

JAPAN INTERNATIONAL COOPERATION AGENCY [JICA]

SECRETARIAT OF COORDINATION AND PLANNING

THE STATE OF RIO GRANDE DO SUL

THE FEDERATIVE REPUBLIC OF BRAZIL

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

FINAL REPORT : VOLUME 4

DATA BOOK

OCTOBER 2000

KOKUSAI KOGYO CO., LTD.

IN ASSOCIATION WITH

PACIFIC CONSULTANTS INTERNATIONAL

Exchange Rate of Currency

January, 2000

US\$1.00 = R\$1.75

R\$ =Brazilian Real

Composition of the Final Report

The final reports are composed of the following 6 volumes.

- 1. Vol.1 Summary**
- 2. Vol.2 Main Report**
- 3. Vol.3 Supporting Report**
- 4. Vol.4 Data Book**
- 5. Summary (Japanese)**
- 6. Summary (Portuguese)**

TABLE OF CONTENTS ON ANNEX

1. Annex SOC : for CHAPTER 1 102 Sheets (Page 1-1 to 1-102)

- SOC-F-1 : Preliminary Analysis on Major Socio-Economic Characteristics in the Study Area Basin**
- SOC-F-2 : Brief Comparison Between Programa Mar de Dentro and JICA Master Plan Study**
- SOC-F-3 : Organization of the Federal Government**
- SOC-F-4 : Population Distribution in Basins and Sub-Basins of the Project Area**
- SOC-F-5 : Distribution of Big Farms (more than 500ha) in Rio Grande do Sul**
- SOC-F-6 : Infrastructures (Transportation Aspect) in Rio Grande do Sul**
- SOC-F-7 : Present Organization of Programa Mar de Dentro**
- SOC-F-8 : Structure of the Coordination and Planning Secretariat (SPC)**

- SOC-T-1 : Questionnaires for Field - Surveys**
- SOC-T-2 : Inquiry about Project Evaluation**
- SOC-T-3 : 29 Municipios Fully Covered in the Study Area
21 Municipios Partly Covered in the Study Area**
- SOC-T-4 : Details on Industries in Municipalities in the Study Area**
- SOC-T-5 : Agroecological Characteristics in the Study Area**
- SOC-T-6 : Plan for Economic Re-structure in the South of Rio Grande do Sul**
- SOC-T-7 : Situation of Navigation in Patos Channel**
- SOC-T-8 : Situation of Tourists coming into the Study Area**

2. Annex POL : for CHAPTER 2 43 Sheets (Page 2-1 to 2-43)

- POL-F-1 : Result of Runoff Simulation by Tank Model**

POL-F-2 : Runoff Load Flowing into Patos Lake

POL-F-3 : L-Q Equation

POL-F-4 : Annual Precipitation

**POL-T-1 : Water Quality and Runoff Load of Rivers Flowing
into Patos Lake**

POL-T-2 : Runoff Load of Inflowing Rivers

POL-T-3 : Existing Data on Nonpoint Sources Measures

3. Annex RIV : for CHAPTER 3 113 Sheets
(Page 3-1 to 3-113)

RIV-F-1 : River System

RIV-F-2 : Geological Units in Rio Grande do Sul

RIV-F-3 : Koppen's Climatic Classification

**RIV-F-4 : Flowchart of Preparation of Land Use Map
using LANDSAT Image Data**

RIV-F-5 : Covered Area by LANDSAT Image Data

**RIV-F-6 : Geological Map of the Selected River
for Murano's Formula (Scale=1/50,000)**

RIV-T-1 : River System

RIV-T-2 : Soil Conditions of Sub-basins

RIV-T-3 : Existing Hydrological Observation Stations

RIV-T-4 : Mean Monthly and Annual Rainfall

RIV-T-5 : Mean Monthly and Max./Min. Discharge

RIV-T-6 : Specific Discharge in the Mirim Lake Basin

RIV-T-7 : Monthly Runoff Coefficient

RIV-T-8 : Actual Land Use

RIV-T-9 : Slope Conditions and Land Use

RIV-T-10: Estimation of Soil Loss in Sub-basins

RIV-T-11: Case Study of Soil Loss by USLE

RIV-T-12: Specific Sediment Yield by Murano's Formula

RIV-T-13: Harvested Area of Suspicious Crop

RIV-T-14: Varieties and Input Pattern of Agricultural Chemicals

RIV-T-15: River Structures and Irrigation Facilities

RIV-T-16: Water Resources State System (SERH)

RIV-T-17: Master Plan

4. Annex ECO : for CHAPTER 4 34 Sheets
(Page 4-1 to 4-34)

- ECO-F-1 : Preliminary Flow-Chart for the Fauna/Flora
Registration Site**
- ECO-F-2 : Filtration Process of the Temporary Data**
- ECO-F-3 : Example of Flora Distribution**
- ECO-F-4 : Example of Birds Distribution**
- ECO-F-5 : Seasonal Variation of the Water Community in
the Patos Lagoon Estuary**
- ECO-F-6 : Number of Organisms Contributed for Ecosystem Studies**

- ECO-T-1 : Fauna/Flora Protected by Law or Threatened
of Extinction**
- ECO-T-2 : Federal Legislation (Federal, State and Municipal)**
- ECO-T-3 : Organizations that can contribute for the Ecosystem Study**

5. Annex WET : for CHAPTER 5 60 Sheets
(Page 5-1 to 5-60)

- WET-T-1 : Items of Information Sheet on Wetlands in Patos/Mirim Basins**
- WET-T-2 : Retrieved Information Sheet on Patos/Mirim Basins**

6. Annex MON : for CHAPTER 6 123 Sheets
(Page 6-1 to 6-123)

- MON-F-1 : Meteorological and Hydrological Conditions**
- MON-F-2 : Track Charts of Survey Lines (ADCP)**
- MON-F-3 : Current Profiles of Survey Lines (ADCP)**

- MON-T-1 : Original Data of In-situ Water Quality Observation Results**
- MON-T-2 : In-situ Water Quality Observation Results**

7. Annex CHE : for CHAPTER 7 193 Sheets
(Page 7-1 to 7-193)

- CHE-F-1 : pH Variation in Patos Lake**
- CHE-F-2 : DO Variation in Patos Lake**
- CHE-F-3 : BOD Variation in Patos Lake**
- CHE-F-4 : Salinity Variation in Patos Lake**
- CHE-F-5 : PO4 -P Variation in Patos Lake**
- CHE-F-6 : TP Variation in Patos Lake**
- CHE-F-7 : NH4 -N Variation in Patos Lake**
- CHE-F-8 : NO3 -N Variation in Patos Lake**
- CHE-F-9 : TN Variation in Patos Lake**
- CHE-F-10 : Si Variation in Patos Lake**
- CHE-F-11 : Chl-a Variation in Patos Lake**
- CHE-F-12 : SS Variation in Patos Lake**
- CHE-F-13 : Total Coliform Variation in Patos Lake**
- CHE-F-14 : Fecal Coliform Variation in Patos Lake**
- CHE-F-15 : Phytoplankton Identification**

- CHE-T-1 : Analytical Results of Water Quality Monitoring**
- CHE-T-2 : Vertical Variation of Salinity**
(including Temperature and Conductivity)
- CHE-T-3 : Analytical Results of Heavy Metals in Water**
- CHE-T-4 : Analytical Results of Sediment**
- CHE-T-5 : Results of Primary Production Measurement In-situ**
- CHE-T-6 : Results of Elution Experiment**
- CHE-T-7 : Results of Sedimentation Experiment**
- CHE-T-8 : Analytical Results of Water Quality Monitoring in Mirim Lake**

8. Annex SIM : for CHAPTER 8 49 Sheets
(Page 8-1 to 8-49)

- SIM-F-1 : Calculated Water Quality Distribution (Annual Mean)**
(Inflow Load :+20%, Rate of Diatoms in Southern Area : 0.5)
- SIM-F-2 : Calculated Water Quality Distribution (Summer)**
(Inflow Load :Present, Rate of Diatoms in Southern Area : 0.2)
- SIM-F-3 : Calculated Water Quality Distribution (Summer)**
(Inflow Load : +20%, Rate of Diatoms in Southern Area : 0.2)

- SIM-F-4 : Calculated Water Quality Distribution (Annual Mean)**
(Reduction Rate of Inflow Load : Main Rivers -10%, Others -10%)
- SIM-F-5 : Calculated Water Quality Distribution (Annual Mean)**
(Reduction Rate of Inflow Load : Main Rivers -20%, Others -20%)
- SIM-F-6 : Calculated Water Quality Distribution (Annual Mean)**
(Reduction Rate of Inflow Load : Main Rivers -20%, Others -50%)
- SIM-F-7 : Calculated Water Quality Distribution (Annual Mean)**
(Reduction Rate of Inflow Load : Main Rivers -50%, Others -50%)

9. Annex WAS : for CHAPTER 10 6 Sheets
(Page 10-1 to 10-6)

- WAS-T-1 : Mean and Maximum Concentrations of Different Leachate Quality Parameters Representing the “Acid” and “Methane” Phase**
- WAS-T-2 : Mean, Maximum and Minimum Concentrations of Different Leachate Quality Parameters where no Dependency could be found.**
- WAS-T-3 : Comparison of Physical and Chemical Parameters of the Infiltrated Liquids in Sanitary Landfills in Sao Paulo**
- WAS-T-4 : Results of the Samples Analysis**
- WAS-T-5 : Characteristics of Leachate in Several Landfills, Actual and Experimental**
- WAS-T-6 : Variation of Physical-Chemical Parameters of Leachate from the Landfill Cells C3 and C4 (January to June 1996)**

10. Annex ENV : for CHAPTER 11 41 Sheets
(Page 11-1 to 11-41)

- ENV-T-1 : Educational Booklet**
- ENV-T-2 : Educational Panels**
- ENV-T-3 : Educational Video**
- ENV-T-4 : Banners**
- ENV-T-5 : Workshops in Pelotas and Rio Grande**

11. Annex FIN : for CHAPTER 12 12 Sheets

(Page 12-1 to 12-12)

**FIN-F-1 : Structure of Executive Power of the Rio Grande
do Sul State**

FIN-F-2 : Present Organization of SEMA

**FIN-F-3 : Distribution of Regional Development Councils
(COREDE) in Rio Grande do Sul**

FIN-T-1 : GDP of Municipalities in Study Area (1998)

**FIN-T-2 : Situation of Budgetary System in Municipalities
of the Study Area**