<Q <10,000 (m^3/day)	10,000≦Q (m^3/day)
Discharge	Daily	Daily	Daily	Daily	Daily	Daily
pH	Daily	Daily	Daily	Daily	Daily	Daily
Water Temperature	Daily	Daily	Daily	Daily	Daily	Daily
COD (Cr)	Once every three months	Once every two months	Monthly	Semi-monthly	Daily	Daily
Solid Sediments	Semi-annually	Once every three months	Once every two months	Monthly	Semi-monthly	Daily
Metal	Semi-annually	Once every three months	Semi-monthly	Monthly	Weekly	Daily
SS	Semi-annually	Once every three months	Semi-monthly	Monthly	Weekly	Daily
BOD_5	Semi-annually	Once every three months	Semi-monthly	Monthly	Weekly	Daily
Special Items	Semi-annually	Once every three months	Semi-monthly	Monthly	Weekly	Daily

Source: Article 15 of State Ordinance No. 10,330, 27 December 1998

3.4.4 Hydrological Monitoring

The hydrological monitoring activities carried out in the Patos Lake basin and the lake itself are carried out to determine meteorological conditions and water level.

The most extensive monitoring activities in the basin are carried out by CPRM (Companhia Pesquisas de Recursos Minerais) to determine meteorological and hydrological (river water level) conditions. Only a few of these stations, however, are currently in operation. The INMET (Instituto Nacional de Meteorologia) conducts meteorological observations in the vicinity of Porto Alegre.

Hydrological monitoring activities in areas in the southern section of Patos Lake are carried out by EMBRAPA (Empresa Brasileira de Pesquisa Agro-pecuaria) for meteorological observations in Pelotas and meteorological observations and lake water level measurements at the Pilot Station in Rio Grande. These observations are carried out for a long period of time and the data are properly arranged.

Hydrological monitoring in Patos Lake and its vicinity(*) is being carried out by DRHS (Departamento de Recursos Hidricos e Saneamento) since 1998, and covers the following items.

1. Meteorological Observation
   - Wind: Santa Rita
   - Rainfall: Santa Rita, Sao Lourenco do Sul, Barra Falsa, Cristovao Pereira

2. Water Level Observation
   - Water Level: Santa Rita, Sao Lourenco do Sul, Barra Falsa, Cristovao Pereira, Farol de Itapua

3. Current Observation
   - Profiling by Direct-reading Current Meter: Entrance of Guaiba Lake, Center of Patos Lake
   - Drifting Float Tracing : Center of Guaiba Lake, Entrance of Guaiba Lake, Center of Patos Lake

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(*) Prestacao de Servicos de Consultoria para o Desenvolvimento de Estudos Visando a Caracterizacao do Comportamento Hidraulico-Hidrologico do Sistema Hidrico Guaiba-Lagoa dos Patos, Localizado no Estado do Rio Grande do Sul

3.5 Legal Framework for the Protection of Biodiversity

Brazil, which is blessed with rich natural resources, is a vast territory that also includes both torrid and temperate zones. The republic not only contains biologically diverse species but is also made up of many precious wetlands, that unfortunately are fast becoming non-existent due to various developments undertaken nationwide. The area of Patos and Mirim lakes is also significantly characterized by vast wetlands that are so biologically diverse, even compared with other places in Brazil, and are considered highly worth preserving. In particular, Peixe Lake is recorded in the Ramsar Convention as an important transit area for migratory birds.

With these conditions, the Federal government and the state of Rio Grande do Sul enacted various kinds of legislation for the conservation of these biologically diverse and precious wetlands. The federal, state and municipal legislation for ecosystem conservation are detailed in the ECO-T-2 of the Supporting Report, and the following are the most important of them all.

The federal government established Law No. 4771 (New Forest Code) in 1965, Law No. 5197 (Fauna Protection Code) in 1967, and the Forest Code which was revised as Decree No. 97628 in 1989 and then Decree No. 1282 in 1994.

For reserved areas: Law No. 6902 (1981) refers to ecological stations and environmental protection areas, Decree No. 89336 (1984) refers to the Ecological Reserves and Areas of Relevant Ecological Interests, Law No. 7754 (1989) refers to the protection of forests located at river springs, while Law No. 6902 was later amended as Decree No. 99274 (1990) for Ecological Reserves and Environmental Protection Areas.

Moreover, Decree No. 9356 establishes the Peixe Lake National Park, while Decree No. 1354 (1994) established the National Program for Biological Diversity (PRONABIO) under the Ministry of Environment and Legal Amazonia. Further the CONAMA resolution No.149 approves the course of action for policies for the conservation and sustainable development of the “Mata Atlantica”.

The organizations related to ecosystem conservation are the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and the National Council of Fauna Protection (CNPF) established in 1989.

For the state government, FEPAM (Law No. 9077) was established in 1990, and in 1922 the Forest Code in Rio Grande do Sul (Law No. 9519) and the Development Council of

Fishery (Law No. 9519) were established. In 1994, Law No. 10330 was established to regulate the organization for the state environmental protection system. Mata Atlantica which was declared a protected area in 1994 (Decree No. 35621) became a target of an environmental study in 1996 based on Decree No. 36636. The CONSEMA Resolution No. 01 established in 1998 recognizes the State Committee for Biosphere Reserve.

Fig. 2.4-1 shows the federal and state designated conservation units in the Patos and Mirim lake area.

In 1971, the Ramsar Convention (Convention on Wetlands of International Importance Especially as Waterfowl Habitat) was adopted for the conservation of internationally important wetlands, the preservation of the fauna (especially waterfowls) and flora that inhabit these wetlands, and the appropriate use of these natural resources. The convention was put into effect in 1975. As a member nation, Brazil registered the following 5 areas under the Ramsar Convention.

1. National Park of Mato Grosso Pantanal
2. Environmental Protection Area of Reentrancias Maranhenses
3. Sustainable Development Reserve of Mamiraua
4. National Park of Araguaia
5. National Park of Lagoa do Peixe

Of these, the National Park of Lagoa do Peixe, a transit area for migratory birds, is included in the area covered by this study.

The legal framework for wetland conservation in Brazil is well documented in the “National Report of Brazil for COP’ of the Ramsar Convention on Wetlands (199)”. The report contains the following (refer to the Data Book for further details):

1. Wise Use Guidelines
2. Legal Tools for Wise Use
3. Wise Use Consideration in Planning Stage
4. Education and Public Awareness of Wetland Values

5. Institutional Capacity Building

6. Conservation of Important Wetlands

7. Designation of Important Wetlands to Ramsar Sites

8. International Cooperation

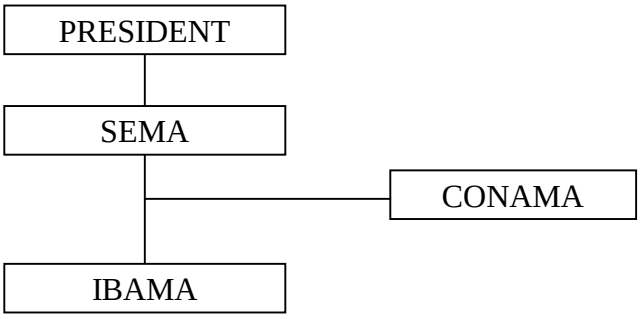
9. National Budgetary Allocation for Wetlands

The implementation of the Ramsar Convention in Brazil was initially the responsibility of IBAMA (Brazilian Institute for Environment and Natural Renewable Resources). At the end of 1995, however, during preparations for COP6, the Ministry of Environment became the major government agency in charge, undertaking all the commitments established by the Convention.

3.6 Agencies Involved in the Environmental Management System

3.6.1 Federal Level

Administrative organizations on the federal level concerning the environmental management system are as follows:



SEMA: Secretaria de Meio Ambiente
(Envionment Secretariat)

CONAMA: Conselho Nacional de Maio Ambiente
(National Council of Environment)

IBAMA: Instituto Brasileiro de Meio Ambiente e dos Recursos Renovaveis
(Brazilian Institute of Environmen t and Renewed Resources)

1) SEMA is the environment secretariat of Republic Presidency, that has the function of planning, coordinating, supervising and controlling, as a federal organism, the national policy and governmental instruction for the environment.

   It is composed by:

   - National Council of Environment (CONAMA)
   - Coordination and Planning Department for the Policy of Environment
   - Technical-Scientific and Cooperation Department
   - Committee for National Fund of Environment

2) CONAMA has the function of assisting, studying and proposing to Government Council instructions of governmental policies for the environment and natural resources as a consulting and deliberative organism.

It also has the function of deliberating norms and standards compatible to a balanced ecological environment and essential to a healthy life quality.

3) IBAMA has the functions to assist SEMA in the coordination and execution of the National Policy on Environment as well as conserve and control over natural resources as a executive organism.

3.6.2 State Level

The organizational structure of environmental agencies in the state of Rio Grande do Sul is shown in **Fig. 3.6-1**. The following two agencies, however, are mainly responsible for the preservation of the water environment and the protection of the ecosystem.

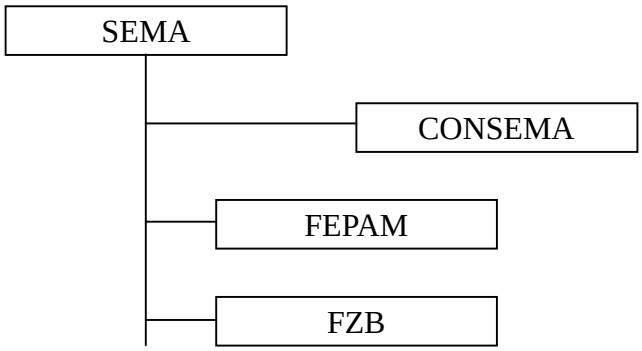
1. SEMA: Secretaria do Meio Ambiente (Envionment Secretariat)

   Former Name: SSMA : Secretaria da Saude e do Meio Ambiente
   (Health and Envionment Secretariat)

2. SOPSH : Secretaria de Obras Publicas, Saneamento e Habitacao
   (Public Works, Sanitation and Housing Secretariat)

1) Although the organizational structure of SEMA was not obtained, it has been confirmed that this organization was established in July of 1999 and directly supervises FEPAM and FZB.

In addition, CONSEMA, the organization primarily responsible for the State Environmental Protection System (SISEPRA) falls under SEMA.



CONSEMA: Conselho Estadual do Maio Ambiente
(State Council of Environment)

FEPAM: Fundacao Estadual de Protecao Ambiental Henrique Luiz Rossler/RS
(State Foundation for Environmental Protection)

FZB: Fundacao Zoobotanica
(State Foundation for Zoology and Botany)

The organizational structure of FEPAM is as shown in **Fig. 3.6-2**. The technical division is sub-divided into the following and, as previously mentioned, is in charge of monitoring the quality of industrial wastewater and the water quality of the rivers flowing into Guaiba Lake.

- Environment and Sanitation Division
- Mining Division
- Industrial Pollution Control Division
- Agriculture and Forestry Division

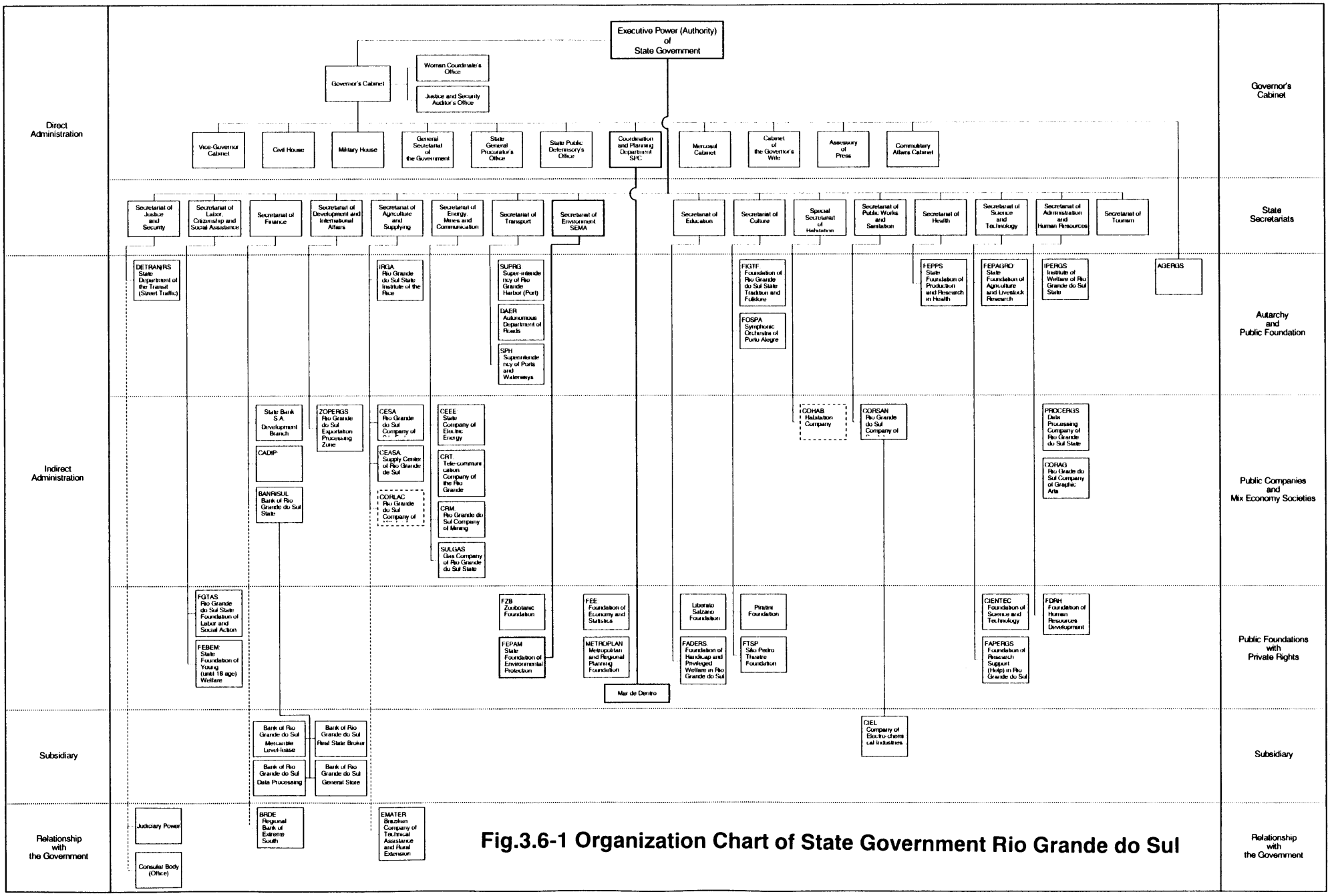
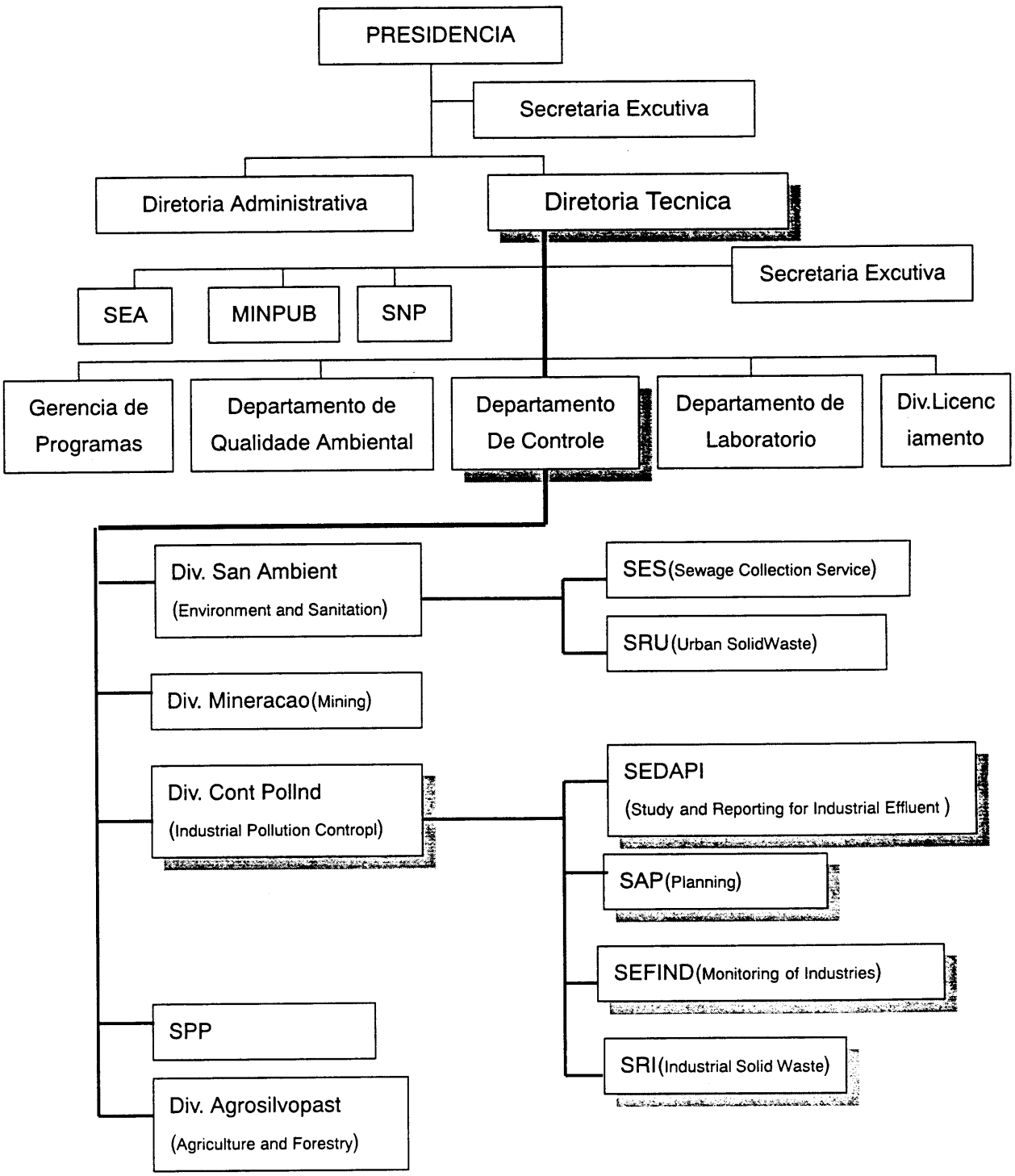


Fig.3.6-1 Organization Chart of State Government Rio Grande do Sul



THE STUDY ON THE ENVIRONMENTAL MANAGEMENT
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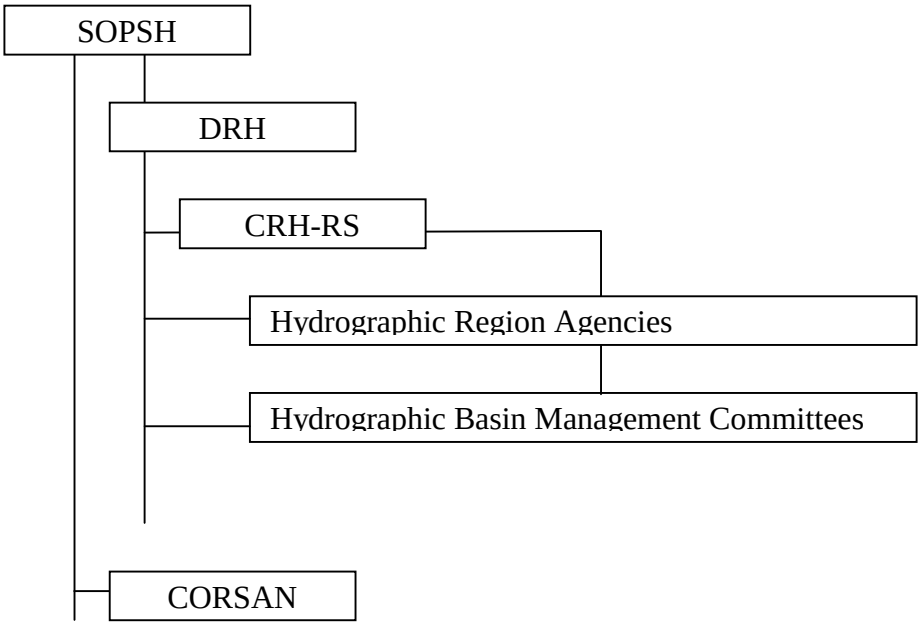
JAPAN INTERNATIONAL COOPERATION AGENCY
KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL

Fig.3.6-2

Organization Chart of FEPAM

2) SOPSH supervises public works, including sanitation projects. The Department of Water Resources (DRH) falls under this organization and constitutes the State Water Resources Council (CRH). CORSAN also falls under SOPSH.

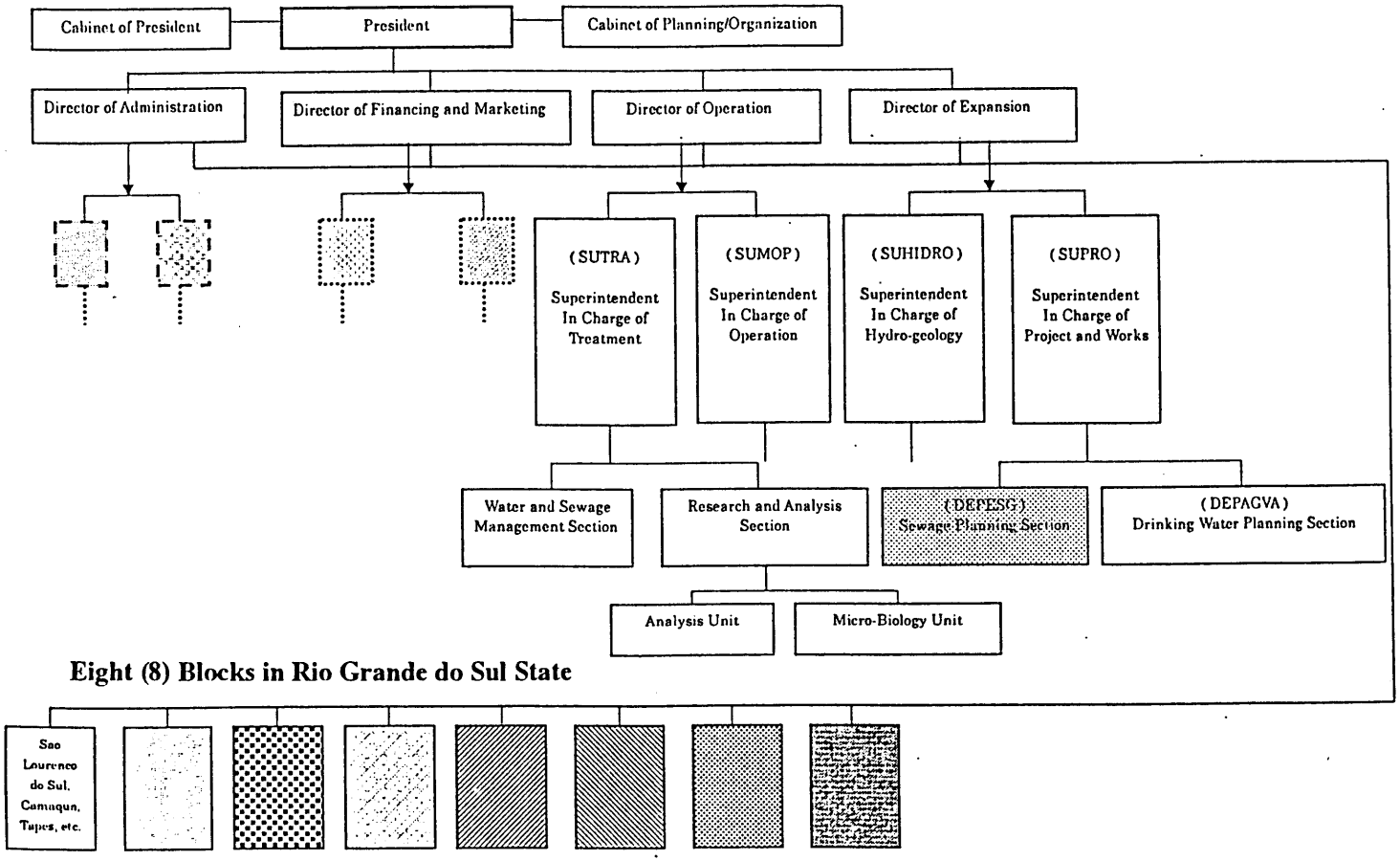


DRH: Departamento de Recursos Hidricos
(Department of Water Resources)

CRH-RS: Conselho de Recursos Hidricos Rio Grande do Sul
(State Water Resources Council)

CORSAN: Companhia Riograndense de Saneamento
(State Public Corporation for Water Supply and Sewage Treatment)

Fig. 3.6-3 shows the organizational structure of CORSAN. As previously mentioned, CORSAN monitors the quality of the water from the water supply source of cities other than Porto Alegre, as well as the quality of wastewater from sewage facilities.



THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig.3.6-3**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Organization Chart of CORSAN**

(1) State Environment Protection System

In Rio Grande do Sul State, the State System for Environmental Protection (SISEPRA) was established as Law No.10.330/94 based on the article 252 of the State Constitution.

SISEPRA has as attributions the planning, implementation, execution and control of the Environmental Policy of the State, the monitoring and the inspection of the environment, seeking to preserve its balance and the essential attributes to the healthy life quality, as well as to promote the sustainable development.

The State Council of Environment (CONSEMA) is a superior organism of the System, with deliberative and normative character, responsible for the approval and follow up of the State Environmental Policy implementation, as well as of the other plans concerned to the area.

The instruments of the Environment State Policy are the followings:

1) State Fund for the Environment (FEMA)
2) State Plan of Environmental Protection
3) Ecological zoning
4) State system of environmental registrations, records and information
5) Hydrographical basins committees, springs preservation plans, grant of water resourcesuse, derivation and charging of water resources
6) Zoning of the several productive or designed activities
7) Appraisal of environmental impacts
8) Analysis of risks
9) Inspection, control and monitoring
10) Scientific reseach and technological training
11) Environmental education
12) State System of Conservation Units

13) Environmental licensing under its different manners, as well as the authorizations and permissions

14) Agreements, covenants, consortia and other mechanisms associated to the environmental resources management

15) Sanctions

16) Encouragement and incentives

(2) State Water Resources System

The State Policy for Water Resources has an objective to promote the harmonization among the multiples and competitive uses of the water resources and its limited and aleatory temporary and space availability.

The participants of the Water Resources System are the Water Resouces Council (CRH), Department of Water Resources (DRH), the Hydrographic Basin Committees and the Hydrographic Region Agencies.

The Water Resources Council of Rio Grande do Sul State (CRH-RS) is instituted as a superior deliberative instance of the State Water Resources System in Rio Grande do Sul and integrated by:

1) Secretary of Public Works, Sanitation and Housing

2) Secretary of Agriculture and Provisioning

3) Secretary of Coordination and Planning

4) Secretary of Health and Environment

5) Secretary of Energy, Mines and Communications

6) Secretary of Science and Technology

7) Secretary of Transports

8) Extraordinary Secretary of Civil Arm Issues

For the purpose of the management of the water resources, the Rio Grande do Sul State is divided into the following hydrographical areas (see **Fig. 3.6-4**):

1. Hydrographical Region of the Uruguay River Basin
2. Hydrographical Region of the Guaiba Basin
3. Hydrographical Region of the Coastal Basins

The hydrographic basins in every hydrographic region are each equipped with their own Hydrographic Basin Management Committee. With assistance from the state technical department, the Hydrographic Basin Management Committee also concludes the policies for basin management (comprehensive master plan, construction and utilization regulations, division of water areas, development and preservation of water resources) priority ranking for ecosystem preservation, importance of dredging, fee collection system). In areas where such a committee does not exist, these responsibilities fall onto the lap of DRH.

The committees of Sinos River, Gravatai River and Santa Maria River Hydrographical Basin Management were created by the Decree No.32.774 of March 17,1988, Decree No.33.125 of February 15, 1989 and Decree No.35.103 of February 1, 1994, respectively (see **Fig. 3.6-5**).

The organization flowchart for river and water resources development in the State of Rio Grande do Sul is shown in **Fig. 3.6-6**.

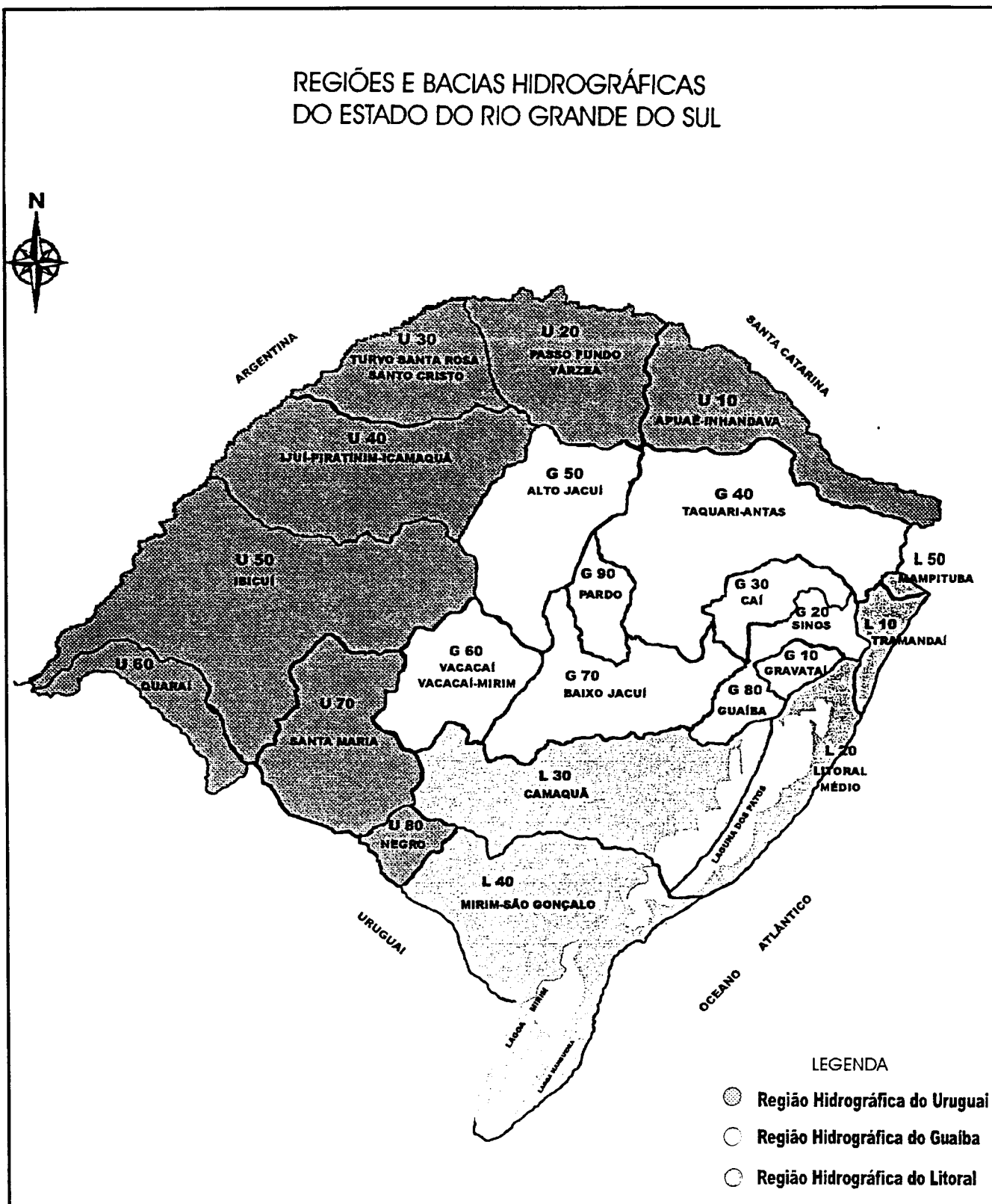


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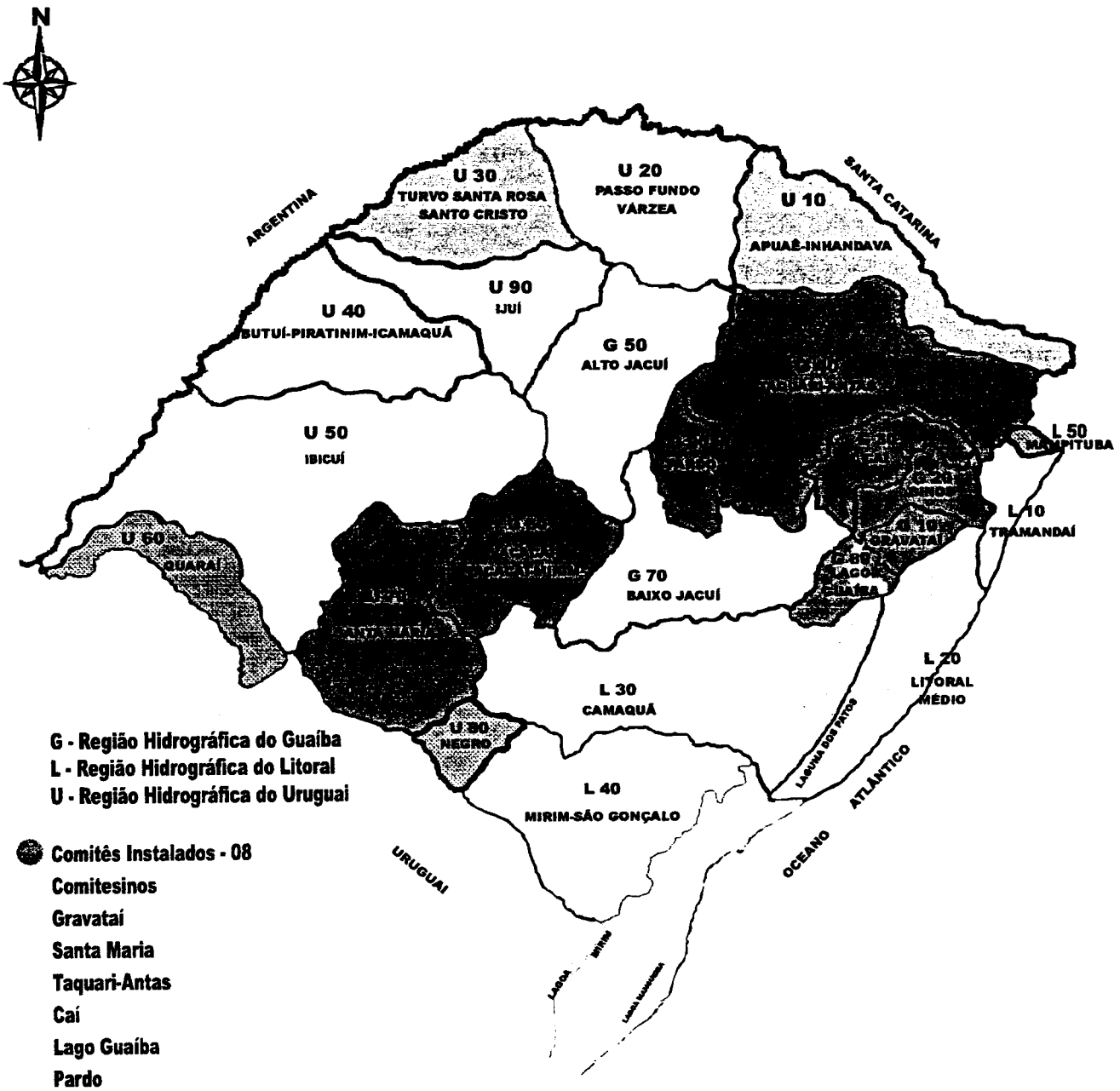
Fig.3.6-4

Map of Division for Hydrographical Region

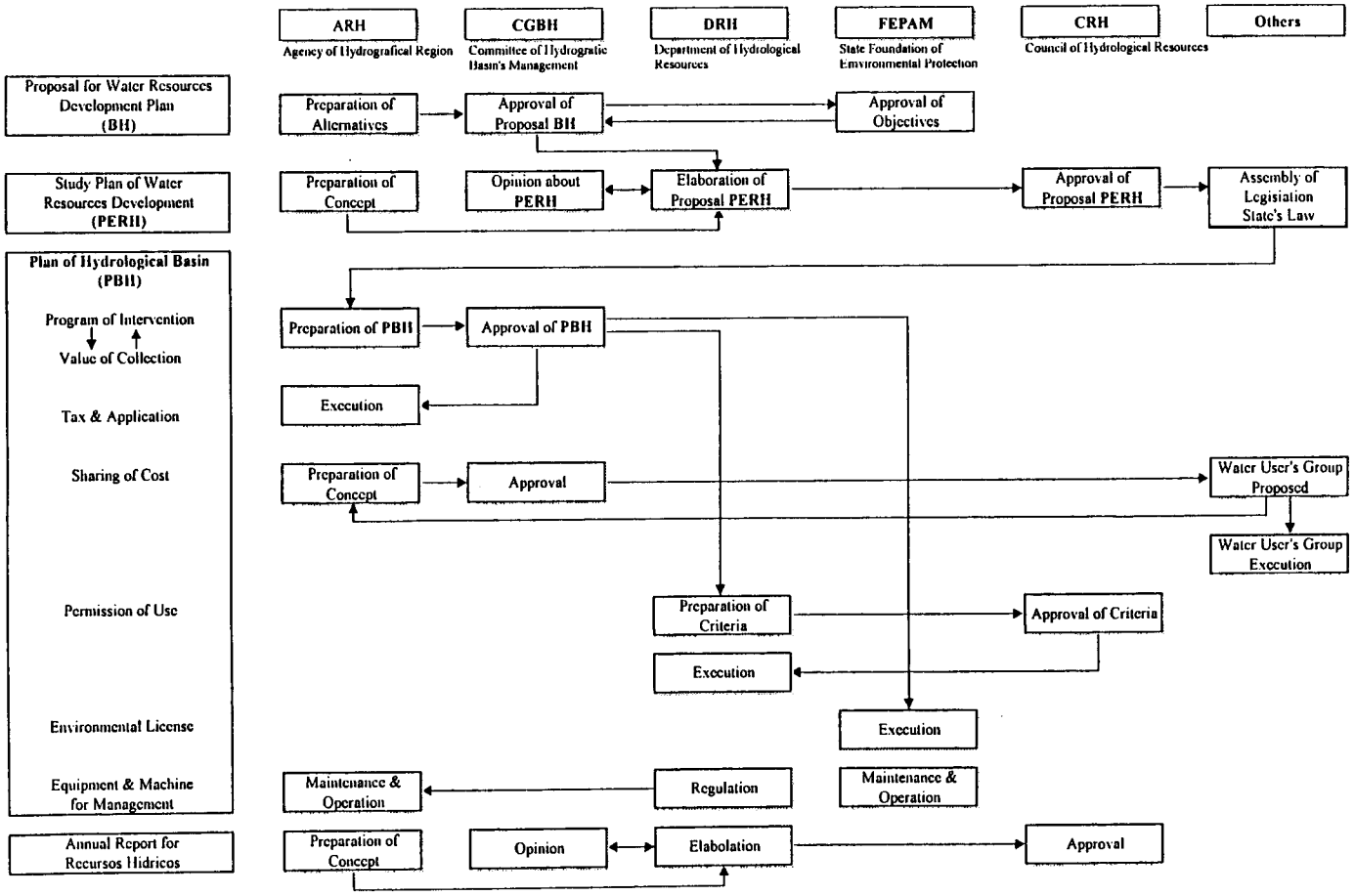
SISTEMA ESTADUAL DE RECURSOS HÍDRICOS - LEI 10.350/94
GERENCIAMENTO DE BACIAS HIDROGRÁFICAS
DO ESTADO DO RIO GRANDE DO SUL



G - Região Hidrográfica do Guaíba
L - Região Hidrográfica do Litoral
U - Região Hidrográfica do Uruguai

- Comitês Instalados - 08
  - Comitesinos
  - Gravataí
  - Santa Maria
  - Taquari-Antas
  - Caí
  - Lago Guaíba
  - Pardo
  - Vacacaí e Vacacaí-Mirim
- Comissões Provisórias - 10
- Estruturação pré-comissões - 02
- Ações Futuras - 03
- Total - 23 Bacias Hidrográficas

THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig.3.6-5**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Map of Division for Hydrographical Basin Management**

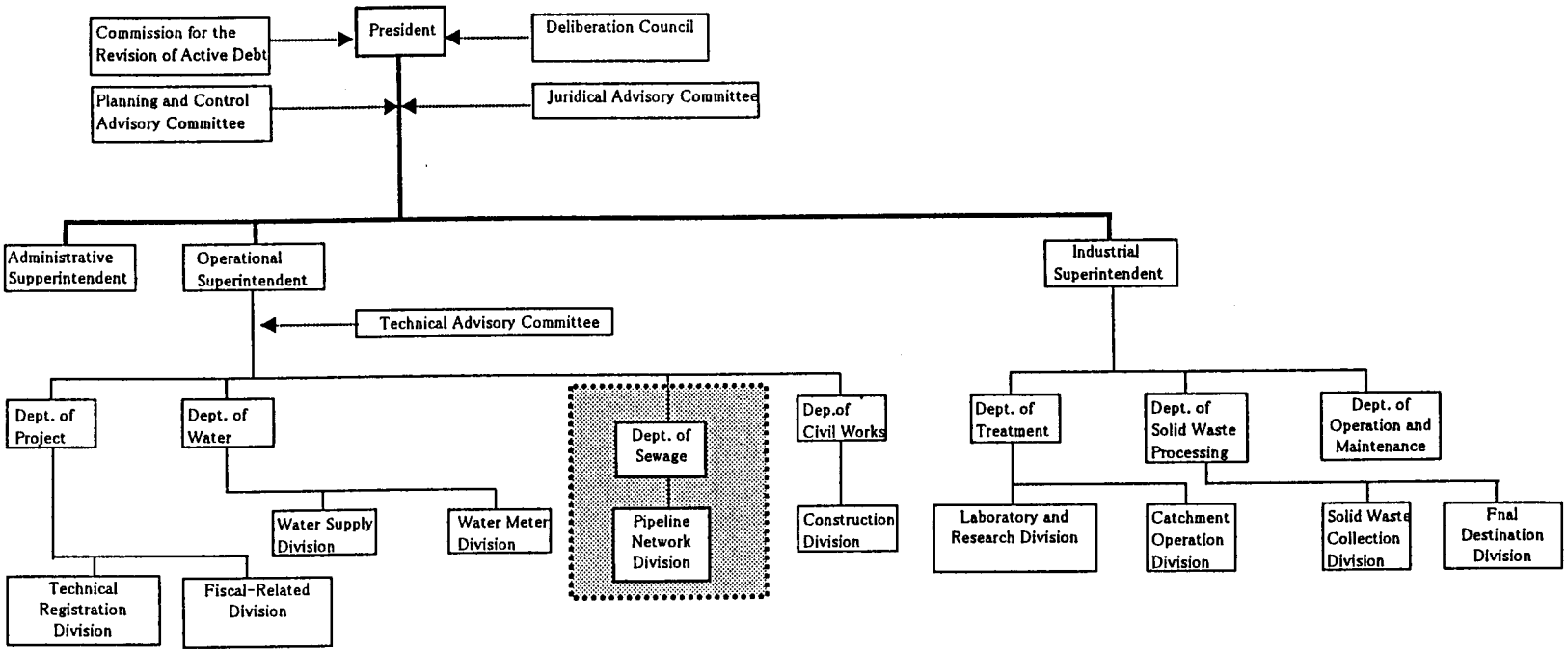


THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	**Fig.3.6-6**
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	**Organization Flowchart for River Basin Management in Rio Grande do Sul State**

3.6.3 Municipality Level

The important environmental agency at the municipality level is SANEP (Servico Autonomo de Saneamento de Pelotas – Service Agency of Pelotas for Water Supply and Sewage Treatment.

The organizational structure of SANEP is as shown in **Fig. 3.6-7**.



Note: Prepared based on information provided by SANEP in Pelotas City.

THE STUDY ON THE ENVIRONMENTAL MANAGEMENT OF THE HYDROGRAPHIC BASIN OF PATOS AND MIRIM LAKES IN THE FEDERATIVE REPUBLIC OF BRAZIL	Fig.3.6-7
JAPAN INTERNATIONAL COOPERATION AGENCY KOKUSAI KOGYO CO., LTD. / PACIFIC CONSULTANTS INTERNATIONAL	Organization Chart of SANEP in Pelotas

3.7 Budget for Environmental Conservation

(1) Generalities

As mentioned in Chapter 12 of the Supporting Report (Financial Conditions in the State of Rio Grande do Sul), the public budget in Brazil is made by a 3-layer system: Federal Budget, State Budget and Municipality Budget, based on its administrative system.

For the purpose of environmental conservation, due to its large scale of annual budgetary requirements, only the Federal Government and concerned States have been substantially dealing with this matter through the Ministry of Environment and the concerned Secretariats of Environment, respectively. The Ministry of Environment, in principle, is in charge of the environmental conservation of objects on national level, and the concerned Secretariats of Environment take care of objects at local level. Therefore, municipality activities on this aspect are generally limited to some programs for local sanitation and environmental education in their localities. On this basis, if a Municipality is willing to take care of some environmental conservation in its locality, it has to apply for financial assistance from the State Government or the concerned Secretariat of Environment.

On another hand, the aspect of environmental conservation has its implication to various Secretariats and Offies in the State. Particularly for the Secretariat of Tourism through its eco-tourist program, many objects of environmental conservation at local level such as some eco-resort sites have been constructed and maintained up to now. FEPAM, however, has been mainly working on the aspect of pollution control. And IBAMA is dealing with the conservation of natural flora and fauna. Each one, therefore, has been reportedly making its own efforts on budget adjustments for properly conducting its activities.

At any level, however, there is a substantial situation of insufficient finances for properly carrying out the aspect of natural conservation. At the national level, for instance, the National Conservation Area of Taim in Mirim Lake has been presently found in seriously financial lack for its operation activities after the termination of financial assistance from a donor. Lagoa de Peixe in Patos Lake also has been found presently threatened by its polluted water quality In institutional operation, IBAMA is reported lacking of budget for controlling illegal activities on fishing and lumbing in the area.

In this respect, of the total annual expenditure from the present federal annual budget (about R$ 300 billion), only 30 % (about R$ 90 billion) are expended for the operation costs for all 22 ministries including environment, health, education, science and technology sectors, the Army, the Legislative, the Judicial Power and the administration itself.

(2) State Budget for Environmental Conservation

At local level, since most states and municipalities have been reportedly receiving a financial assistance from the federal budget, this insisted a basic condition of financial insufficiency in the fiscal revenues of many states and municipalities.

Concerning the financial assistance of the federal government to the state government, there are 2 kinds: 1). The basic transfer of assistance funds from the National Treasury to the subjected states and, 2). The federal funding for specific projects/programs including those belonged to the scope of environmental conservation/management at the local level also.

In principle, the latter is distributed according to the needs and maturity of the subjected projects as well as the federal budget capacity and the results of negotiations between the federal government and the local government. The very fact as specified in the above is that the very limited capacity in federal budget for the aspect of environmental conservation as shown by the case of National Conservation Area of Taim in Mirim Lake in the Study area etc.

(3) Rio Grande do Sul and Environmental Conservation

Despite the environmental conservation or environmental management is an important matter in the Study area as well as Rio Grande do Sul, the budget allocation in an integrated system for this matter has been mostly ignored up to now. The following showed the public finance situation in Rio Grande do Sul.

Table 3.7-1 Public Finance Situation in Rio Grande do Sul

Item	Amount (R$ million)	Percent
Total Budget	**8,800**	**100 %**
1. Transfer to Municip.	1,700	20 %
2. Transfer to Other Agencies	935.4	12 %
(Legilation)	(257.8)	
(Judicary)	(532.0)	
(Public Min.)	(146.6)	
3. Public Debts	400	4.5%
4. Personnel Fees	4,600	52 %
5. Investments	750	8.5%

Source: Prestacao de Contas do Governo do RS/1999

In general, of the annual state budget after obligatory transfers, about 75 % are used for paying routine direct costs (personnel salaries and O.M. costs) and 25 % are used for annual development investments in the State, mainly through 12 Secretariat Offices. Therefore, each Secretariat, in principle, has an annual investment/development budget of more or less 2 % (about R$ 200 million), depending on its scale of activities. The Secretariats of Health, Education and Agriculture, as per their large-scale activities, have a rather higher annual budget.

Also, through the results of local voices made in Participatory Budget Program, the major development investments are requested for the aspects of agriculture, education and public health. The budget allocations in 2000 for these 3 sectors, therefore, are envisaged as follows:

- Agriculture: R$ 222.6 million (This showed a 50 % up from the figure of last year)*
- Education: R$ 1,913 million (This is envisaged as 35 % of the amount of collected taxes as defined by the Constitution)*
- Public health: R$ 416 million (This showed a 50 % up from the last year, calculated as 10 % of the collected taxes as defined by the Constitution)*

(* amount including personnel cost and others)

Concerning the aspect of environmental conservation and management in Rio Grande do Sul, the Secretariat of Environment (SEMA) which was newly established to cover its affiliated organization FEPAM for controlling the public environmental aspects has a present budget allocation of about R$ 130 million. This amount will be used for

implementing the environmental management/conservation related programs/projects in Rio Grande do Sul, mainly through FEPAM for pollution control and FZB for zoo-botanical control.

From the present financial conditions mentioned above, the State is found in difficulties for implementing an environmental management/conservation project of large scale without the financial assistance from some other financial source(s).

However, for substantially dealing with the matter of environmental conservation and management in the Study area, the State government of Rio Grande do Sul, for the first time, has officially financed Programa Mar de Dentro an annual budget for operation of R$ 2.7 million in 2000 for taking care of this aspect in this part of the State.

The Program objective, therefore, is for the ecologically sustainable development of Patos Lagoon and Mirim Lake Hydrographic Basins, by reclaiming and preserving the Environment; awaking people to ecological consciousness as well as creating adequate conditions for the environmental conservation and socio-economic development in this region.

In the present component formulation, the Program is structured in 4 modules to be developed within 10 to 15 years. The First Module (Environmental Assessment), in progress, consists of several interlinked projects, coordinated by the different entities integrated of PRO-MAR-DE-DENTRO. Meanwhile, the remaining 3 modules consisting of the 9 following subprograms shall be implemented accordingly, based on a sequence to be established in the near future as follows:

Subprogram 1 : Administration and Management

Subprogram 2 : G.I.S

Subprogram 3 : Environmental Education

Subprogram 4 : Systems for treating Water, Sewerage and Solid Waste

Subprogram 5 : Systems for Drainage, Sanitation of Habitation and Control of Vectors and Zoonoses

Subprogram 6 : Environmental Monitoring, Ecological Management of Basins, Sub-basins and Micro-basins

Subprogram 7 : Preservation of Environmental, Historical and Cultural Patrimoines

Subprogram 8 : Communications Plan

Subprogram 9 : Master Plan for the whole Mar de Dentro Program

From the basic conditions of restricted finance and human resources, along with the basic concept of personnel cooperation and the financial assistance from other organizations, this cooperation program is envisaged for a cooperation period of 4-5 years with one year of pilot project.

In order to implement these 9 subprograms, the Technical Group of Programa Mar de Dentro had formulated a prevision for cost allocations and sources envisaged as follows:

Table 3.7-2 Prevision for Cost Allocations and Sources Envisaged

Program	Situation	Self Source (Programa)	External Cooperation	TOTAL	(%)
Subprogram 1	Current	621,562	621,562	1,243,124	2.0
	Capital	0	10,359	10,359	
Subprogram 2	Current	207,187	207,187	414,375	1.9
	Capital	0	828,750	828,750	
Subprogram 3	Current	414,375	621,562	1,035,937	2.6
	Capital	0	627,482	627,482	
Subprogram 4	Current	0	0	0	35.7
	Capital	8,287,496	14,503,118	22,790,615	
Subprogram 5	Current	0	0	0	26.0
	Capital	4,143,748	12,431,244	16,574,992	
Subprogram 6	Current	1,035,937	2,071,874	3,107,811	14.0
	Capital	2,693,436	3,107,811	5,801,247	
Subprogram 7	Current	1,035,937	3,107,811	4,143,748	16.2
	Capital	2,071,874	4,143,748	6,215,622	
Subprogram 8	Current	207,187	0	207,187	1.0
	Capital	0	414,375	414,375	
Subprogram 9	Current	414,375	0	414,375	0.6
	Capital	0	0	0	
TOTAL		**21,133,114**	**42,696,883**	**63,830,009**	**100**

Notes: Currency unit : R$

Besides, as for the financial proceeding for a new project/program in the State, the budget procurement for a new environmental conservation project/program is proceeded with the following procedure:

(Principles for New Project-Budget Allocation)

Project Budget

Planned and requested

From each Project-Unit

|

Department / Division

Elaborates the whole Dept./Division Budget and requests to the Corresponding Secretariat

|

Each Secretariat

Elaborates its Secretariat Annual Operation Budget

And requests to the State for Budget Allocation

|

With the verification from Finance Secretariat

The State readjusts the whole Budget and sends to

The State General Assembly for Approval

|

With approved Budget Allocation , each Secretariat contacts the Finance Secretariat Office

For Payment Disbursement upon Utilization/State Financial Situation