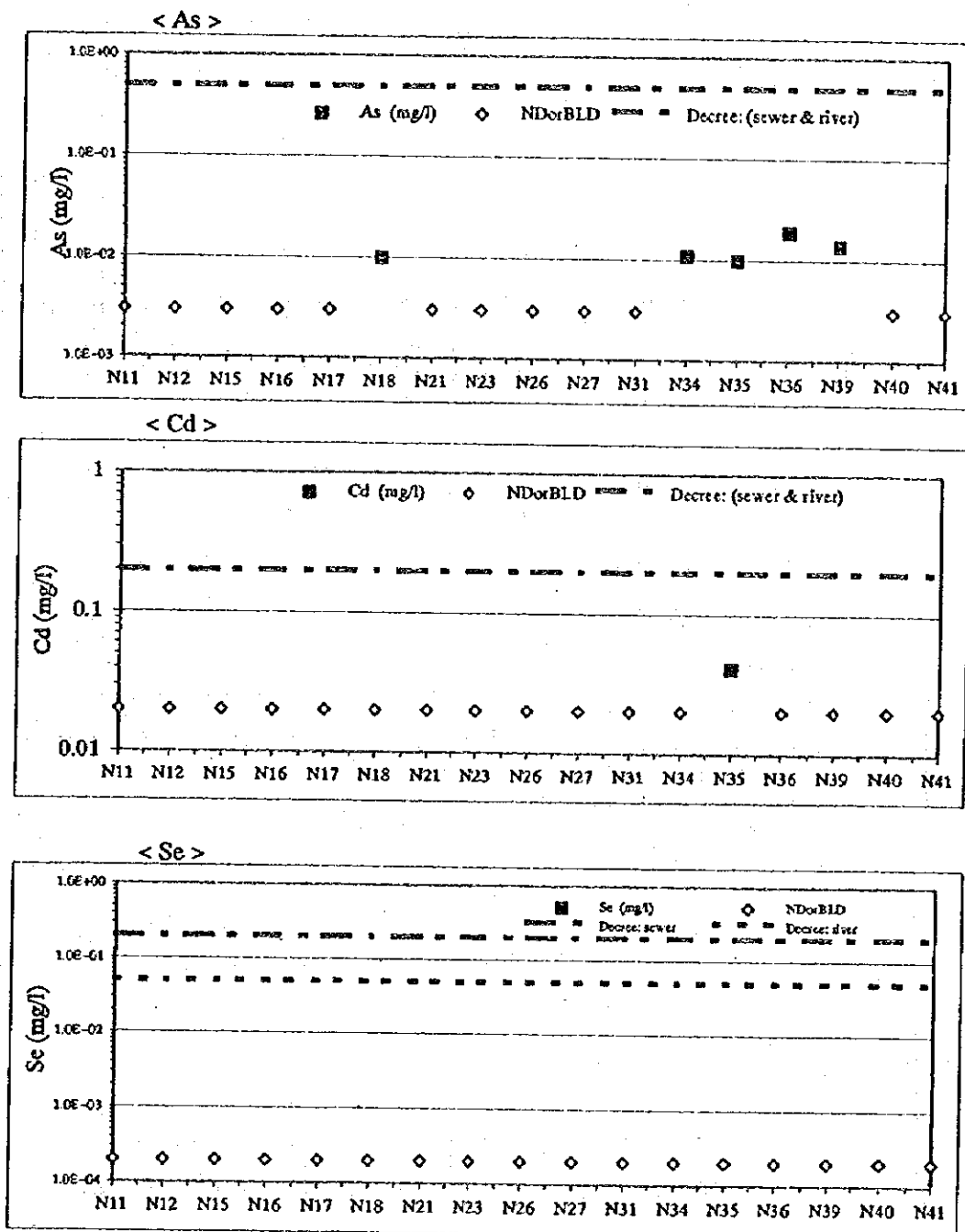


### Water Quality in Non-food Factory Wastewater



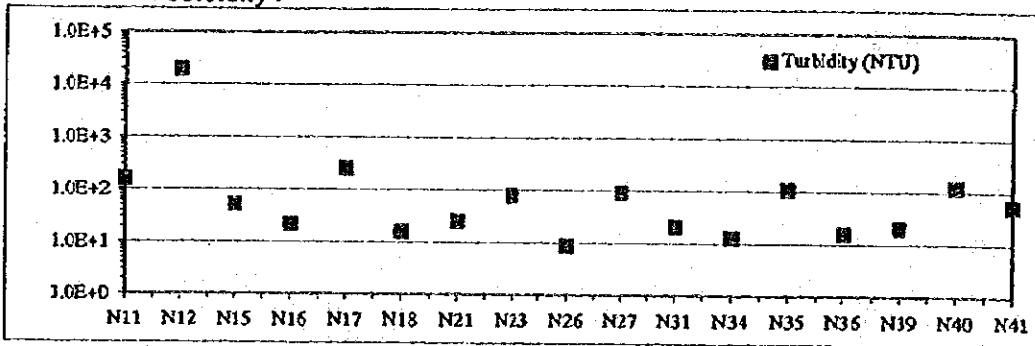
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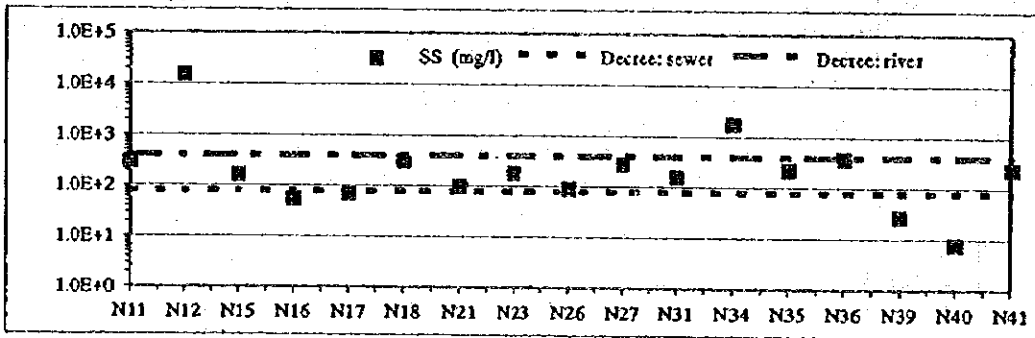
Fig. 2.2-9 Contaminación de las Fábricas de Productos No-Alimenticios (3/4)

### Water Quality in Non-food Factory Wastewater

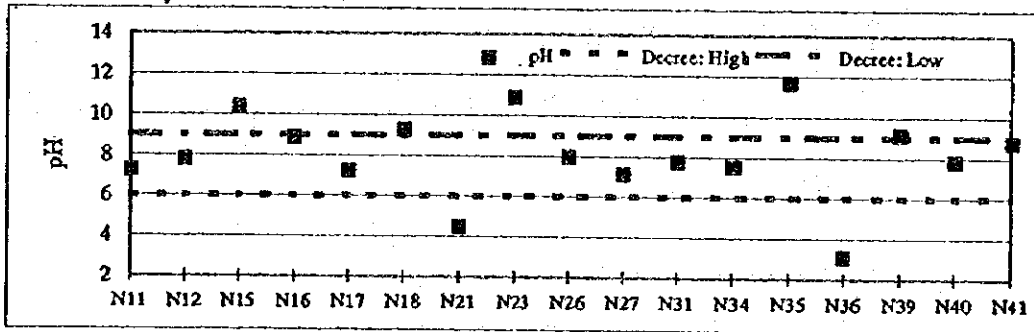
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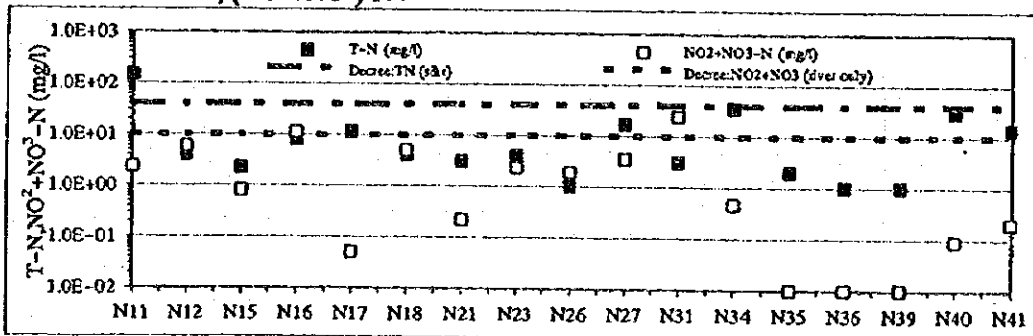
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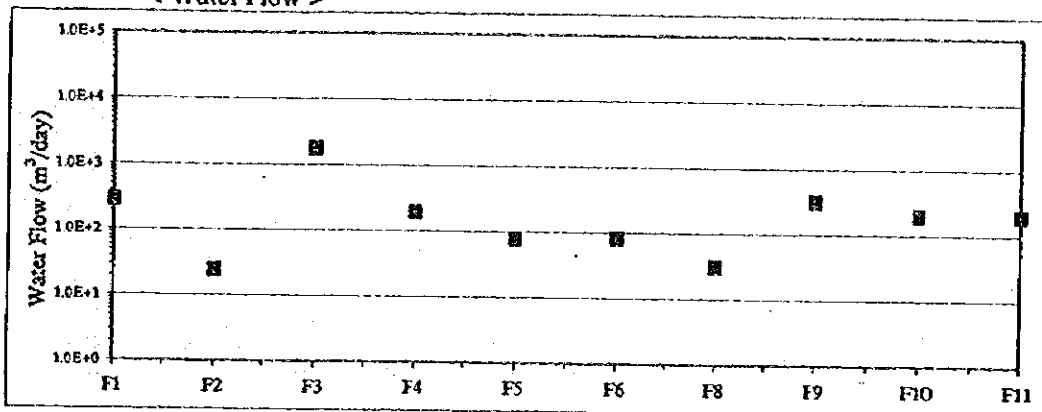


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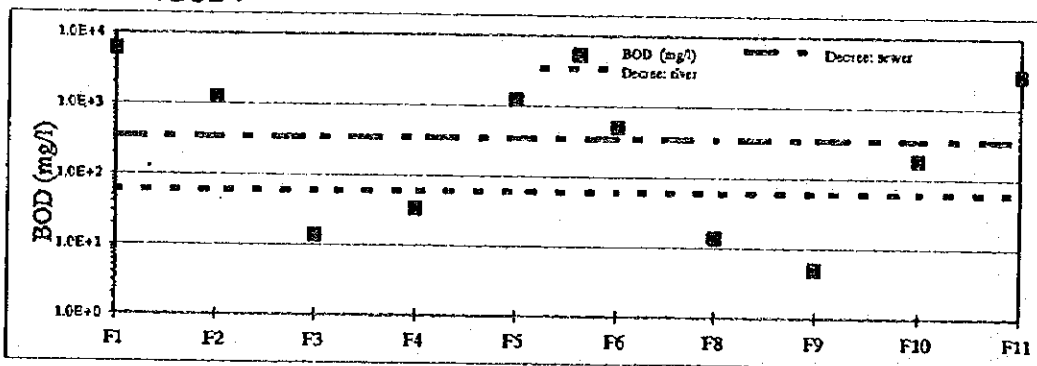
Fig. 2.2-9 Contaminación de las Fábricas de Productos No-Alimenticios (4/4)

## Water Quality in Food Factory Wastewater

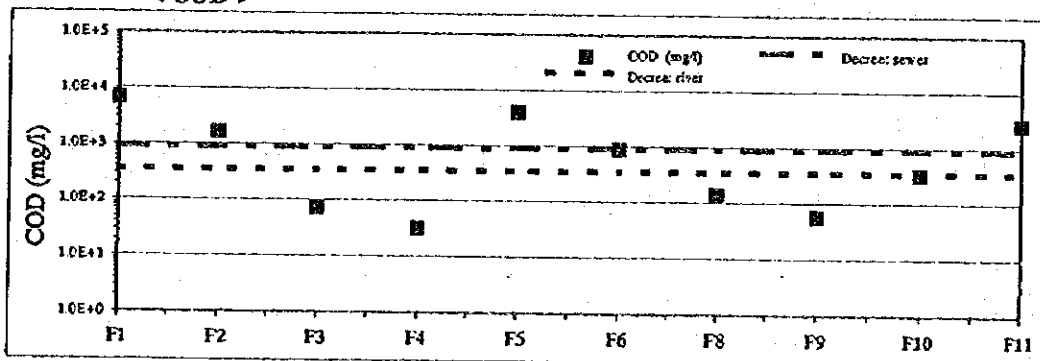
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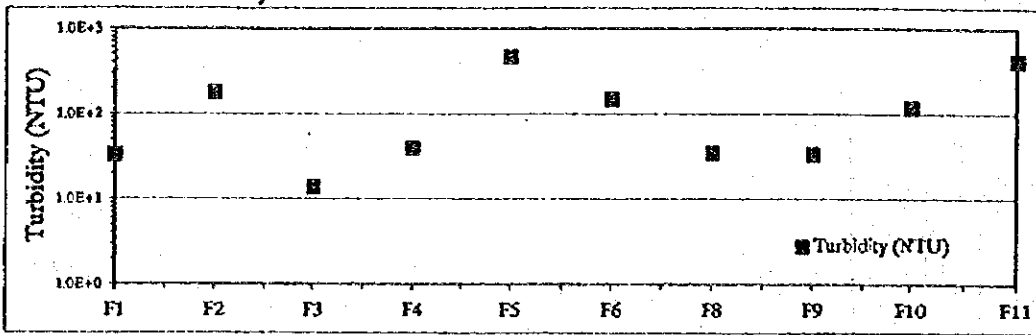


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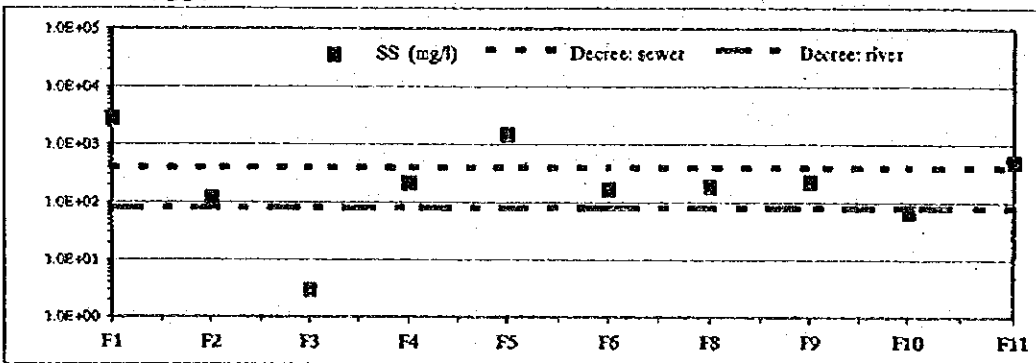
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Fig. 2.2-10 Contaminación de las Fábricas de  
(1/2) Productos Alimenticios

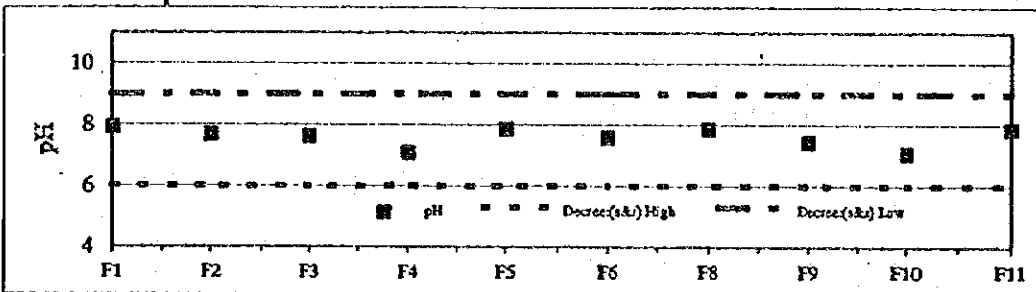
Water Quality in Food Factory Wastewater  
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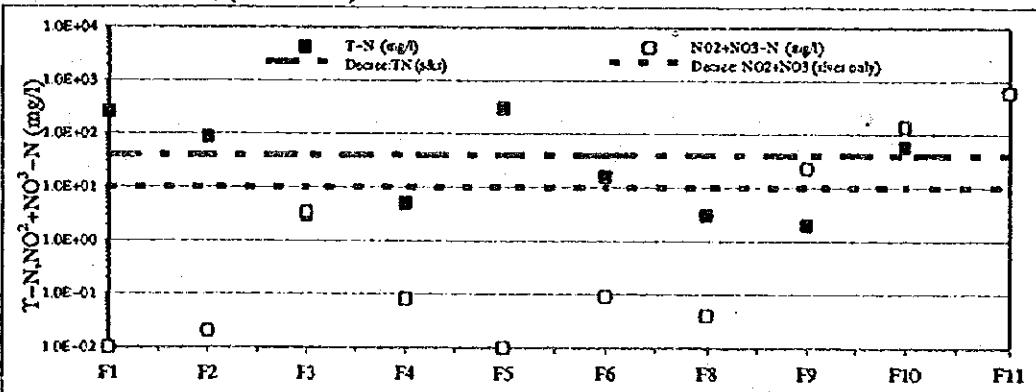
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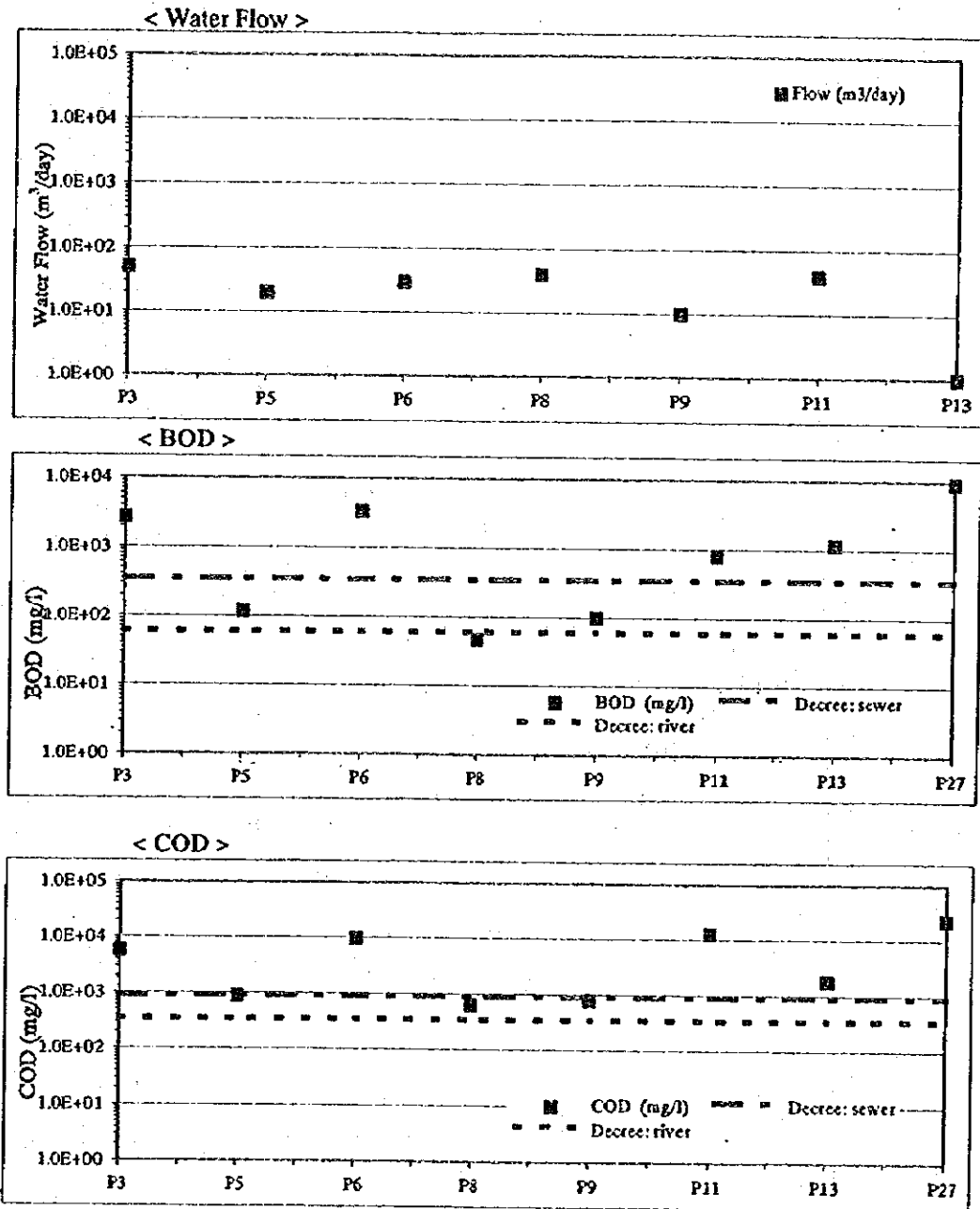


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Fig. 2.2-10 Contaminación de las Fábricas de  
(2/2) Productos Alimenticios

### Water Quality in Piggery Wastewater

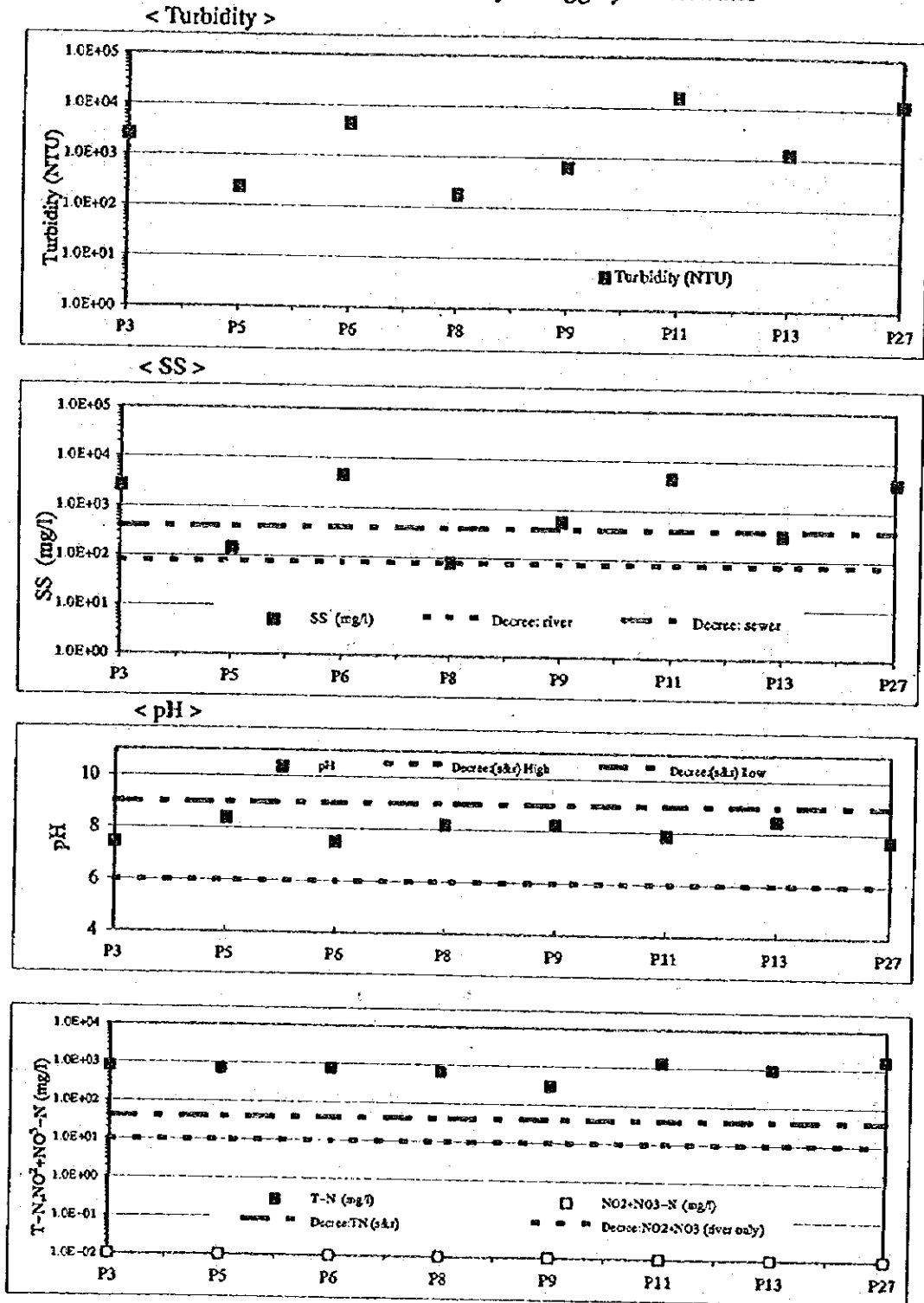


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Fig. 2.2-11 Contaminación de las Granjas  
(1/2) Porcinas

### Water Quality in Piggery Wastewater



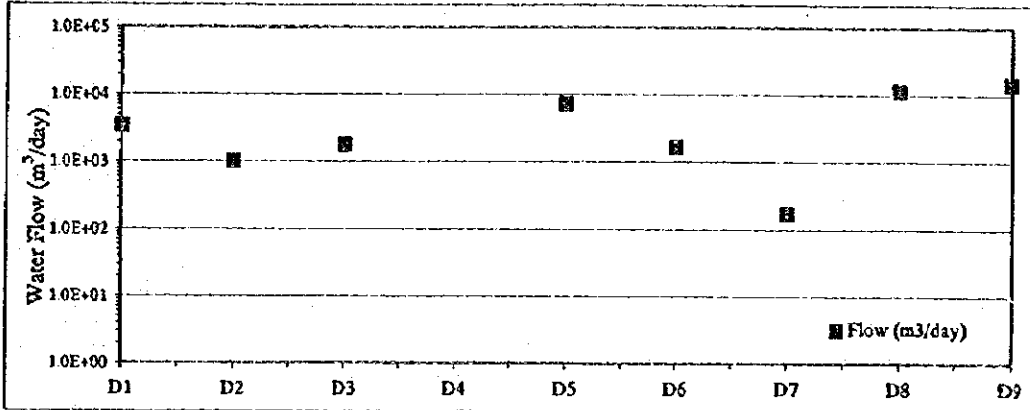
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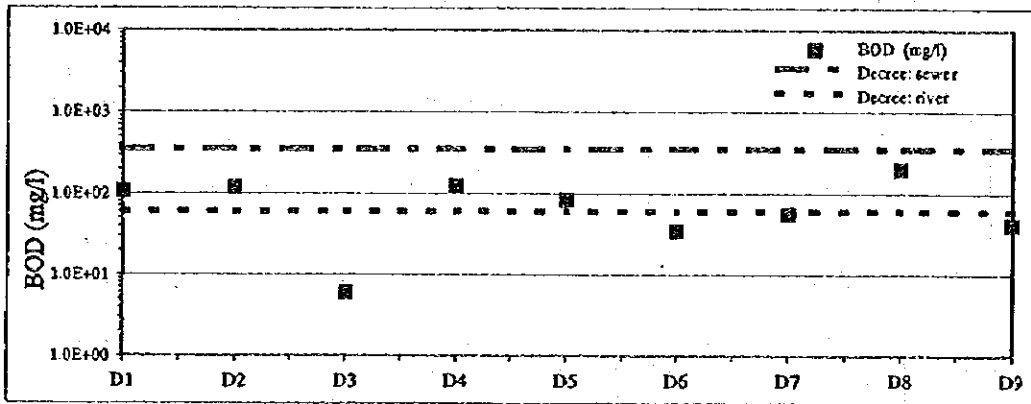
Fig. 2.2-11 Contaminación de las Granjas  
(2/2) Porcinas

### Water Quality in Domestic Wastewater

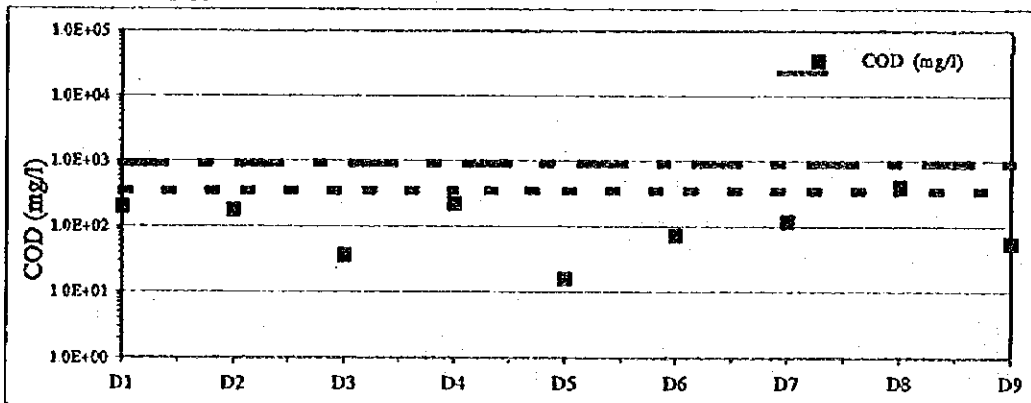
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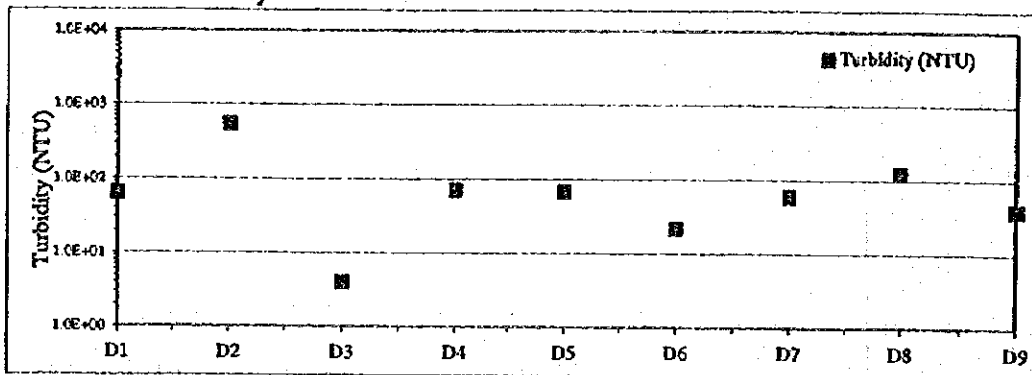
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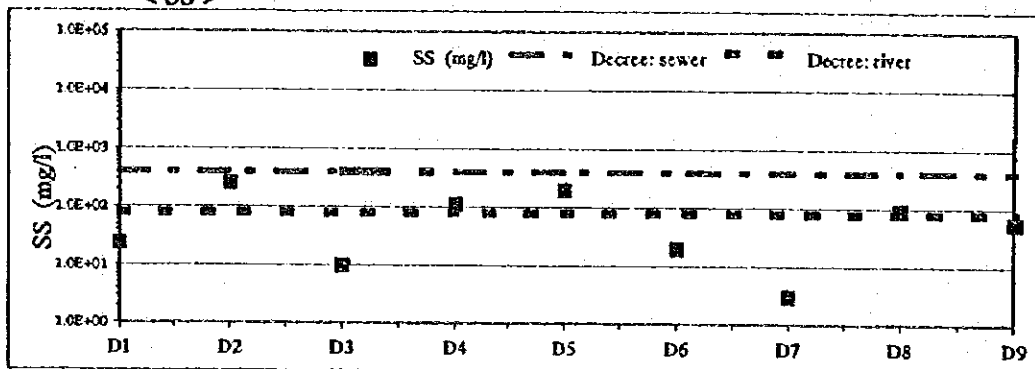
Fig. 2.2-12 · Contaminación de las Aguas  
(1/2) Residuales Domésticas

### Water Quality in Food Factory Wastewater

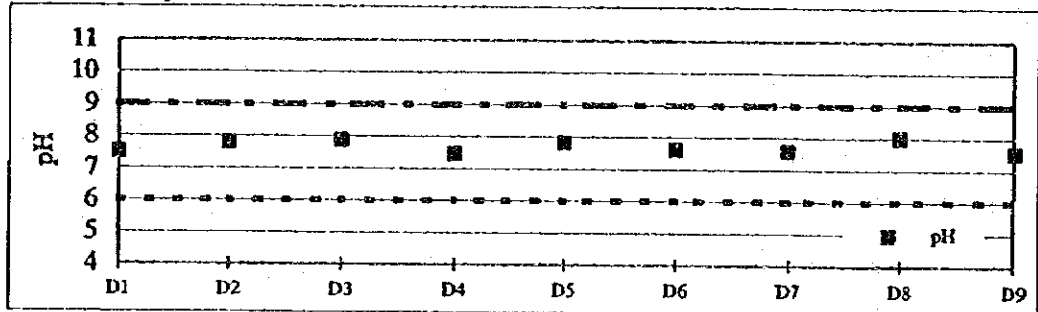
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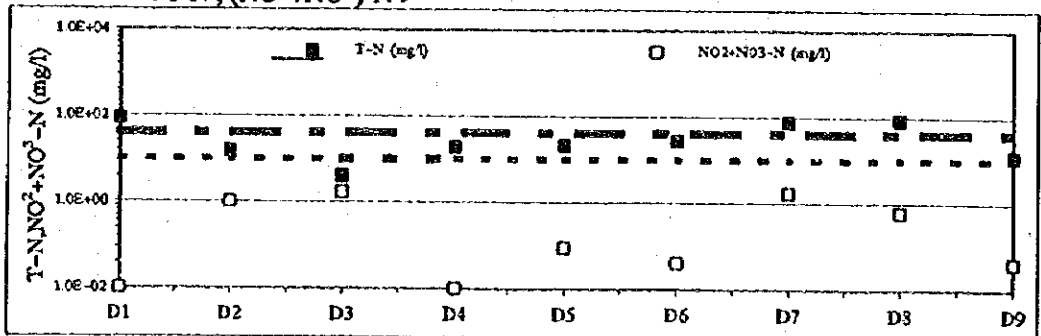
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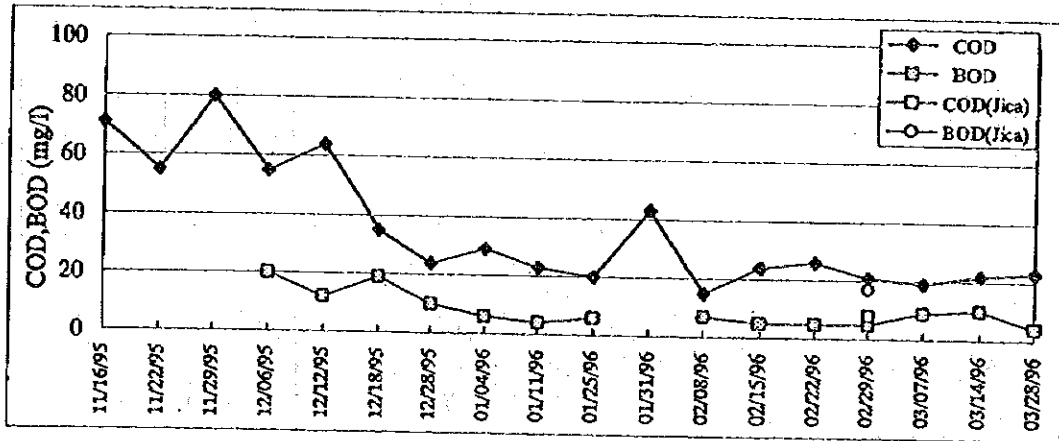
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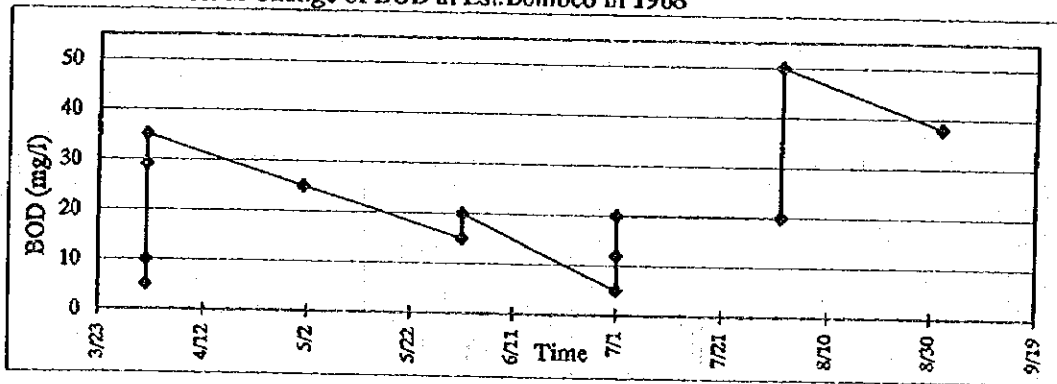
Fig. 2.2-12 Contaminación de las Aguas  
(2/2) Residuales Domésticas



Water Quality in Tuy River (Puente Ocumare) from GTZ Data



Seasonal Change of BOD at Est. Bombeo in 1968

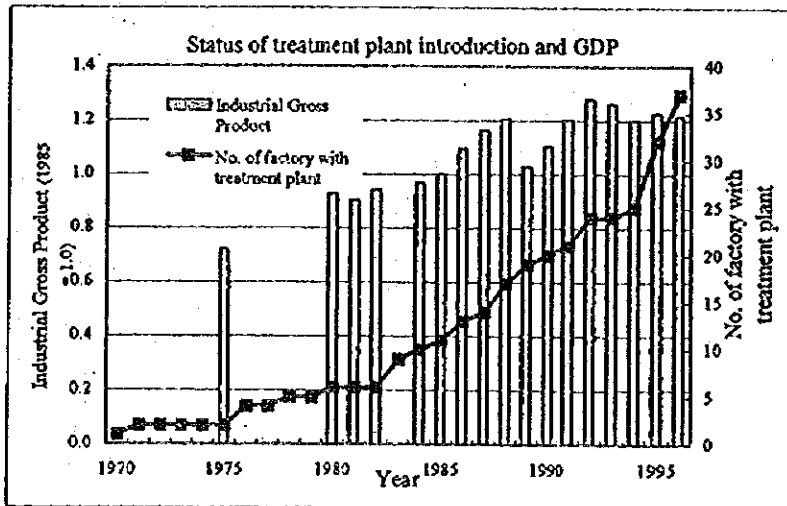
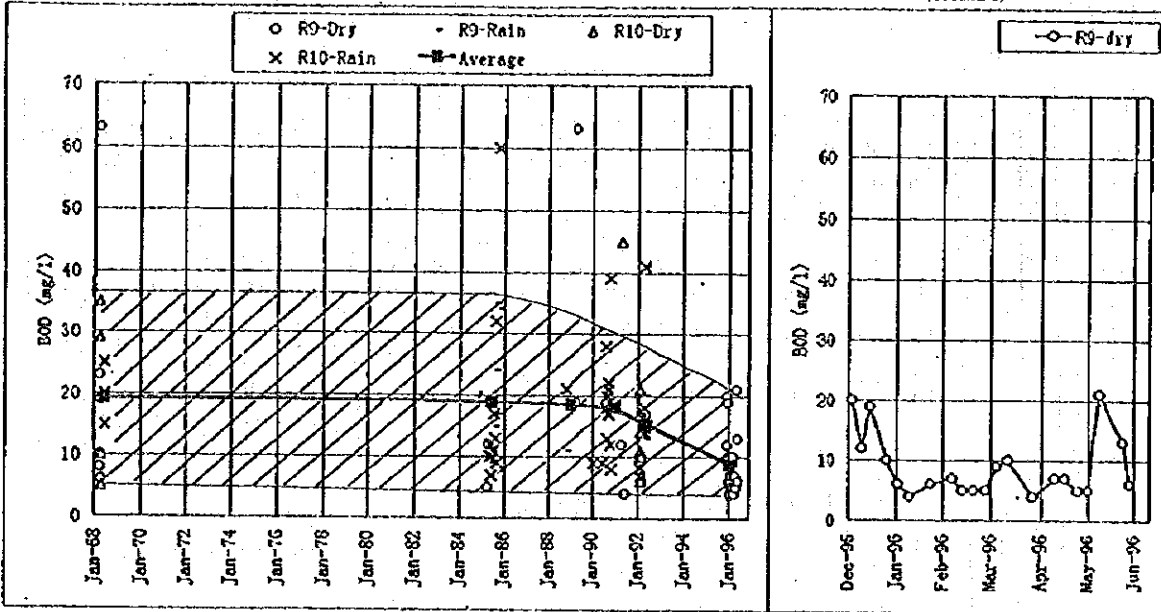


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Fig. 2.2-13 Características del Agua en Observaciones Previas

(Ocuare, Toma-de-Agua)

(Ocuare)

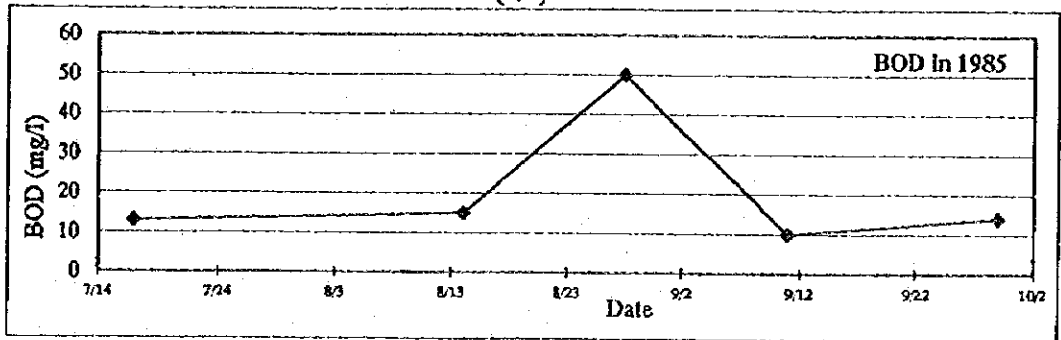


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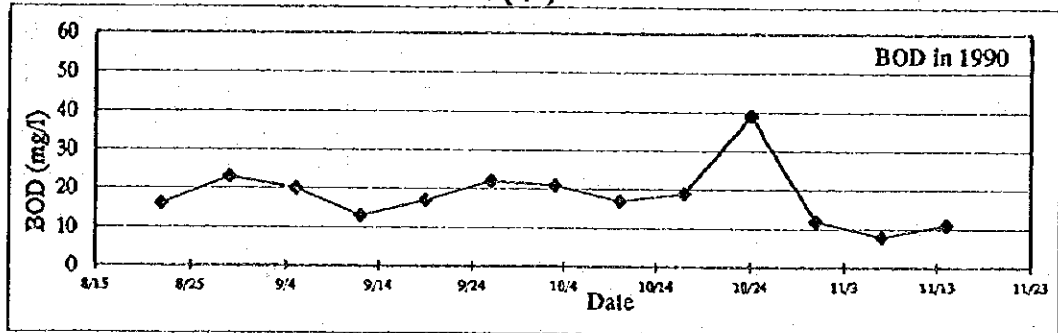
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Fig. 2.2-14 Cambios Históricos y Estacionales  
(1/2) de BOD en el Río Tuy

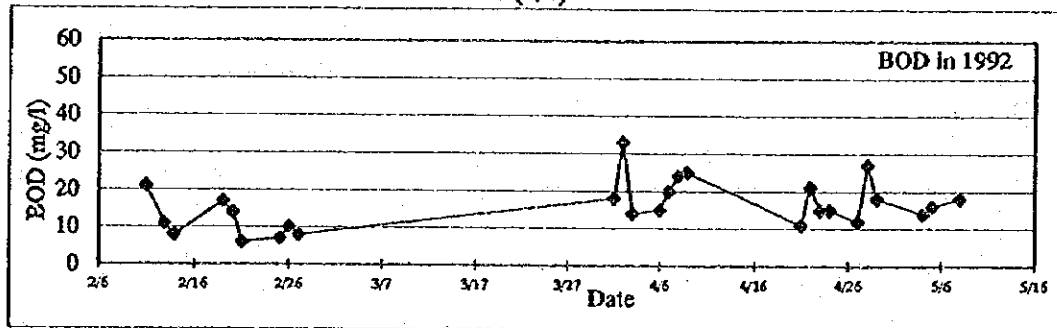
BOD at San Antonio (1/4)



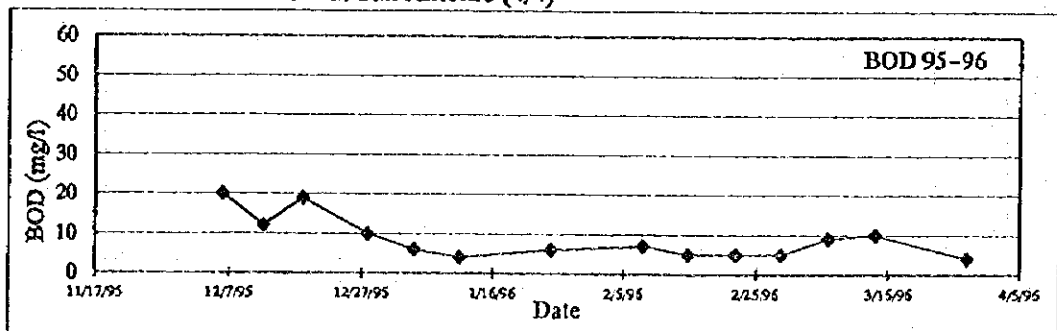
BOD at San Antonio (2/4)



BOD at San Antonio (3/4)



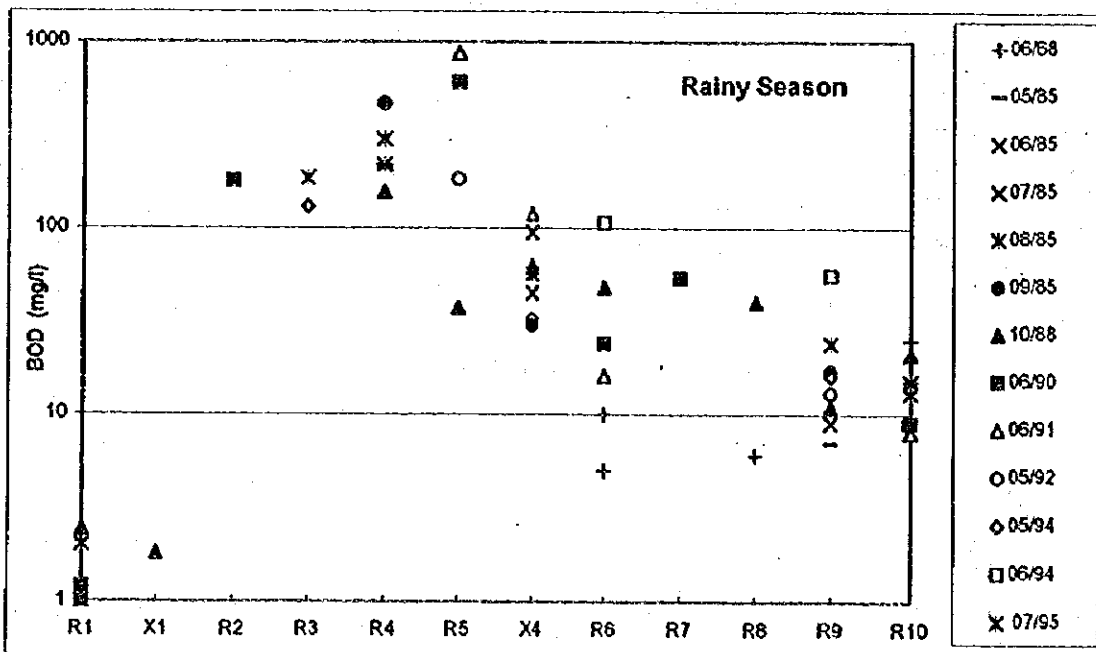
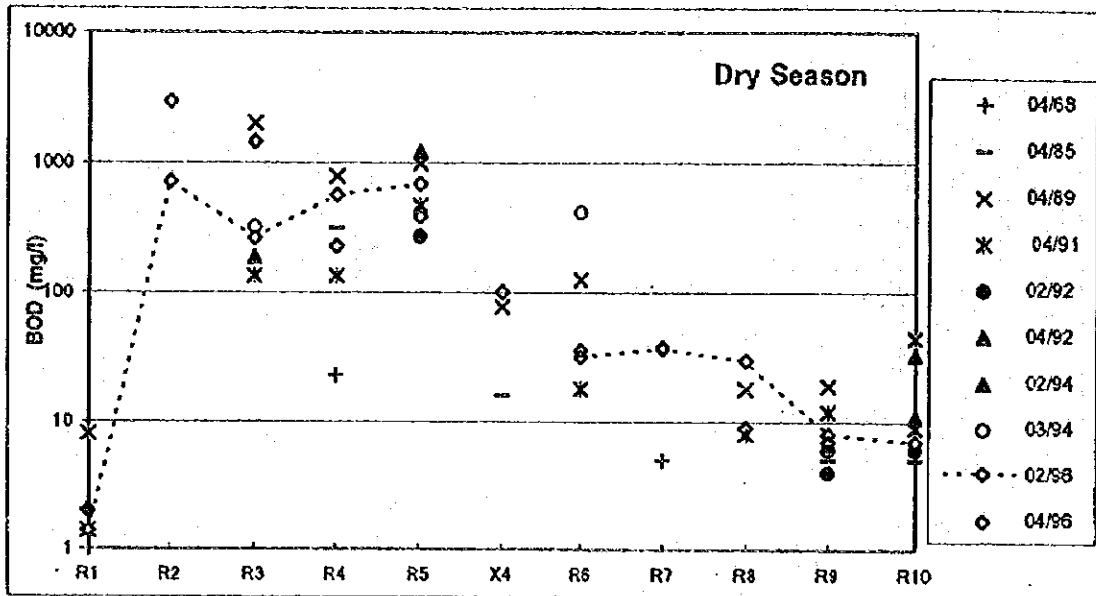
BOD at San Antonio (4/4)



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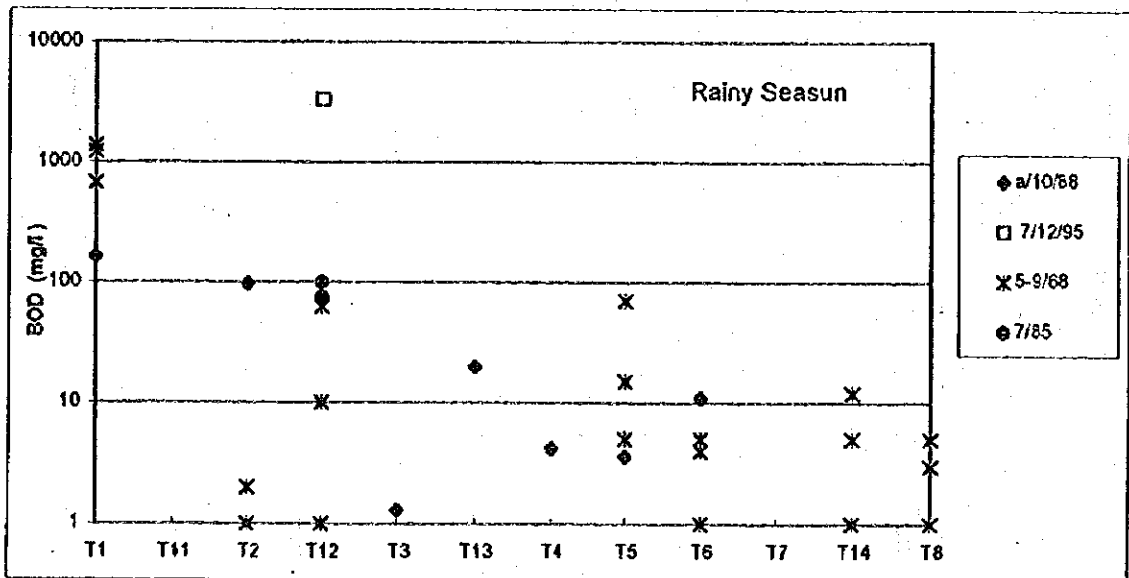
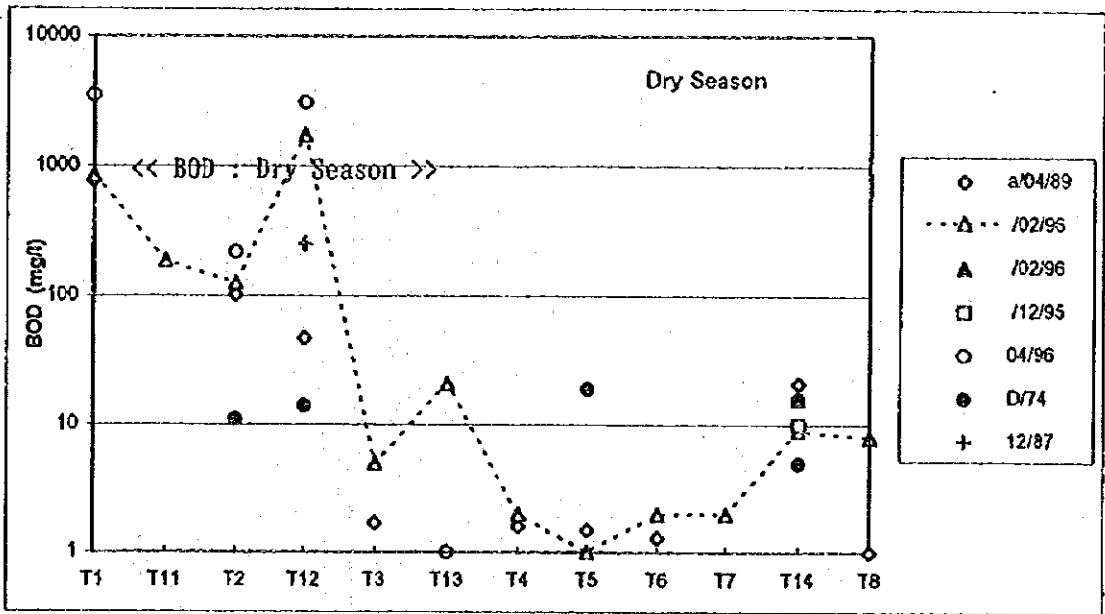
Fig. 2.2-14 Cambios Históricos y Estacionales  
(2/2) de BOD en el Río Tuy



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Fig. 2.2-15 Cambios Estacionales del BOD en  
(1/2) el Río Tuy y sus Tributarios



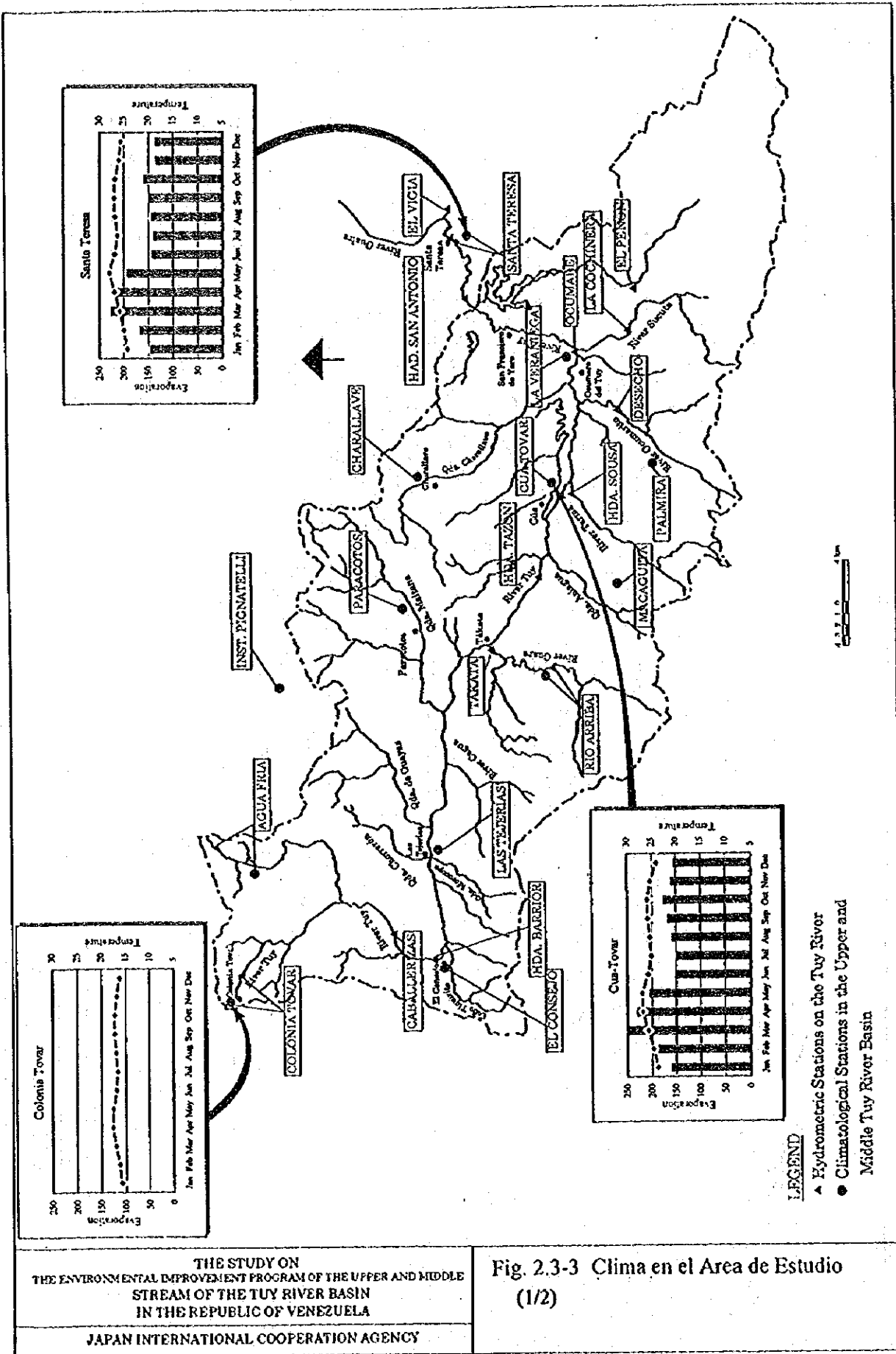
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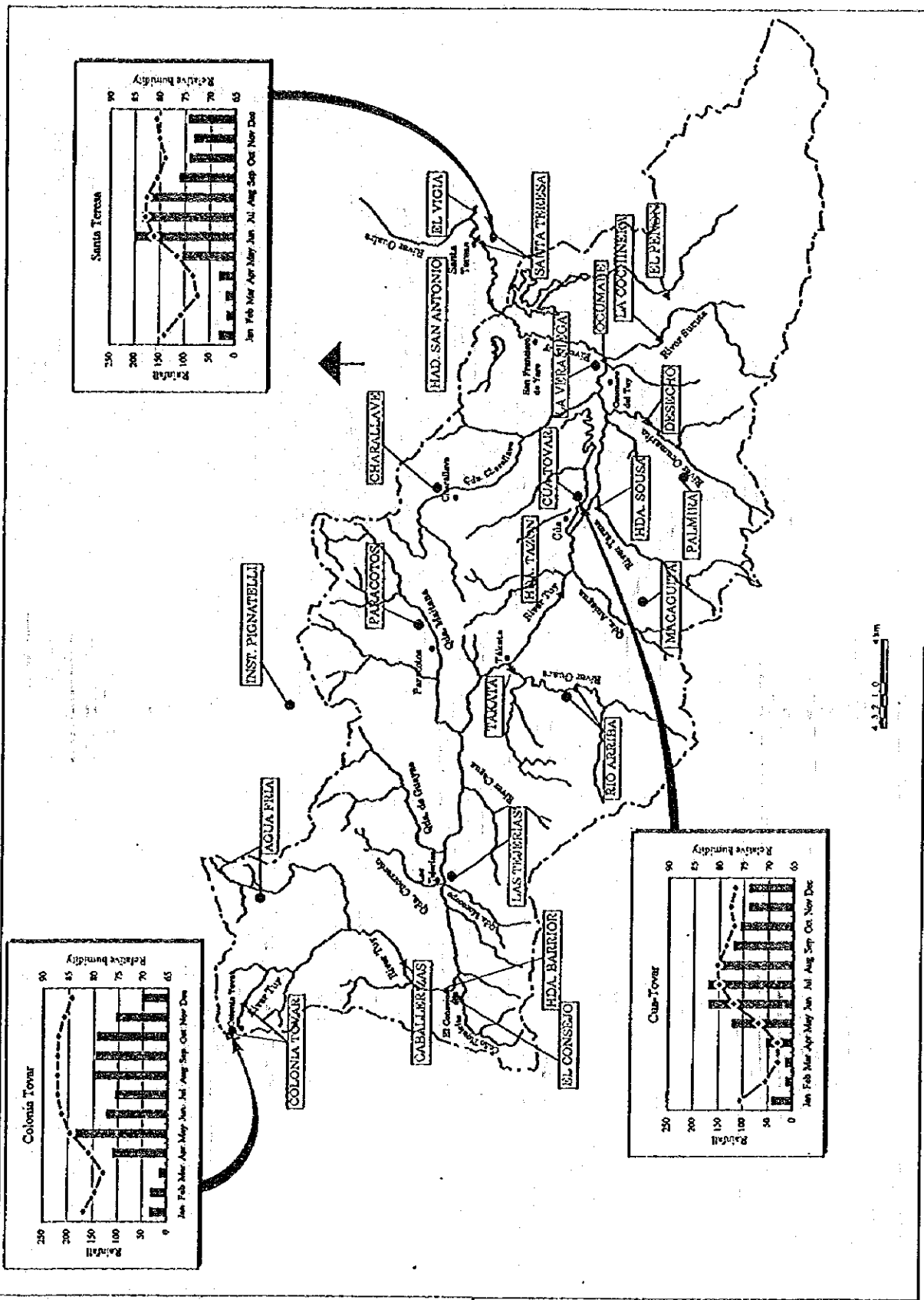
Fig. 2.2-15 Cambios Estacionales del BOD en  
(2/2) el Río Tuy y sus Tributarios







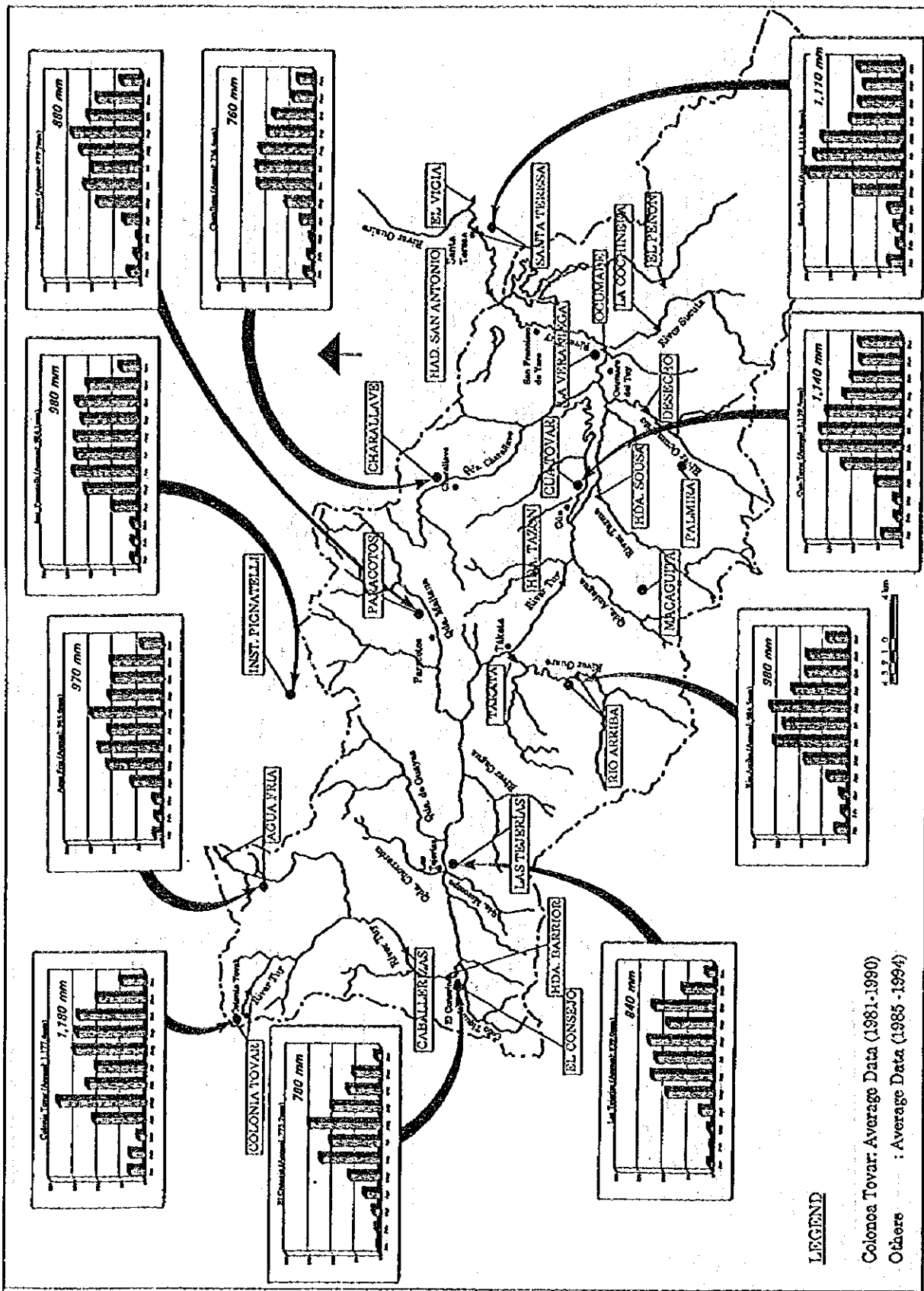




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Fig. 2.3-3 Clima en el Area de Estudio  
 (2/2)



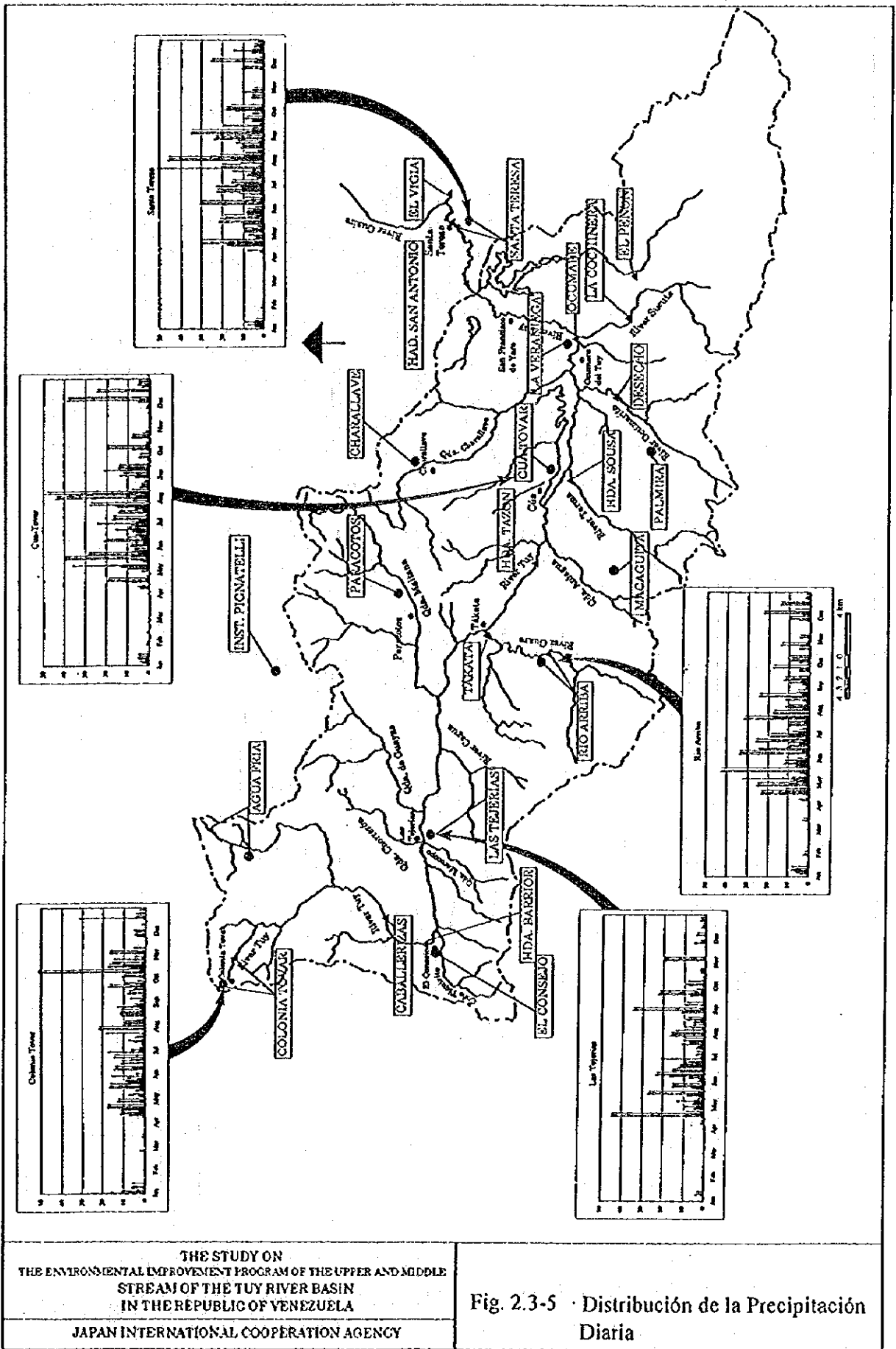
**LEGEND**

Colonia Tovar: Average Data (1981-1990)  
 Others : Average Data (1985-1994)

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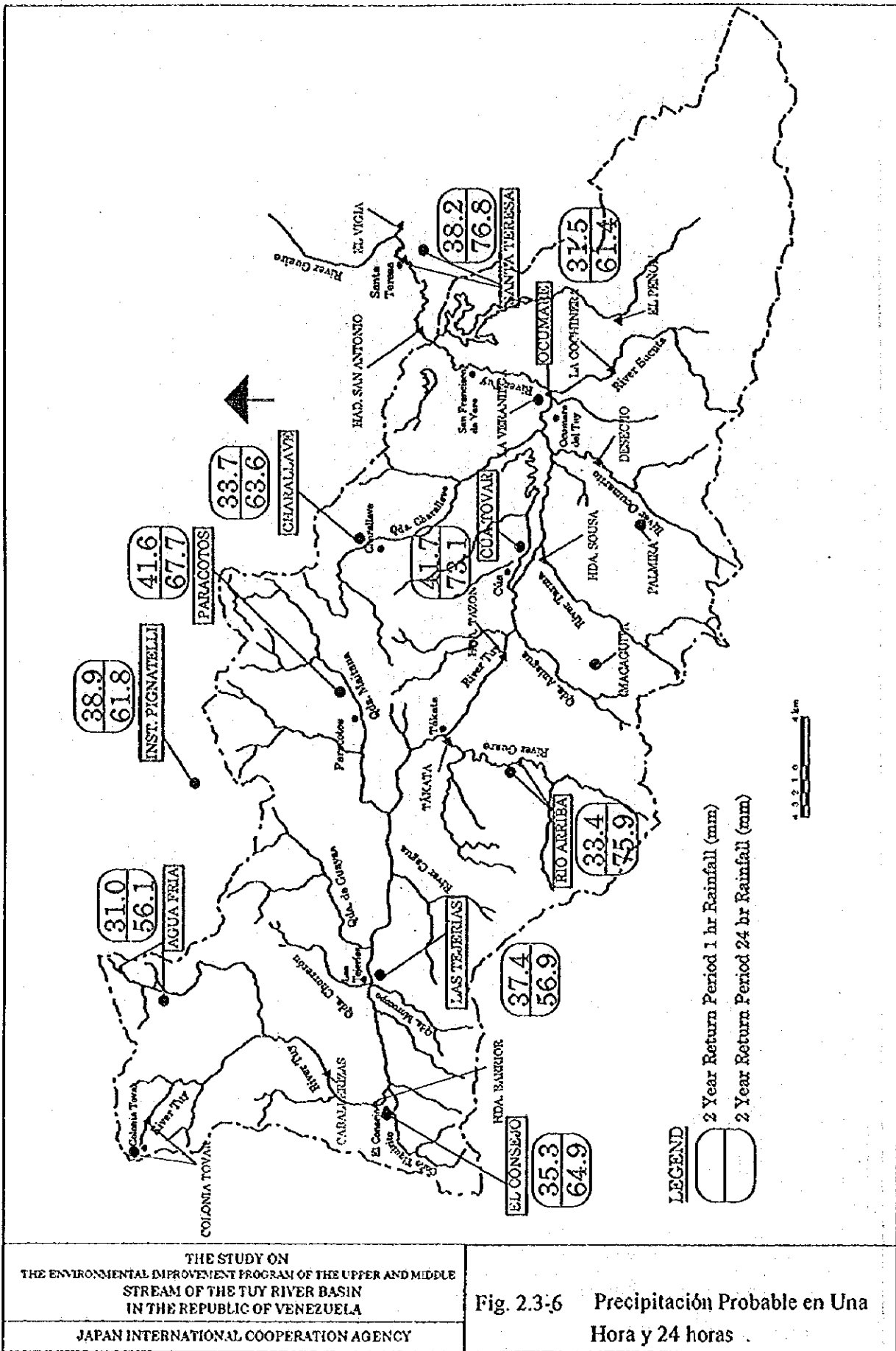
Fig. 2.3-4 Precipitación Mensual Promedio

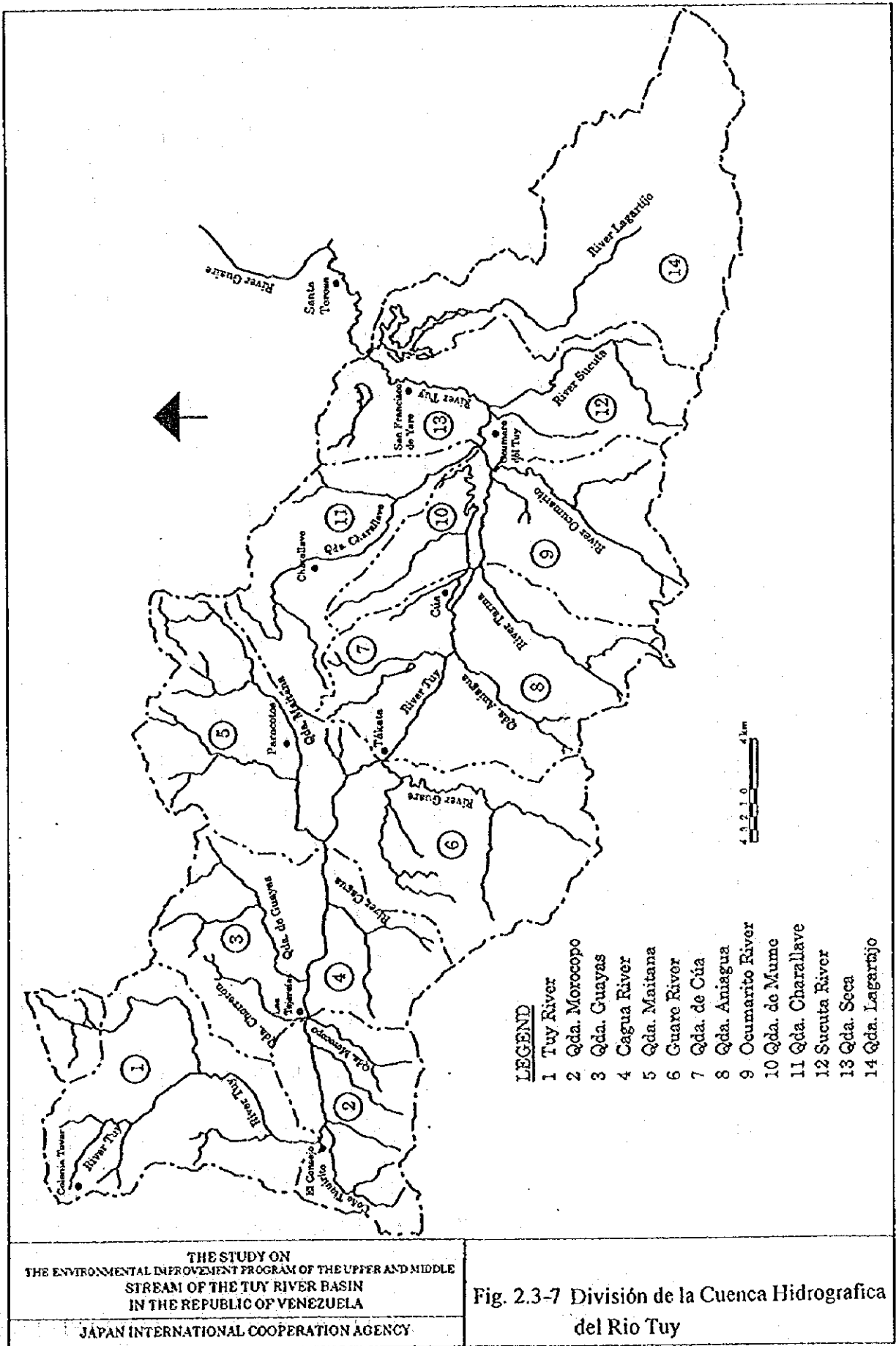


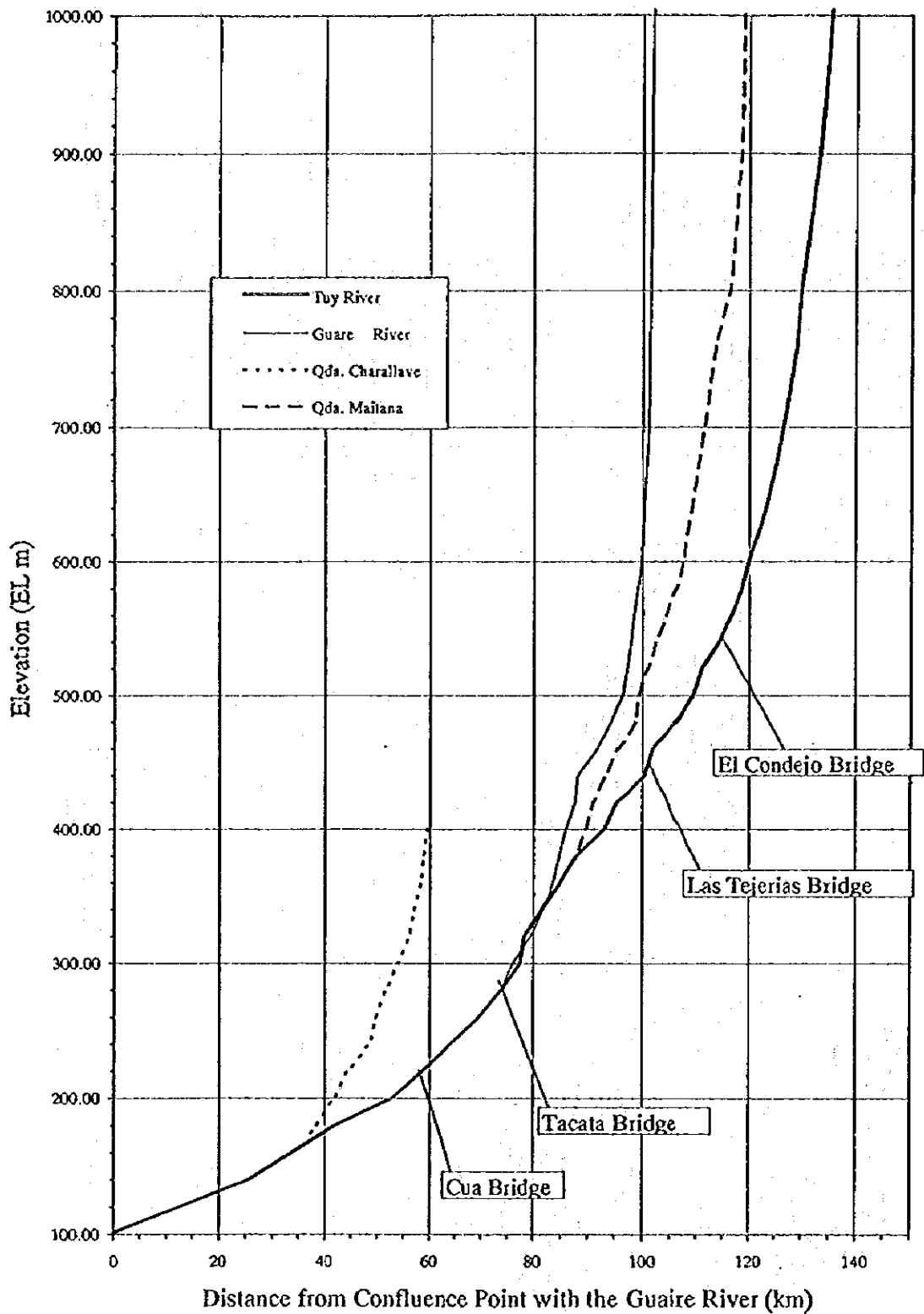
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Fig. 2.3-5 · Distribución de la Precipitación Diaria



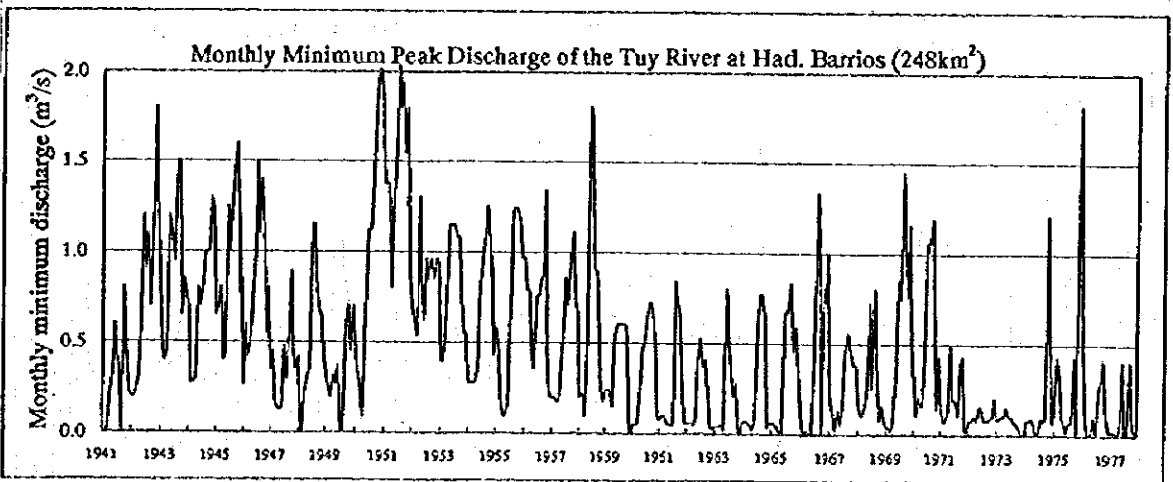
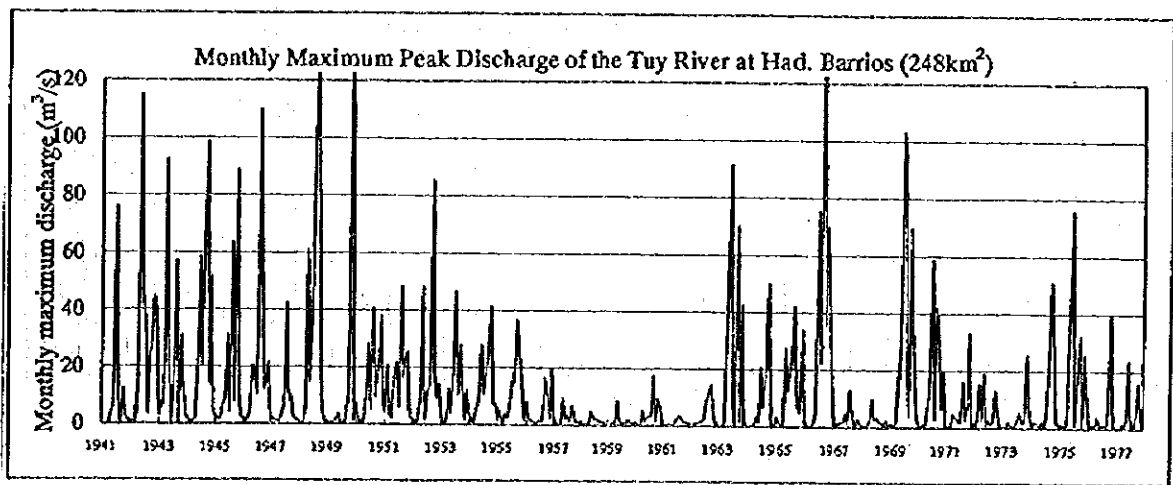
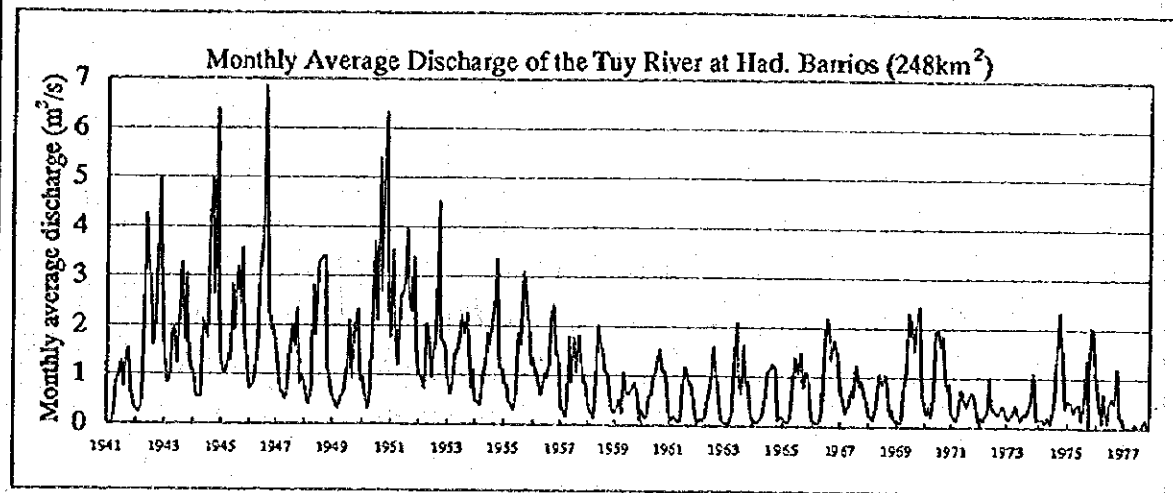




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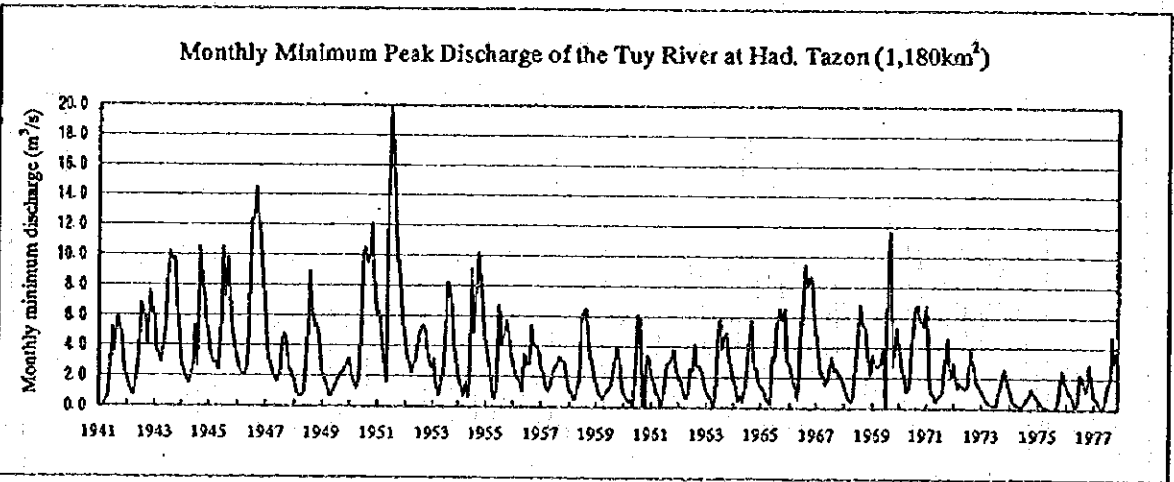
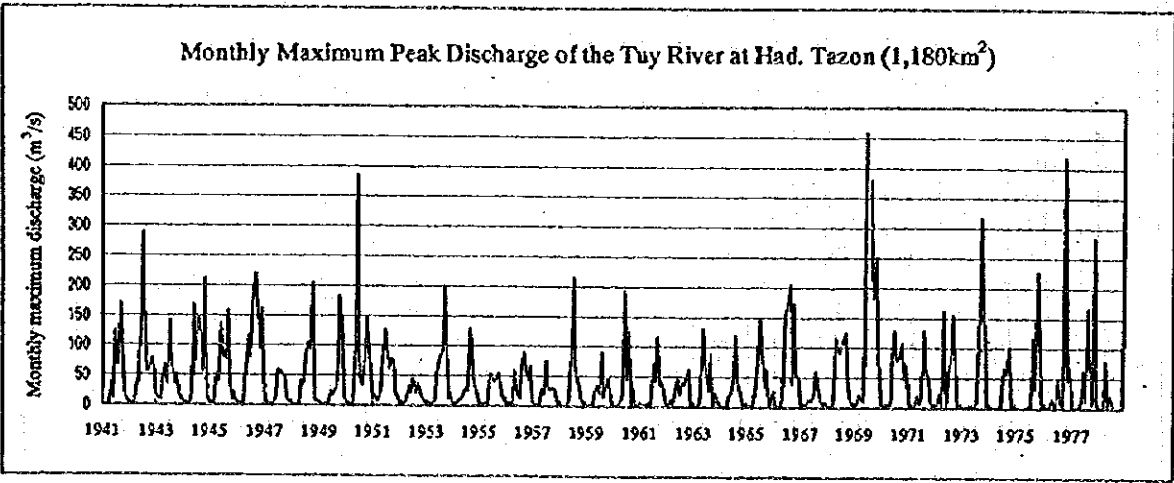
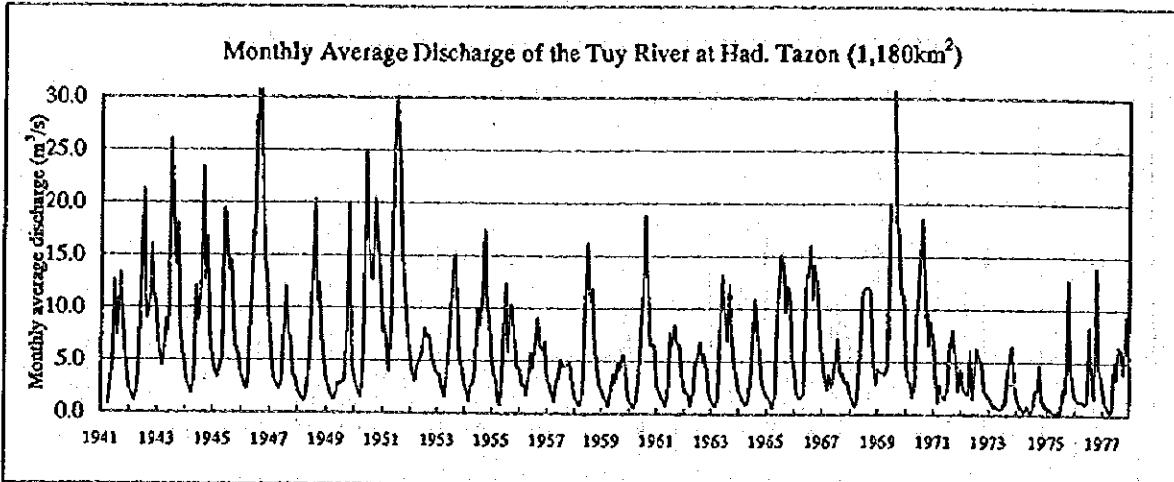
Fig. 2.3-8 Perfil Longitudinal del Rfo Tuy y sus Tributarios



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Fig. 2.3-9 Caudal Mensual del Río Tuy  
 (1/2)

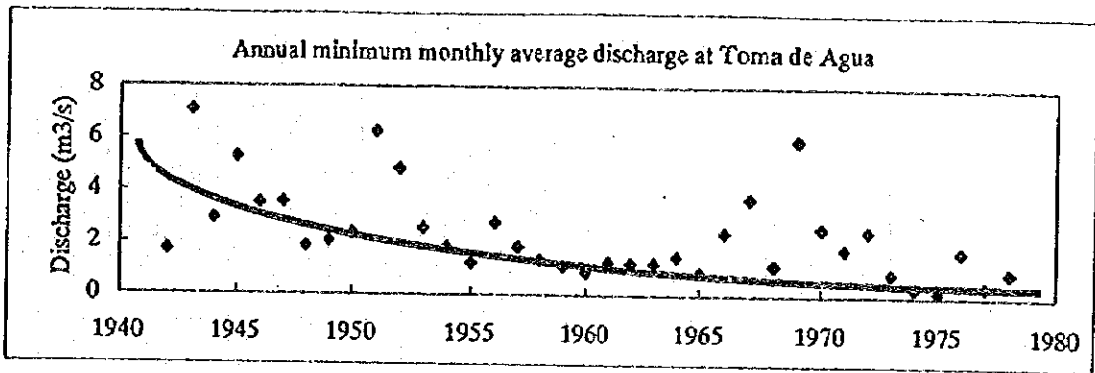


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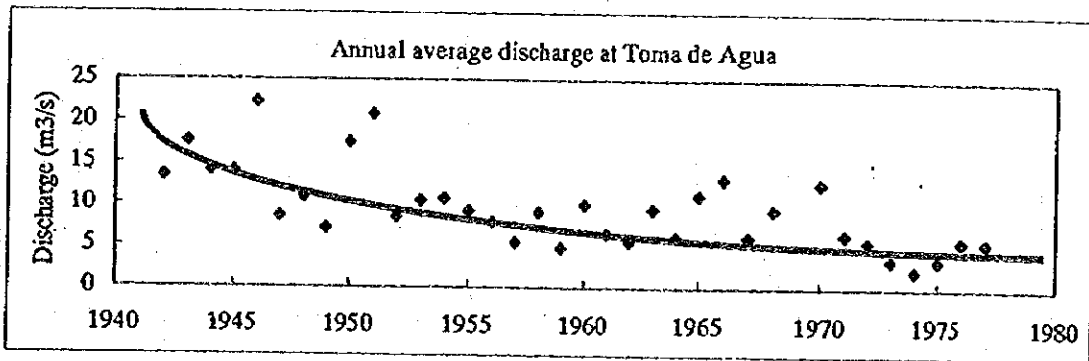
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**Fig. 2.3-9 Caudal Mensual del Río Tuy (2/2)**





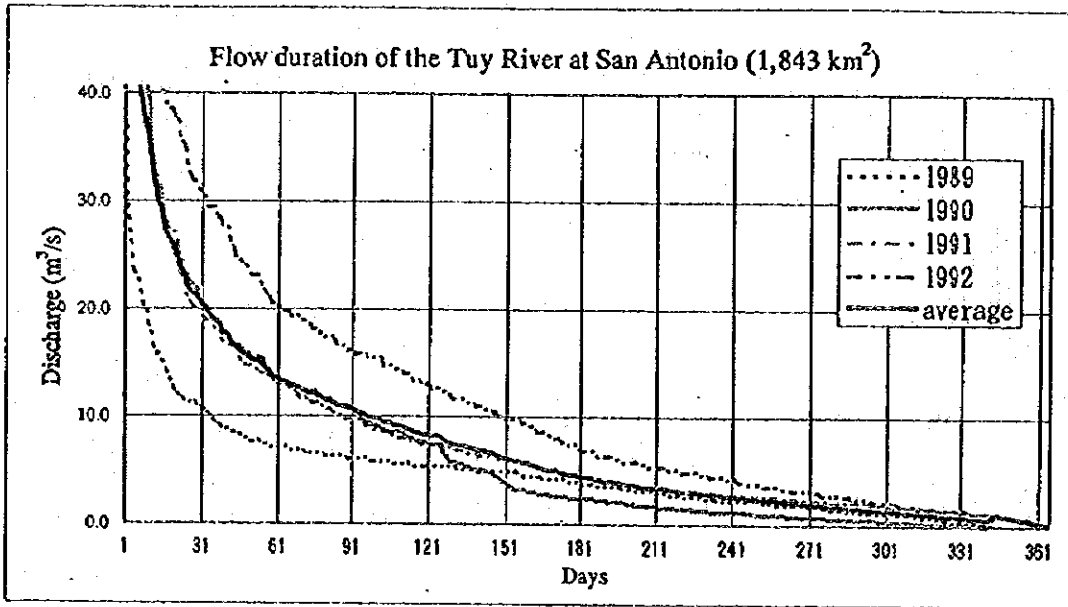
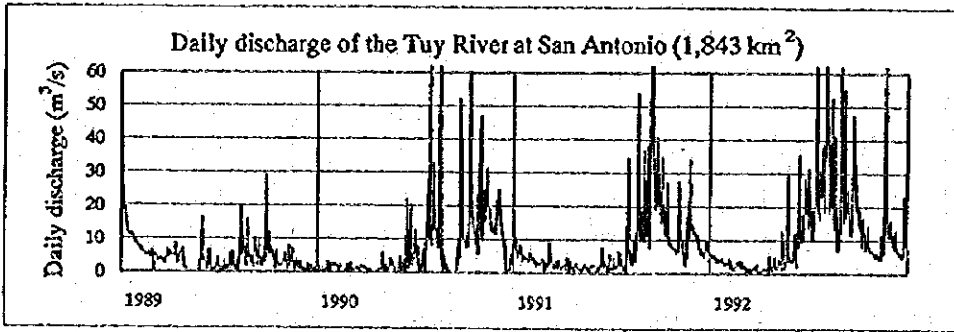
Note: Data is for Toma de Agua (1,856 km<sup>2</sup>) calculated on data at Hda. Tazon (1,180 km<sup>2</sup>)



Note: Data is for Toma de Agua (1,856 km<sup>2</sup>) calculated on data at Hda. Tazon (1,180 km<sup>2</sup>)

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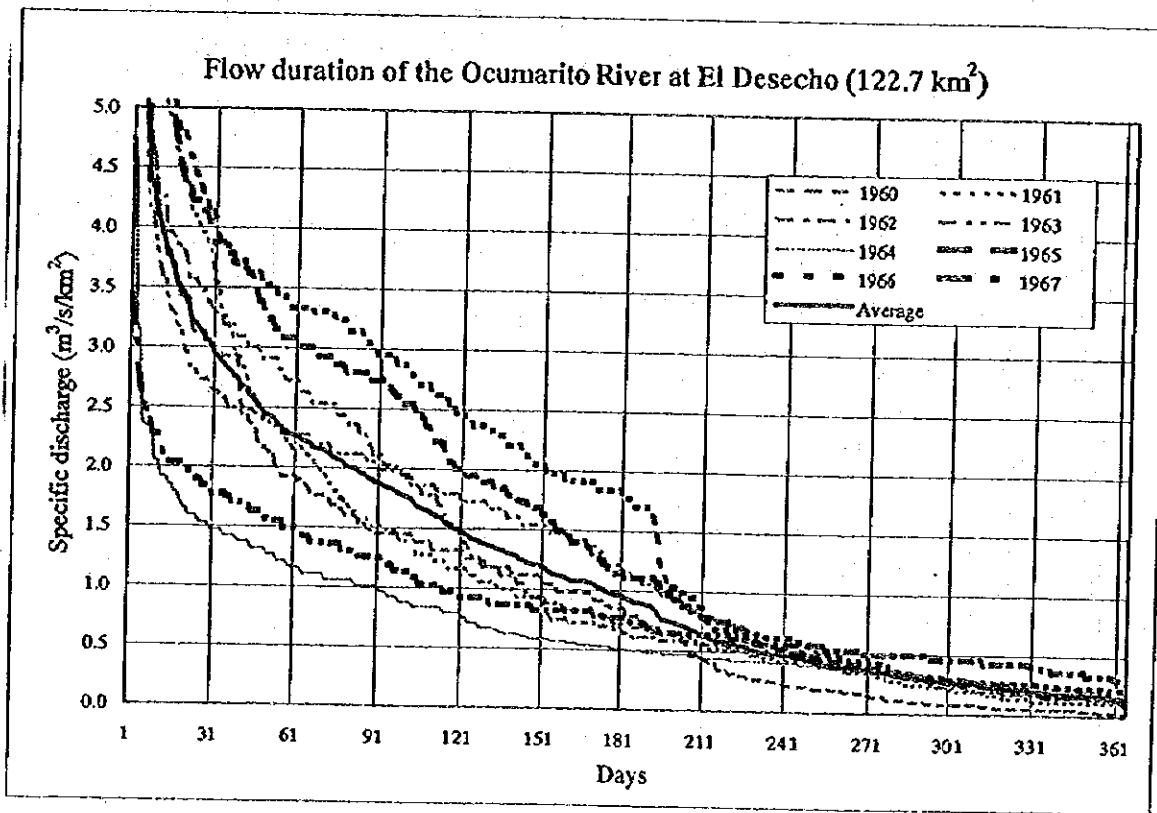
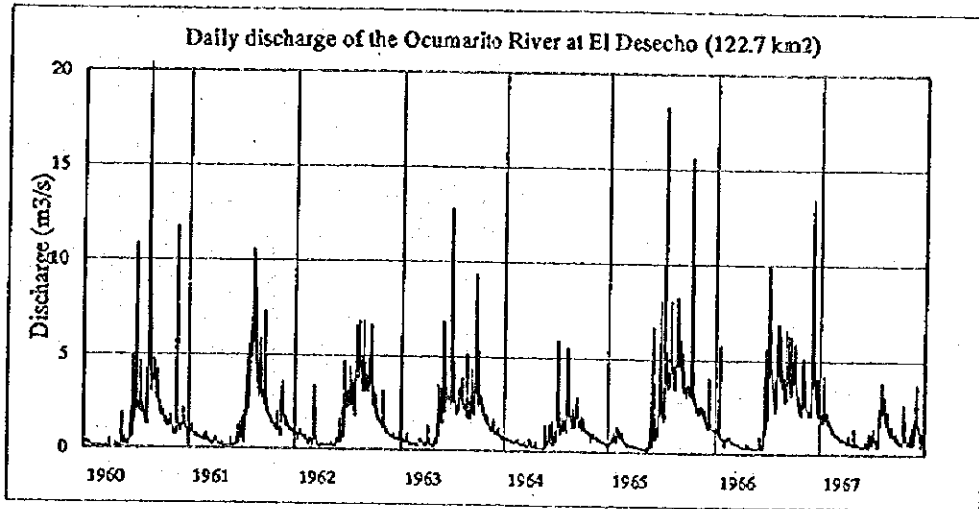
Fig. 2.3-10 Caudal Promedio Anual y Mnimo Mensual Anual del Rio Tuy en Toma de Agua



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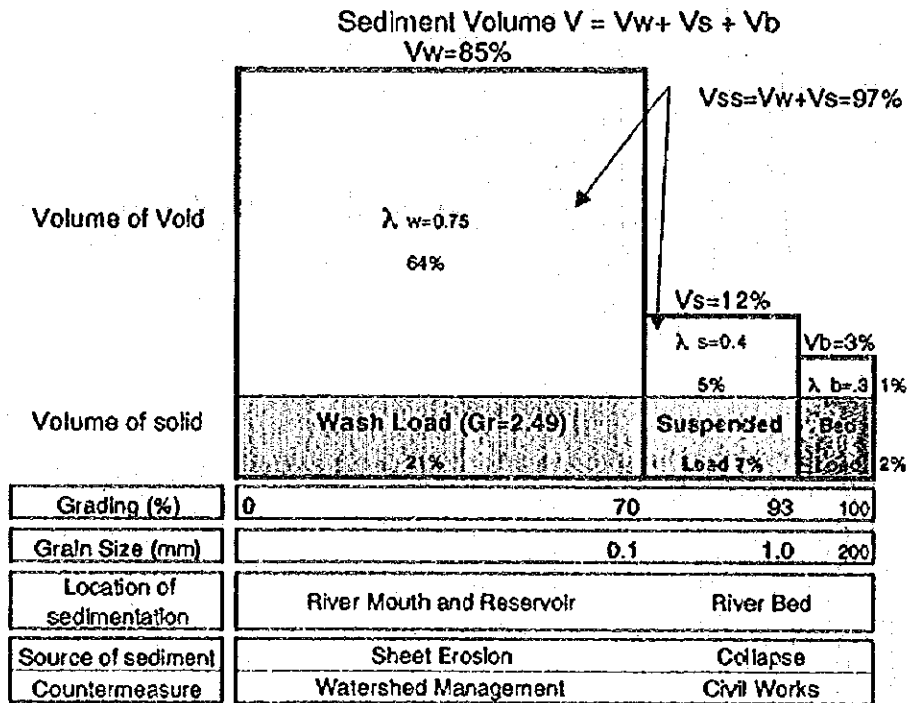
Fig. 2.3-11 Caudal del Río Tuy en  
San Antonio



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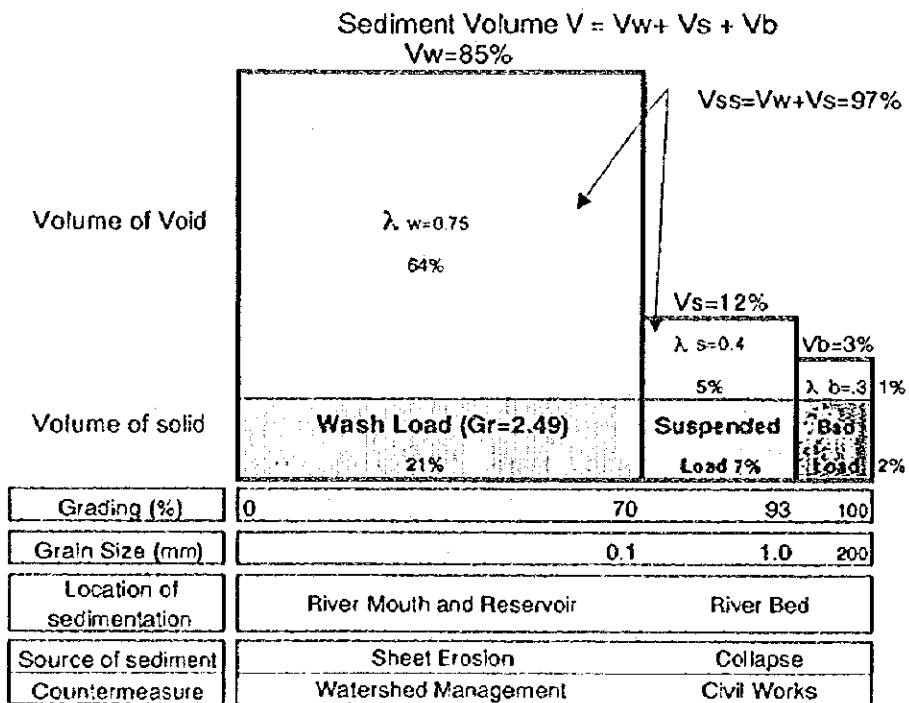
Fig. 2.3-12 Caudal del Río Ocumarito en  
El Desecho



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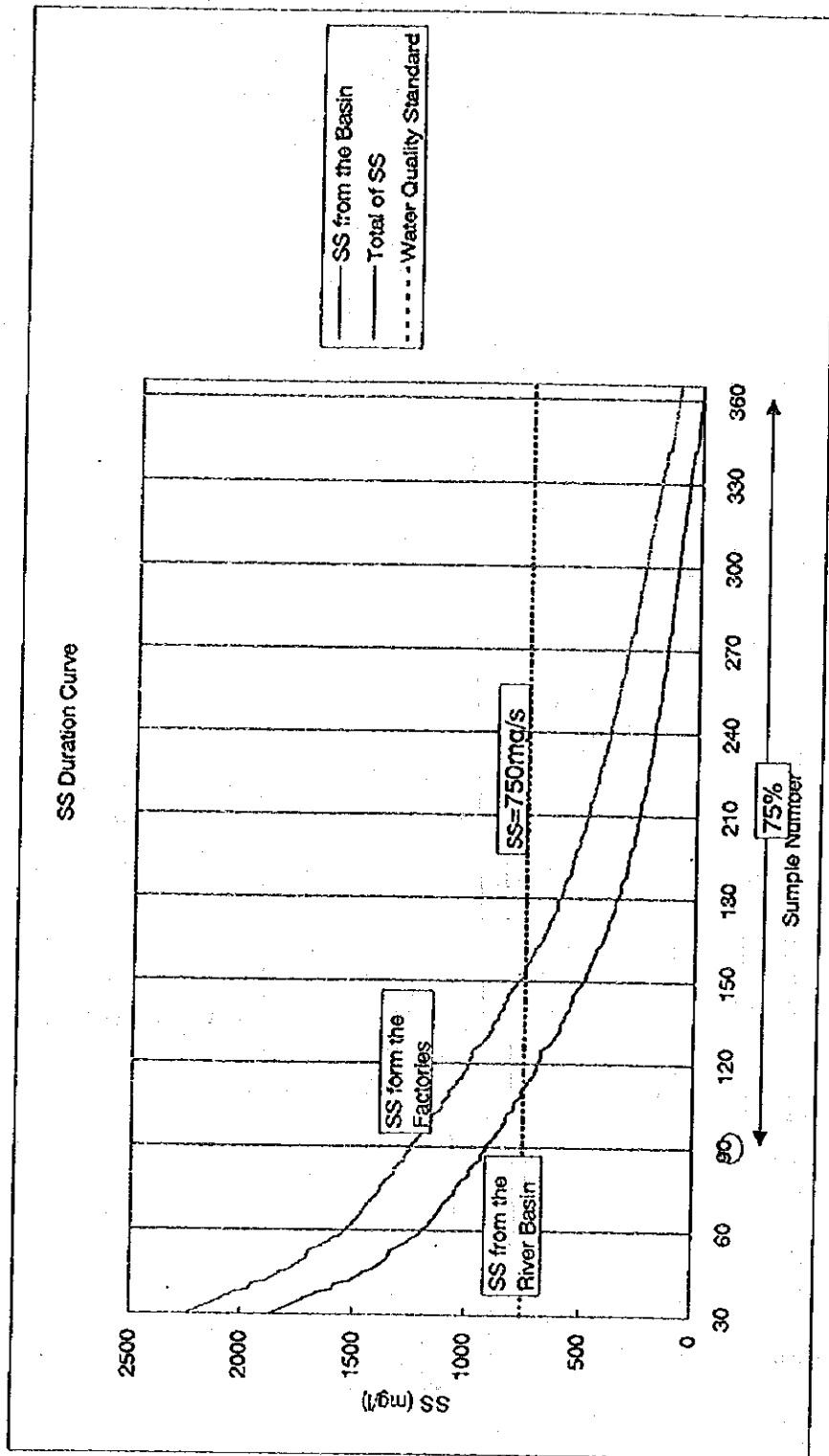
Fig. 2.4-1 Diagrama de Sólidos Suspendidos



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Fig. 2.4-1 Diagrama de Sólidos Suspendedos



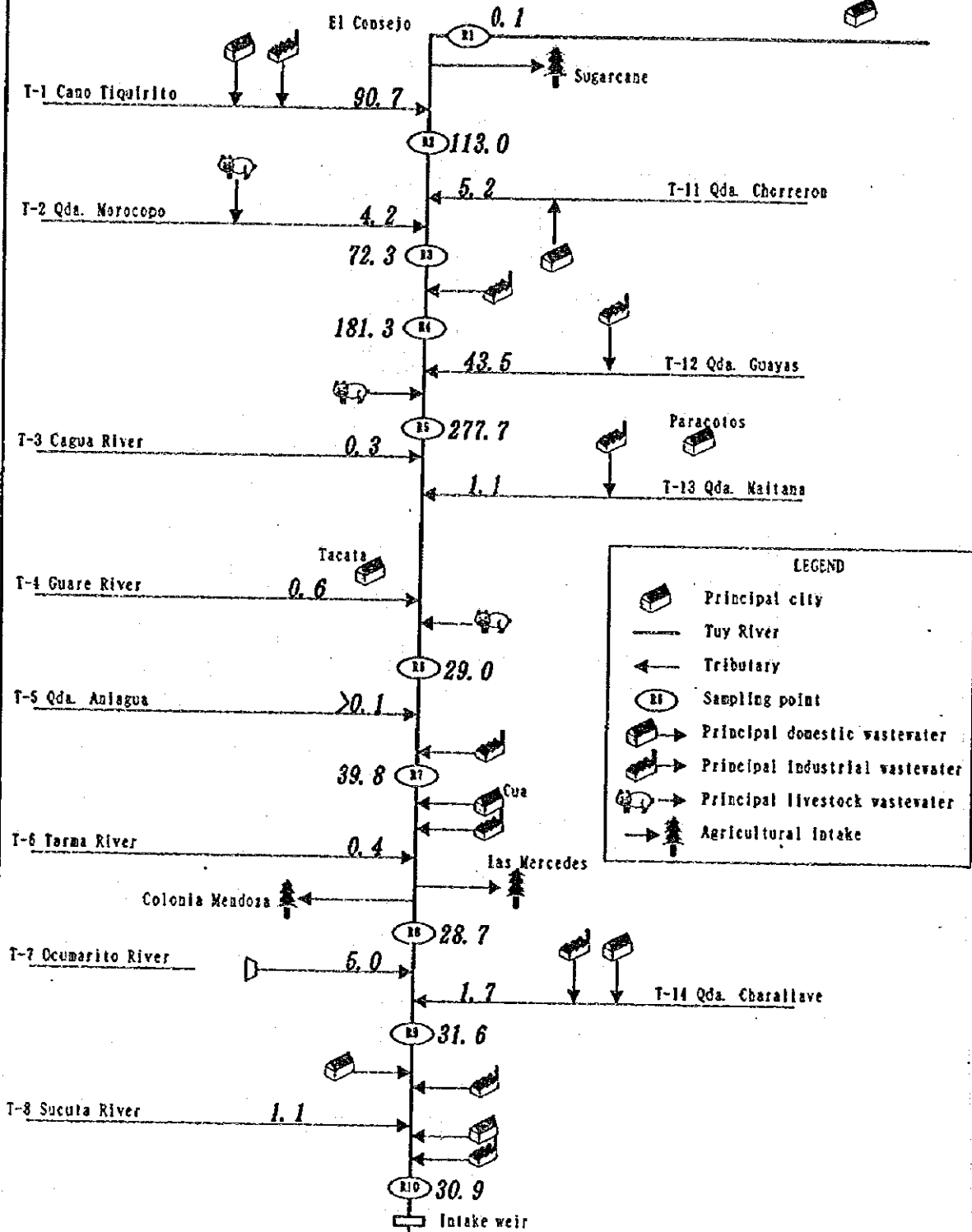
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Fig. 2.4-2 Curva de Duración de Sólidos  
 Suspendedos

**BOD Load (g/s) in February, 1996**

Colonia Tovar

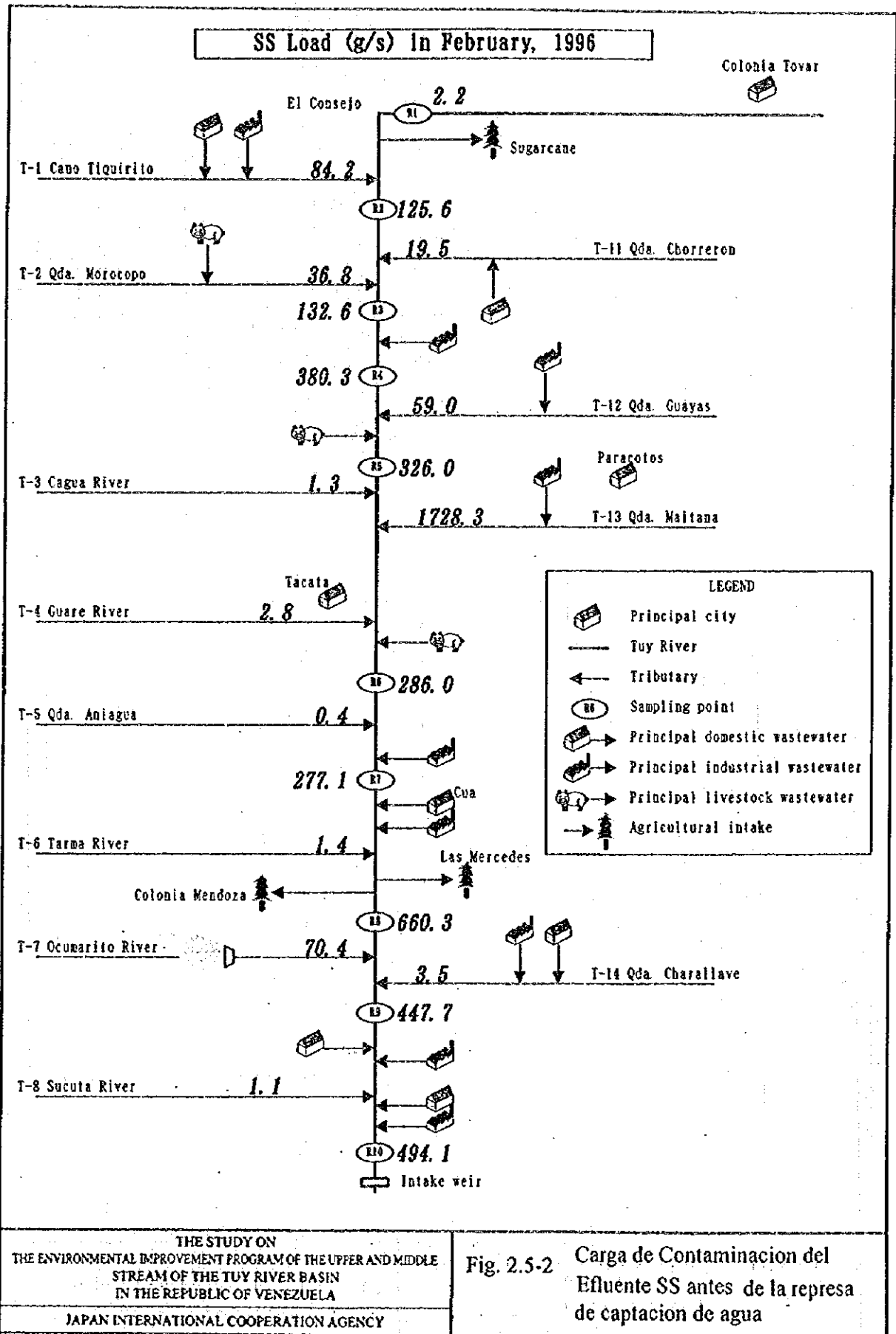


**LEGEND**

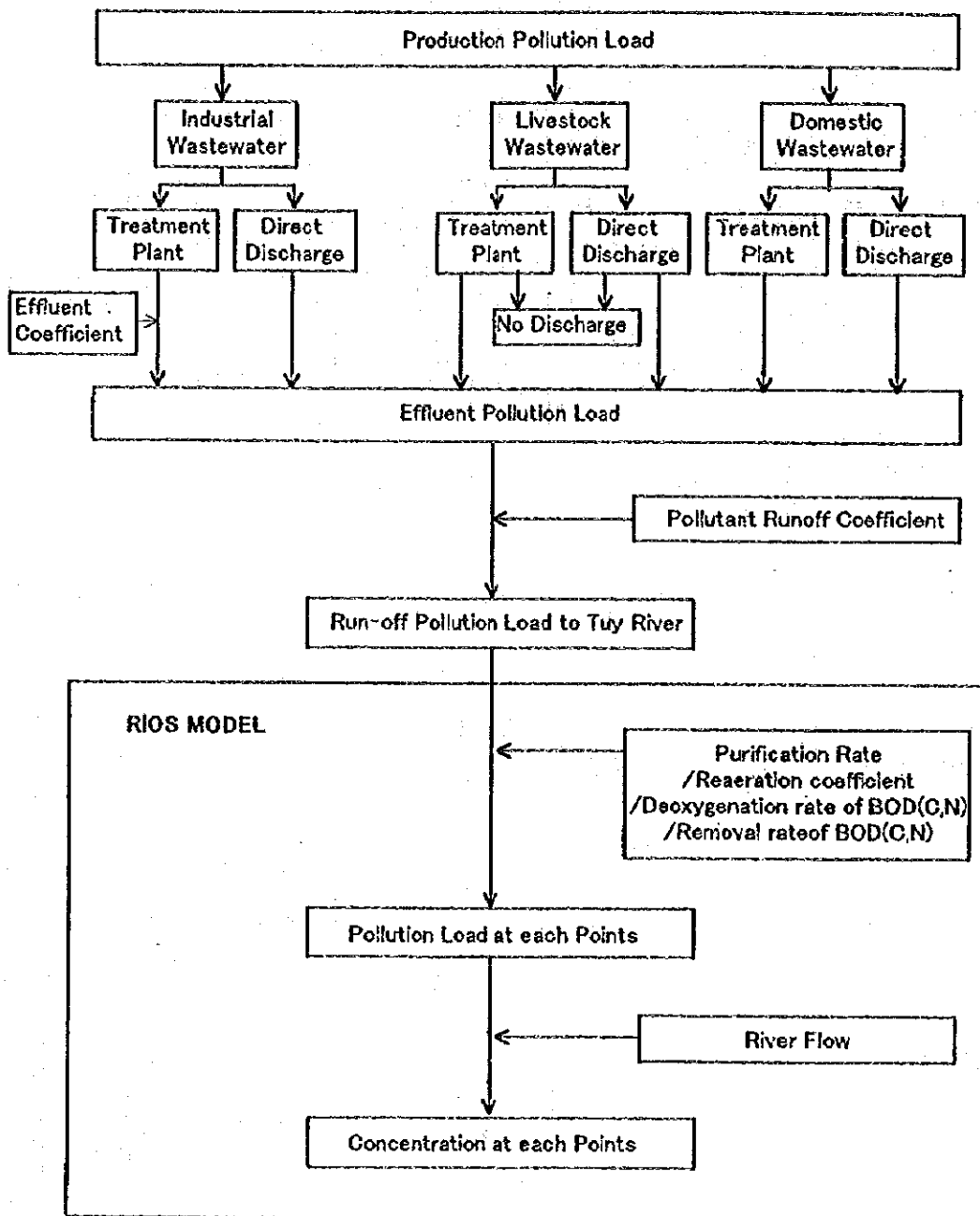
- Principal city
- Tuy River
- Tributary
- Sampling point
- Principal domestic wastewater
- Principal industrial wastewater
- Principal livestock wastewater
- Agricultural intake

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Fig. 2.5-1 Carga de Contaminación del Efluente DBO antes de la represa de captación de agua



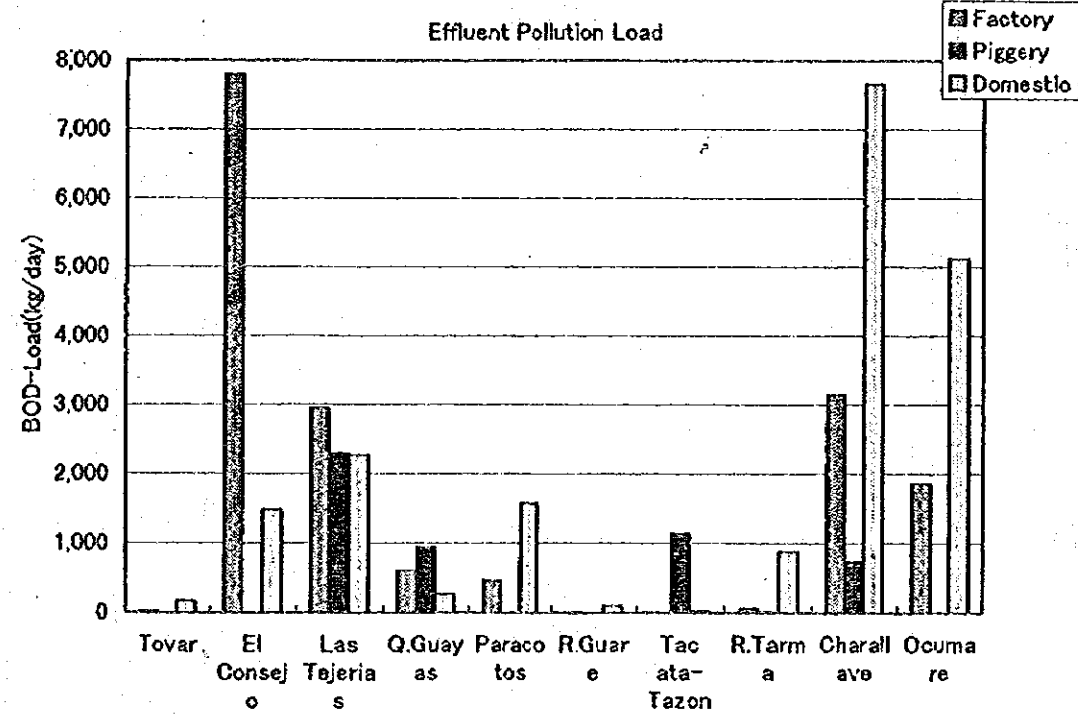
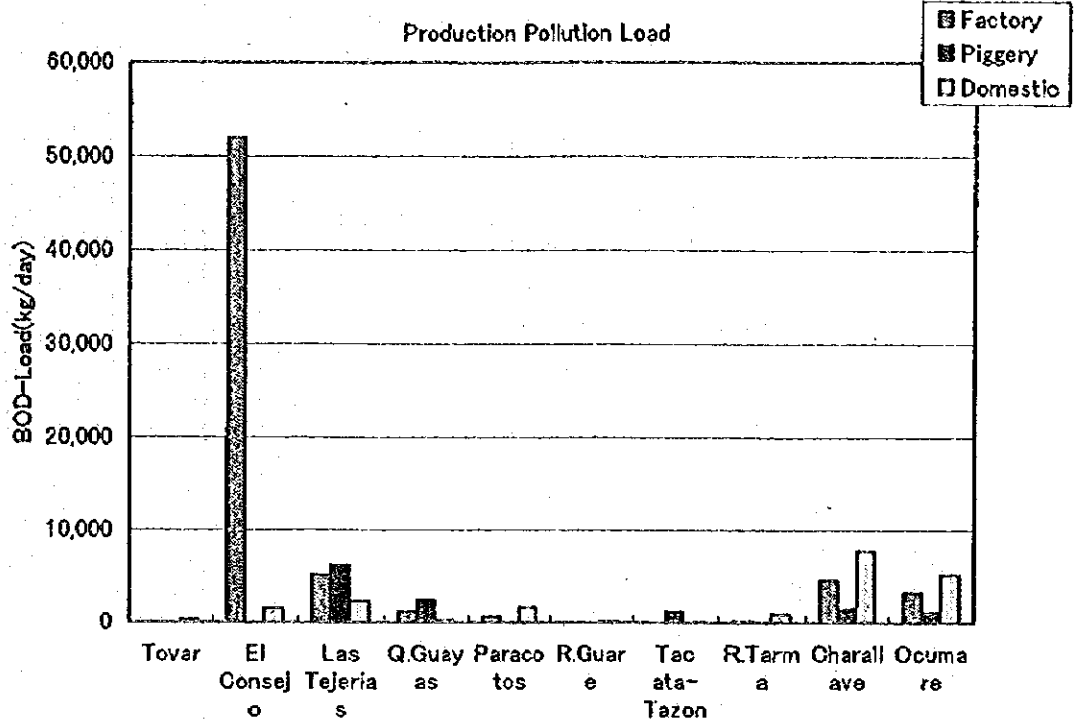




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Fig. 2.5-3 Flujograma del Análisis de Contaminación

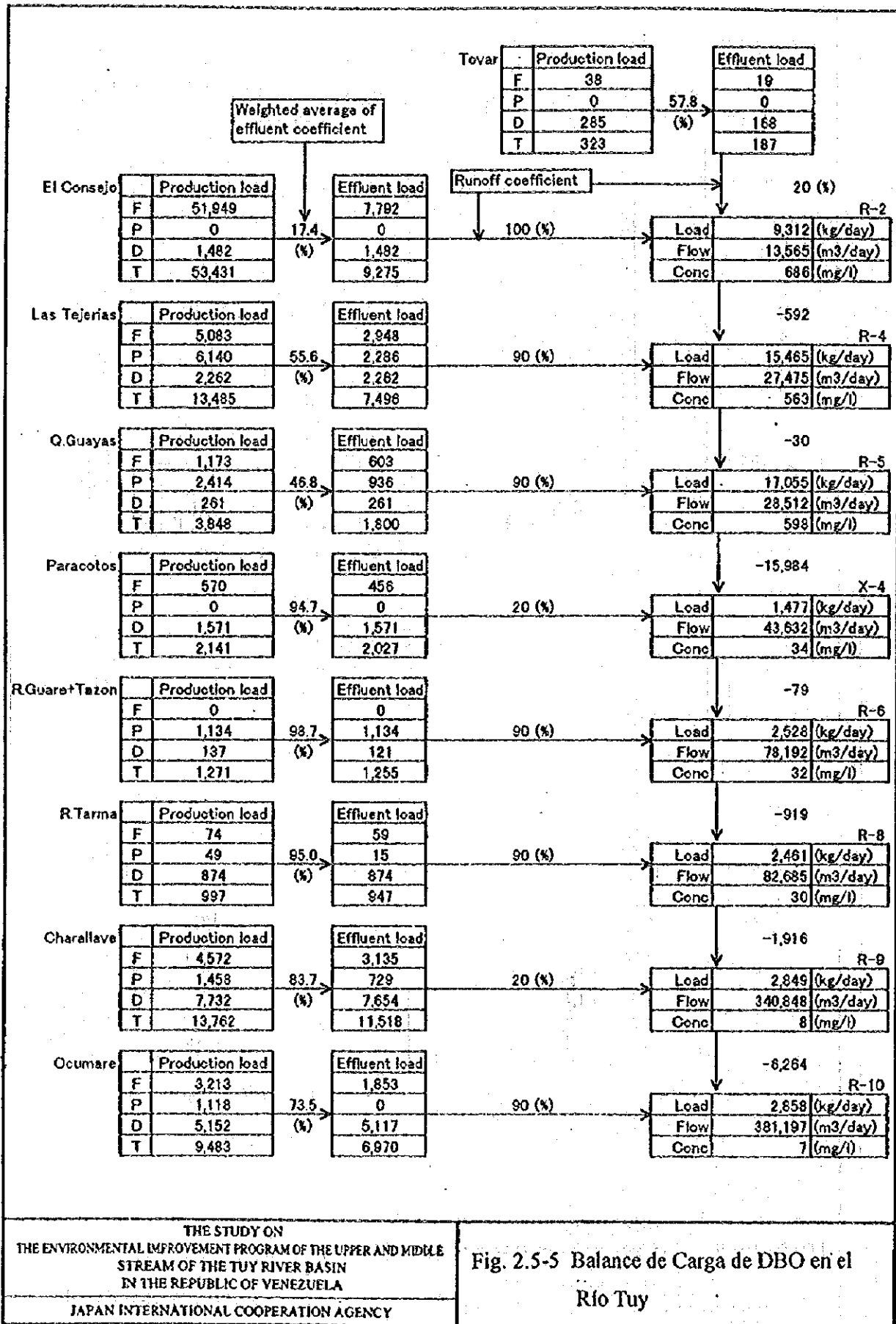


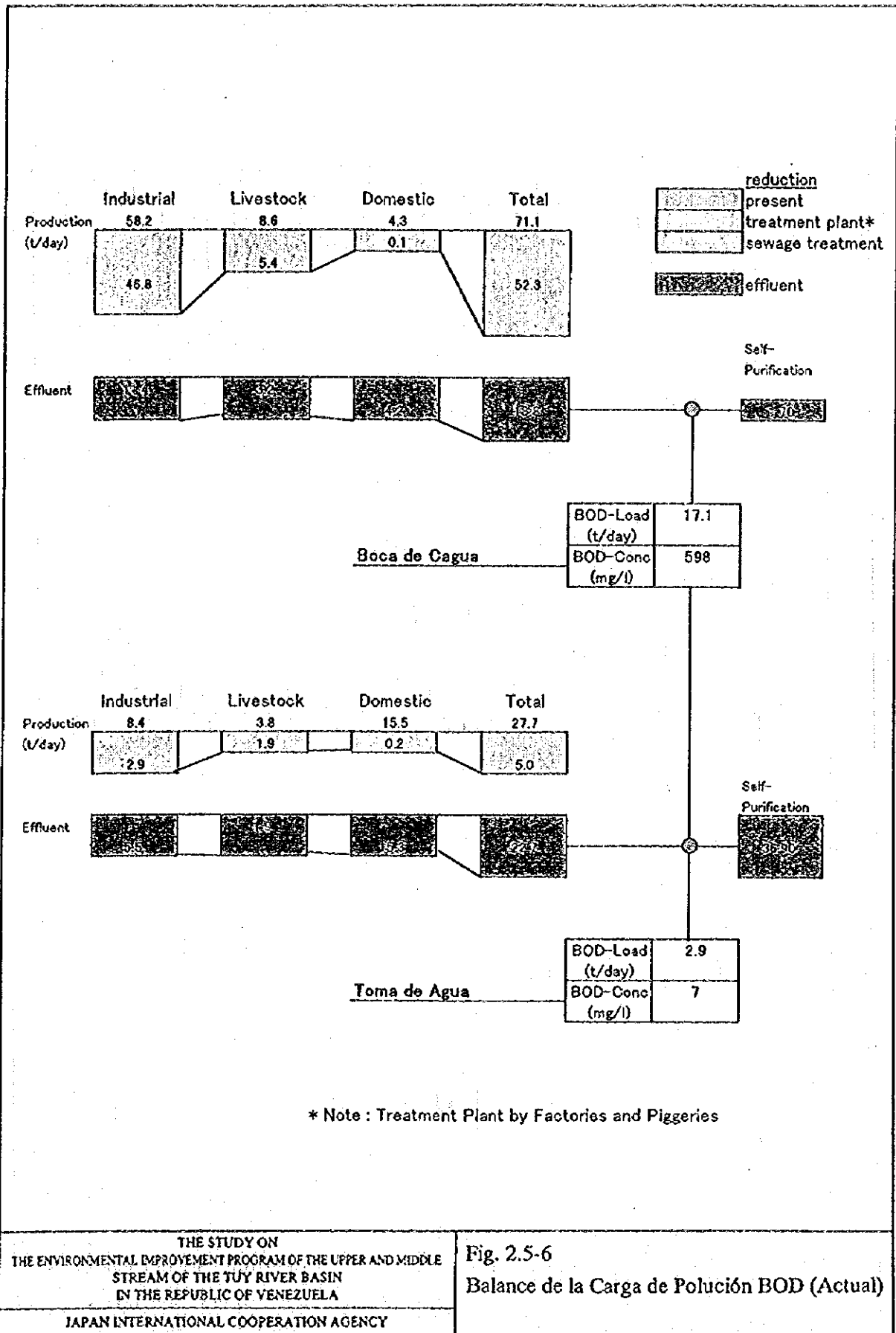
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Fig. 2.5-4 Producción y Carga de Contaminación de Efluentes

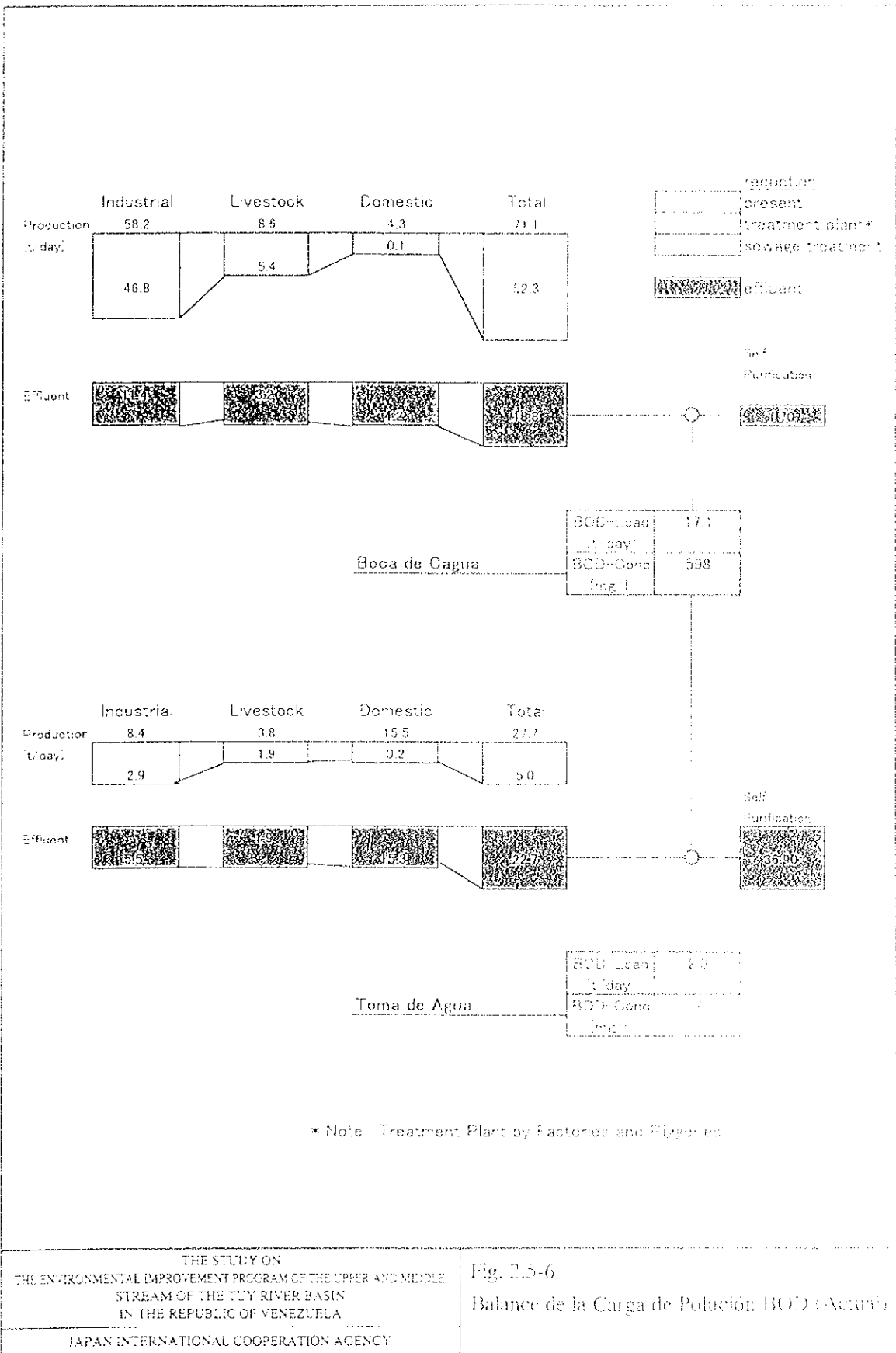




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Fig. 2.5-6  
Balance de la Carga de Polución BOD (Actual)

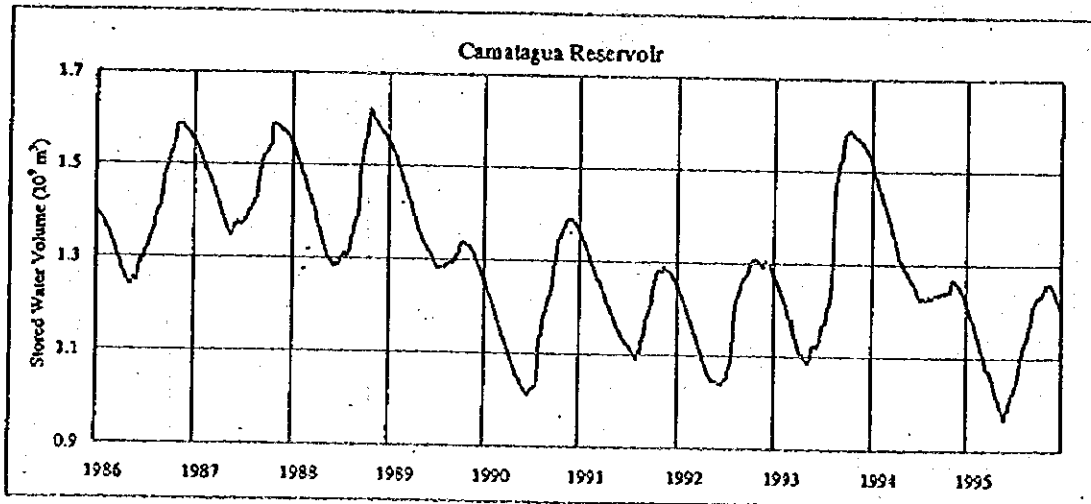
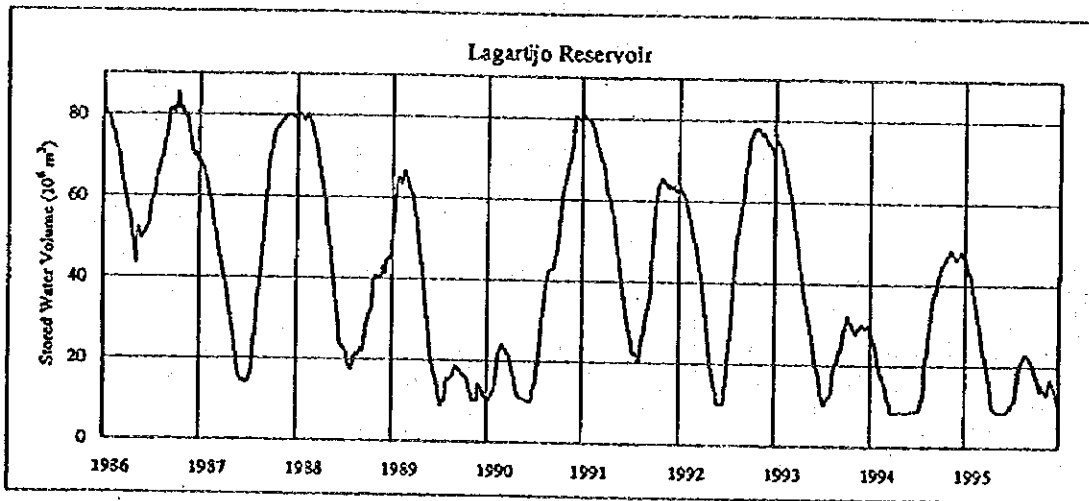
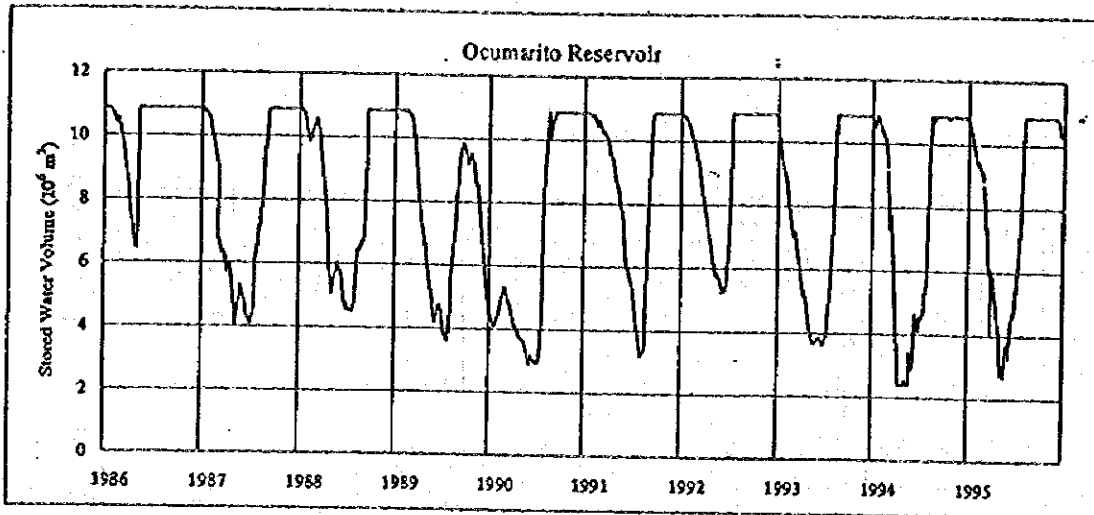


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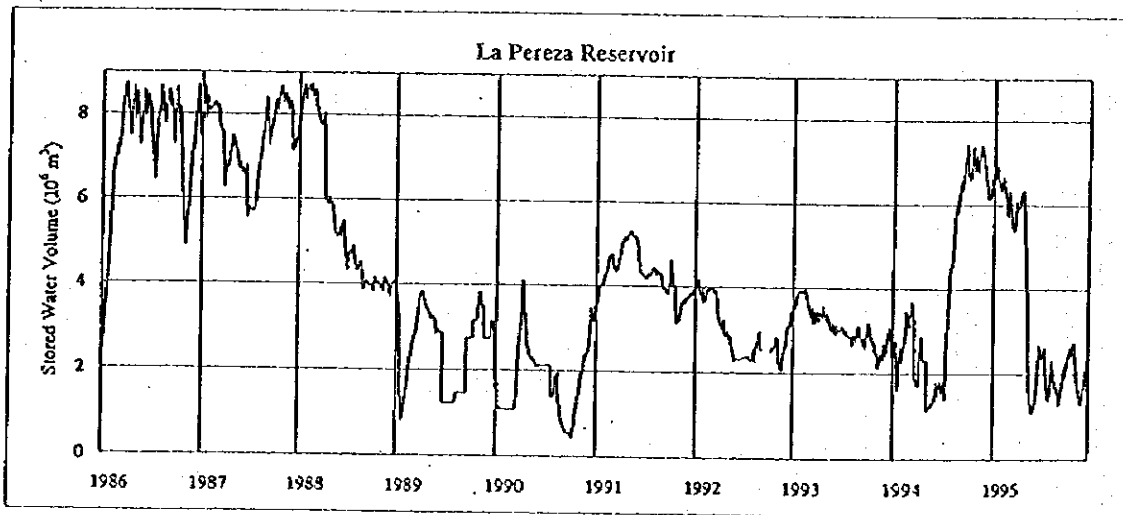
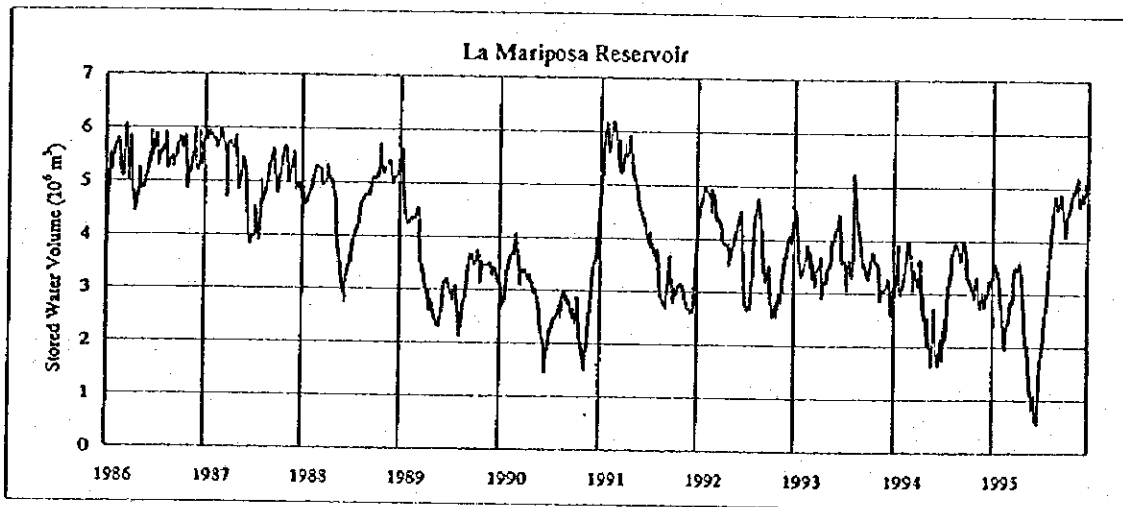
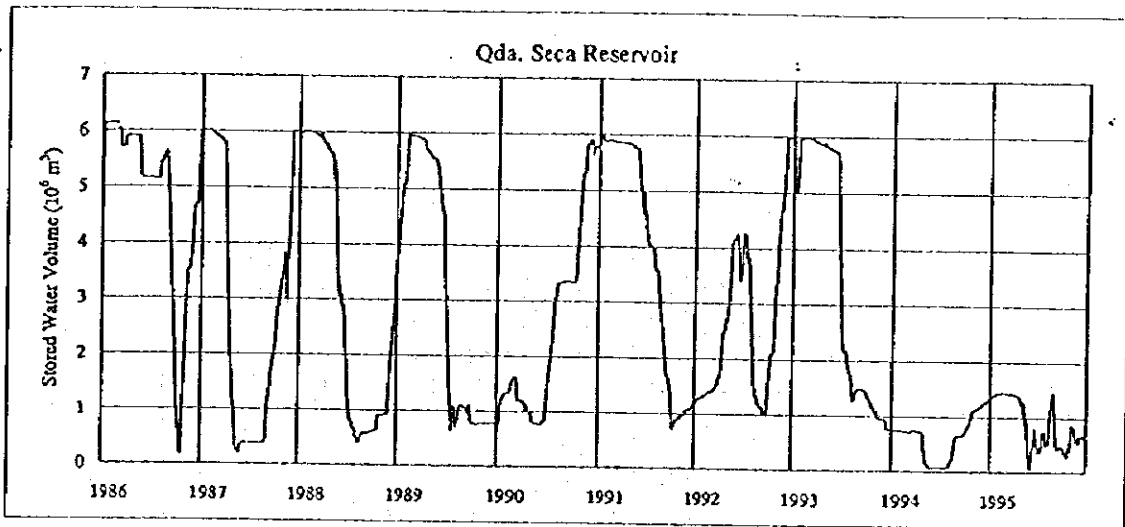
Fig. 2.5-6

Balace de la Carga de Polucion: BOD (Activa)



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Registros Cronológicos de la  
 Fig. 2.6-1 Operación Diaria de los Embalses  
 (1/2) Correspondientes

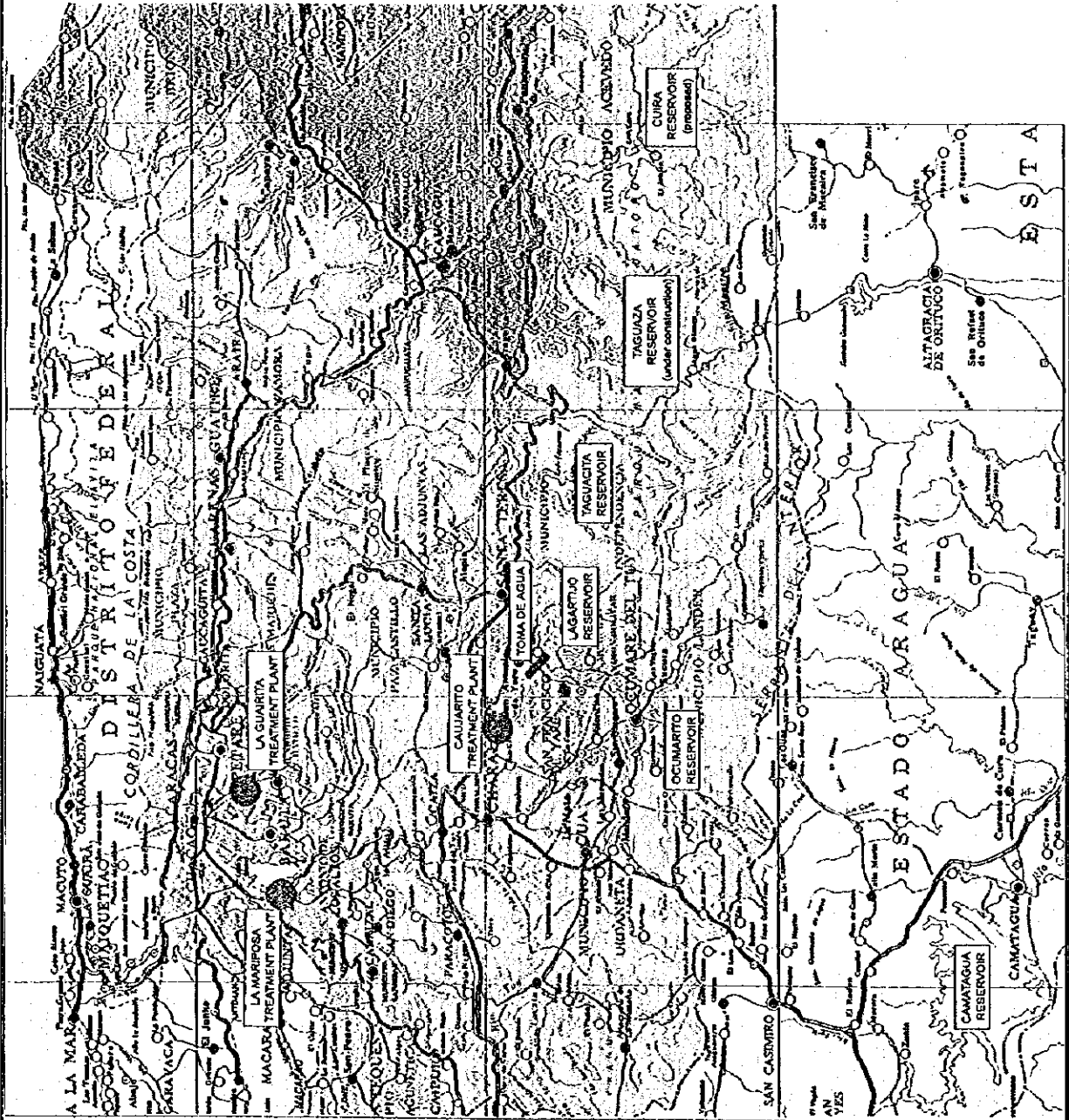
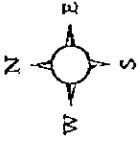


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Fig. 2.6-1  
(2/2)

Registros Cronológicos de la  
Operación Diaria de los Embalses  
Correspondientes

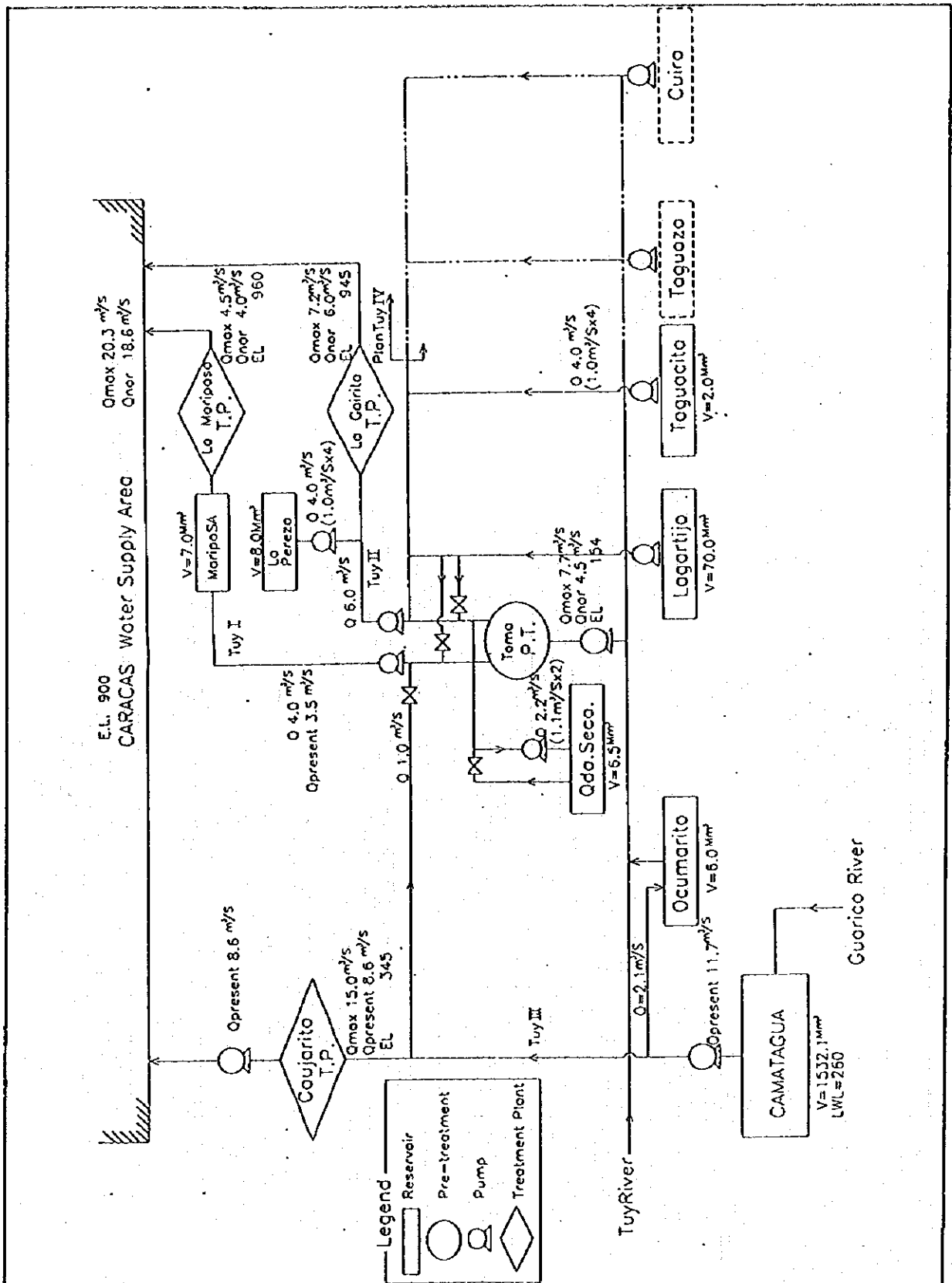


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Fig. 2.8-1 Mapa del Suministro de Agua del  
 Area Metropolitana de Caracas

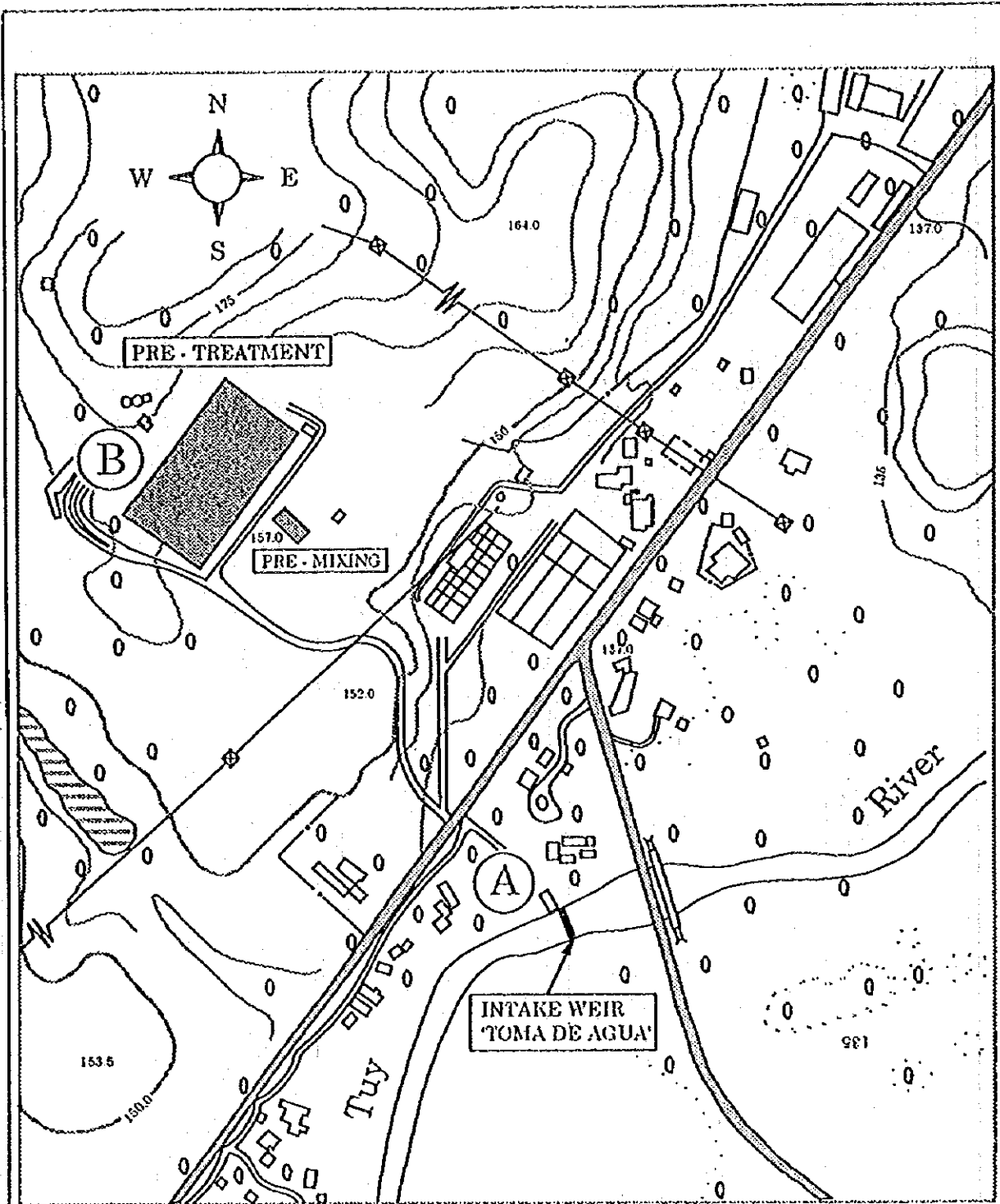




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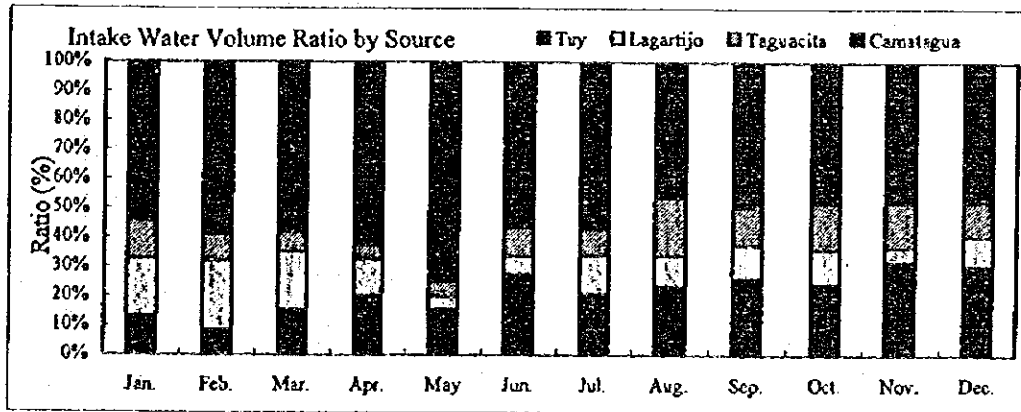
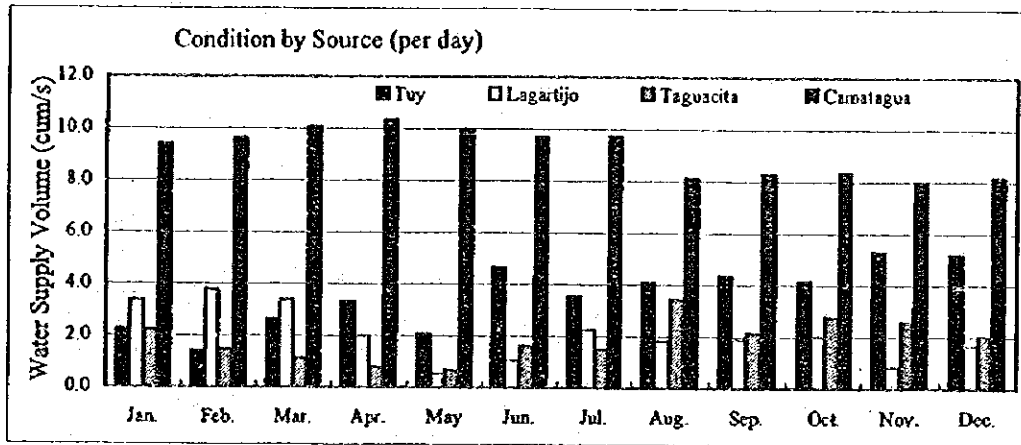
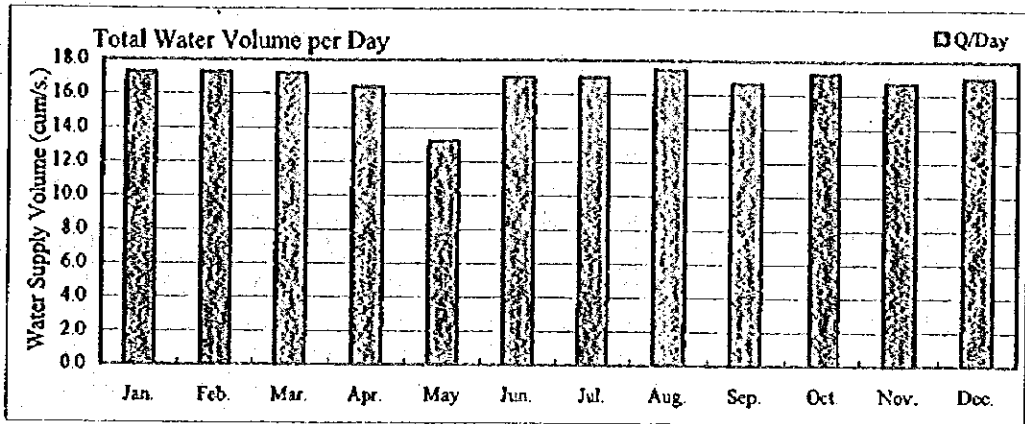
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Fig. 2.8.2 Diagrama del Sistema de  
 Suministro de Agua para el Area  
 Metropolitana de Caracas



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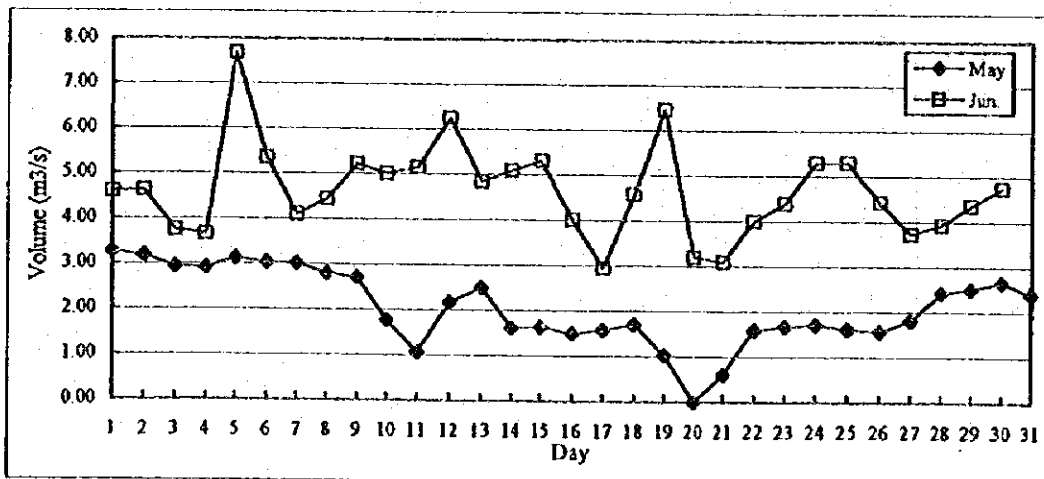
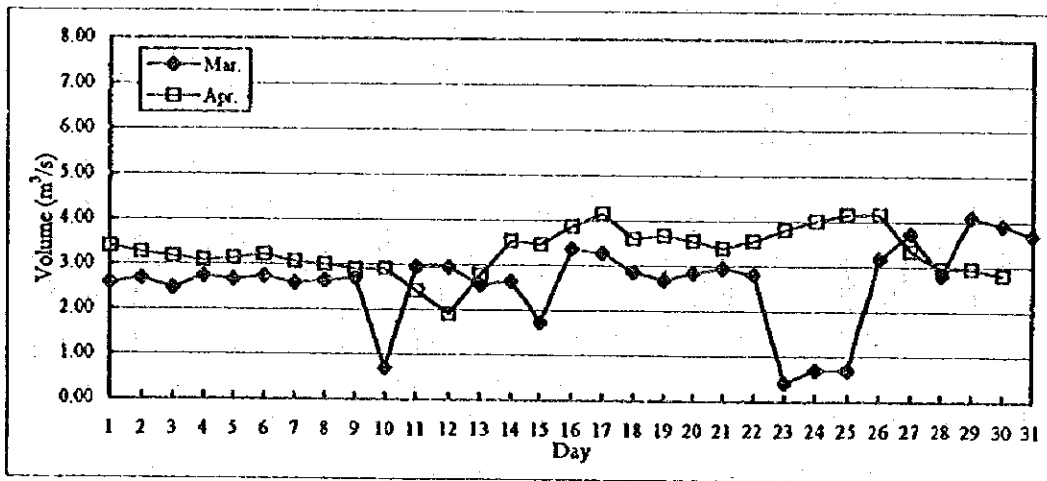
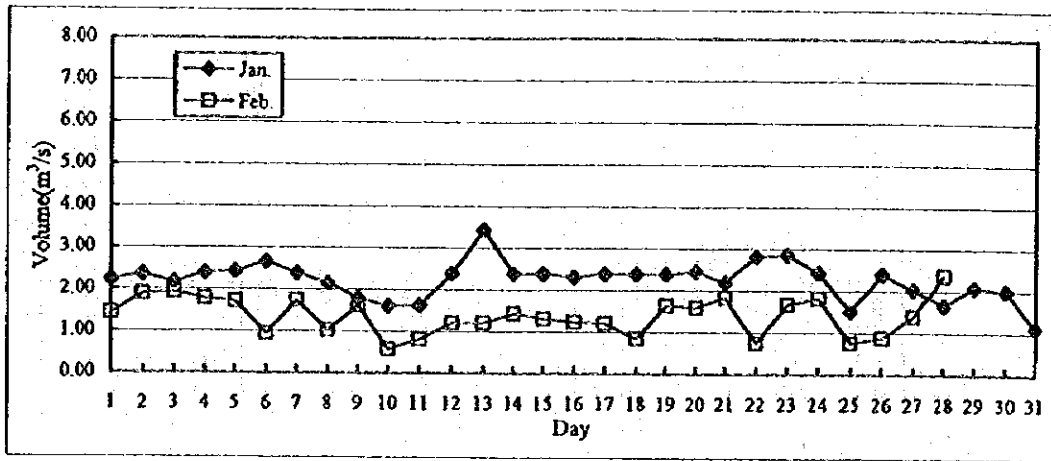
Fig. 2.8-3 Trazado de la Planta de  
 Pre-Tratamiento de la Estación de  
 Toma (Toma de Agua)



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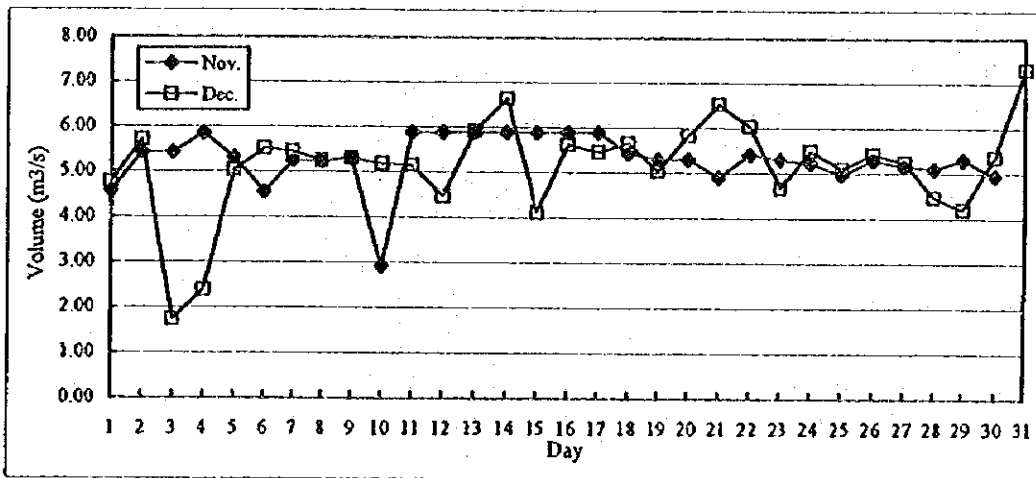
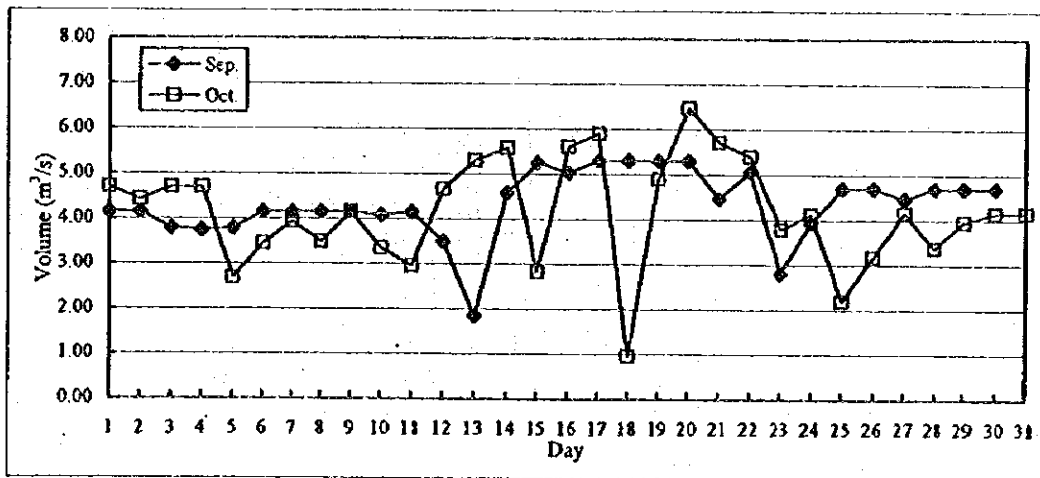
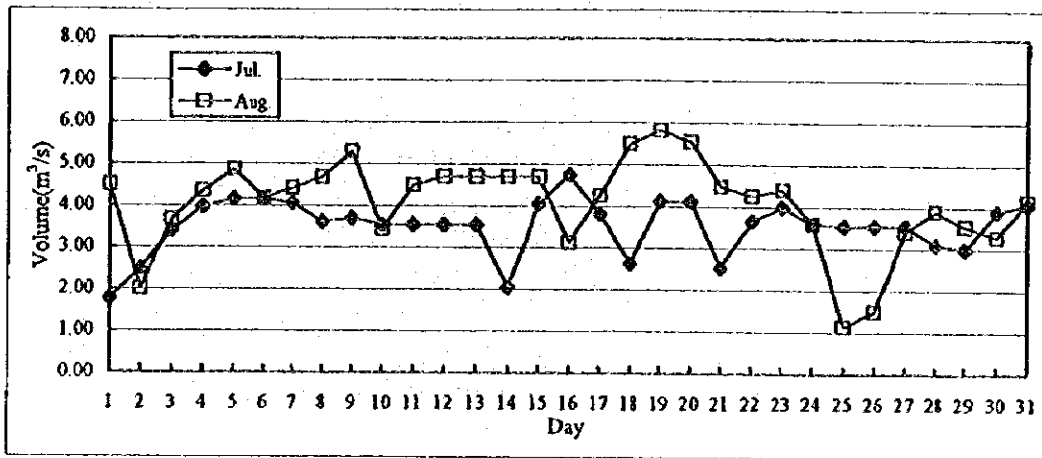
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Fig. 2.8-4 Captacion Promedio Mensual de Aguas de los Sistemas Tuy I, II y III



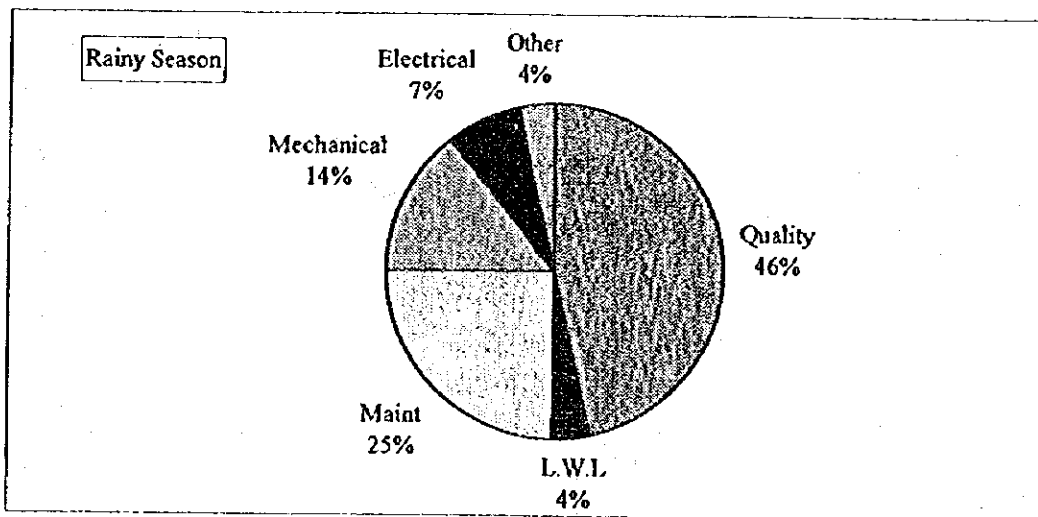
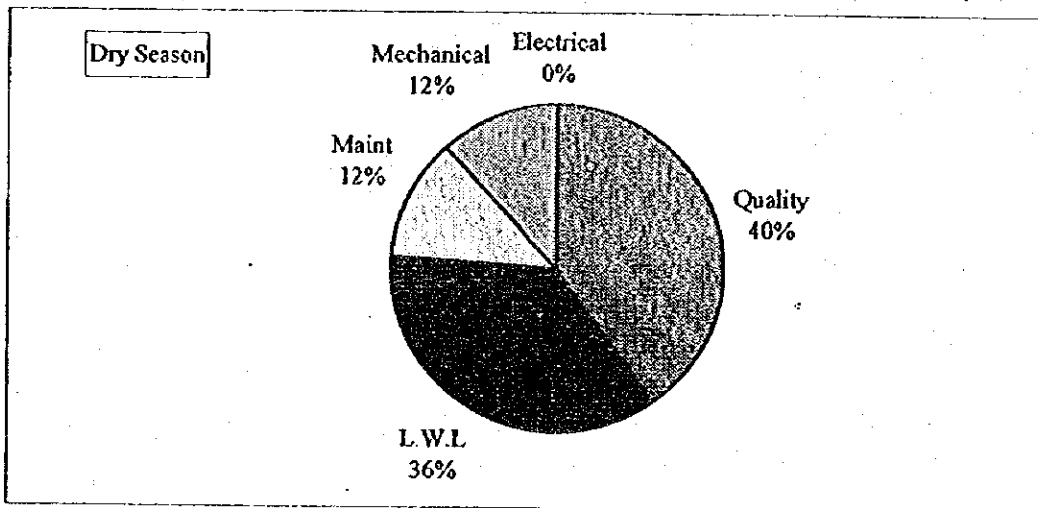
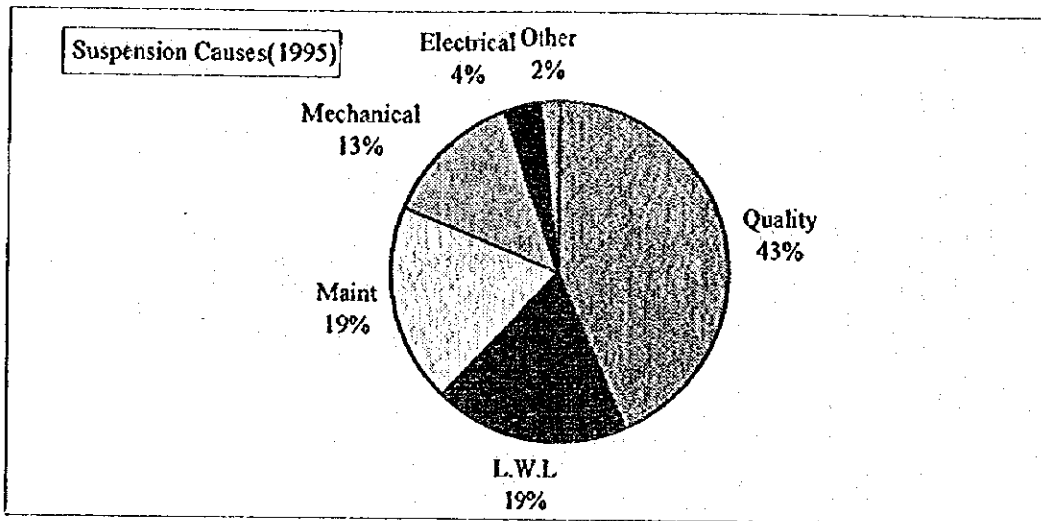
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Fig. 2.8-5 Volumen Promedio Diario de  
 (1/2) Agua Captado en Toma de Agua  
 en 1995



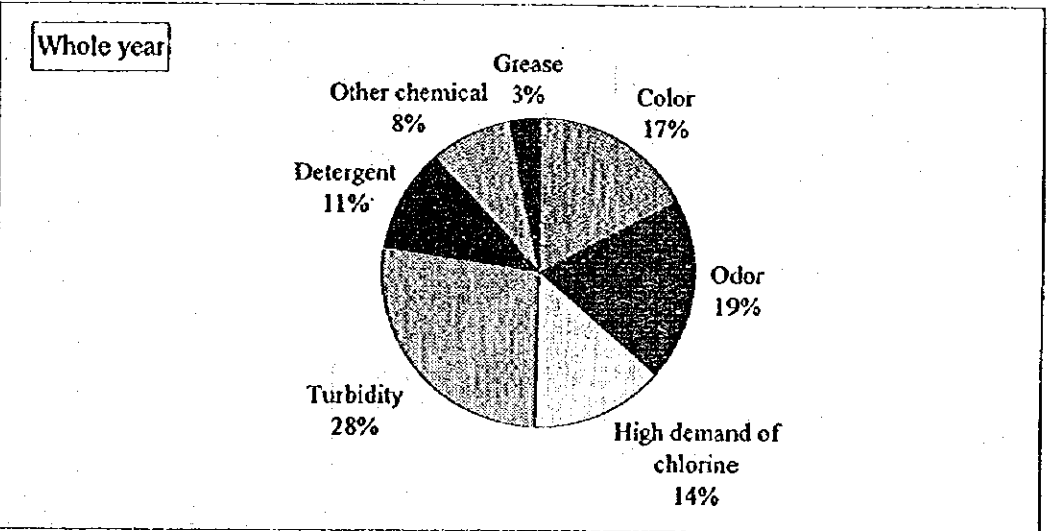
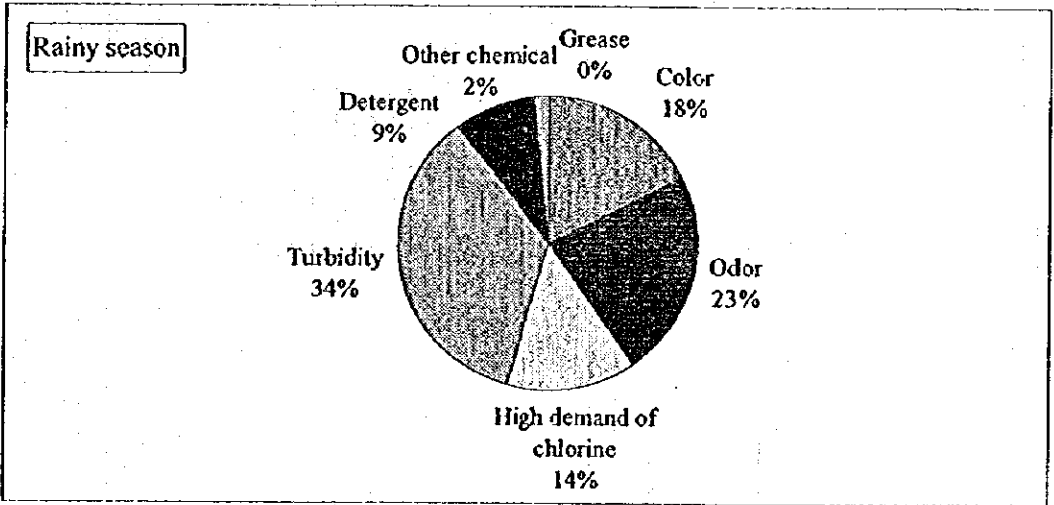
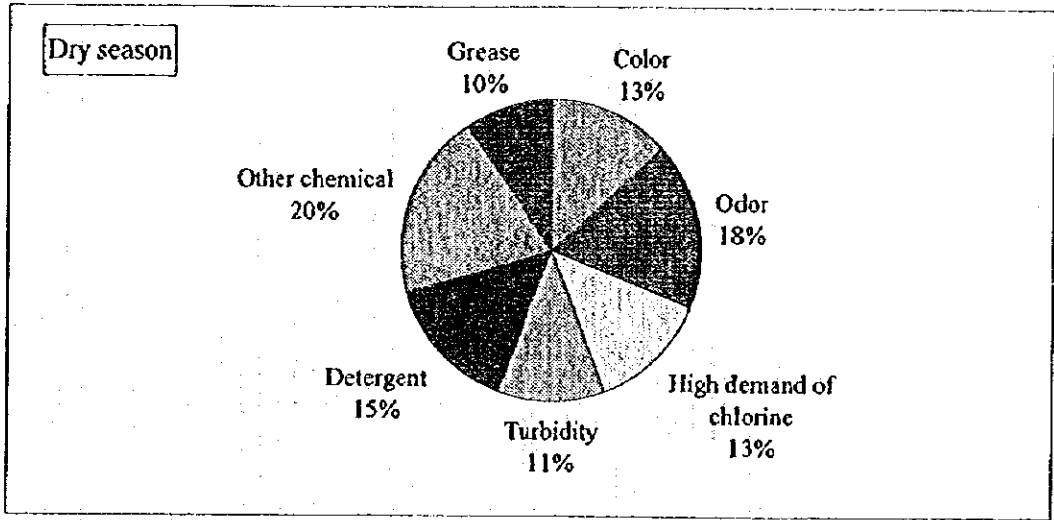
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Fig. 2.8-5 Volumen Promedio Diario de  
 (2/2) Agua Captado en Toma de Agua  
 en 1995



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Fig. 2.8-6 Causas de Suspensión en la  
 Captación de Agua en Toma de  
 Agua (1995)

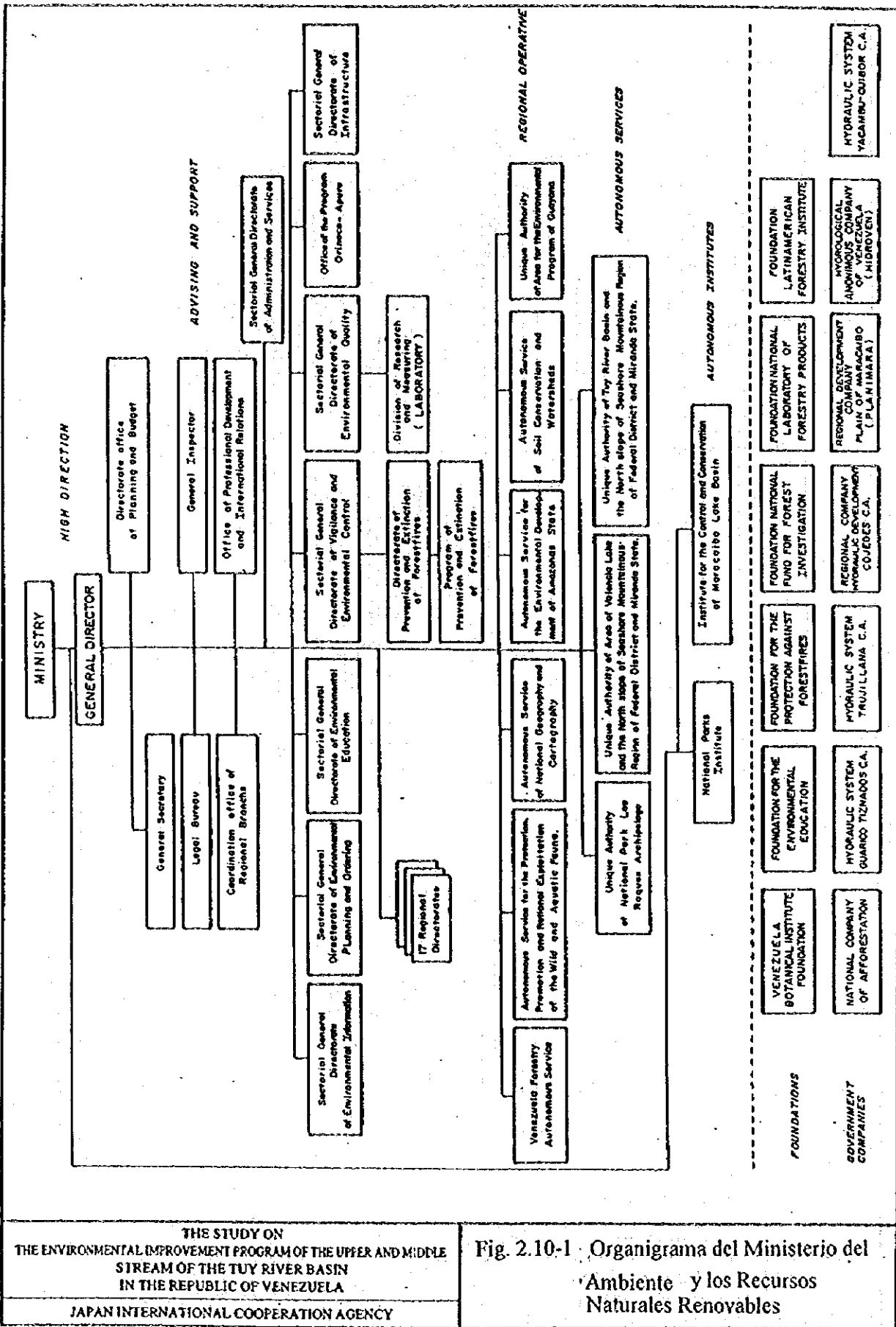


Note: Data are averages from 1993-95

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Fig. 2.8-7 Suspensión de Captación de Agua Debido a la Calidad del Agua

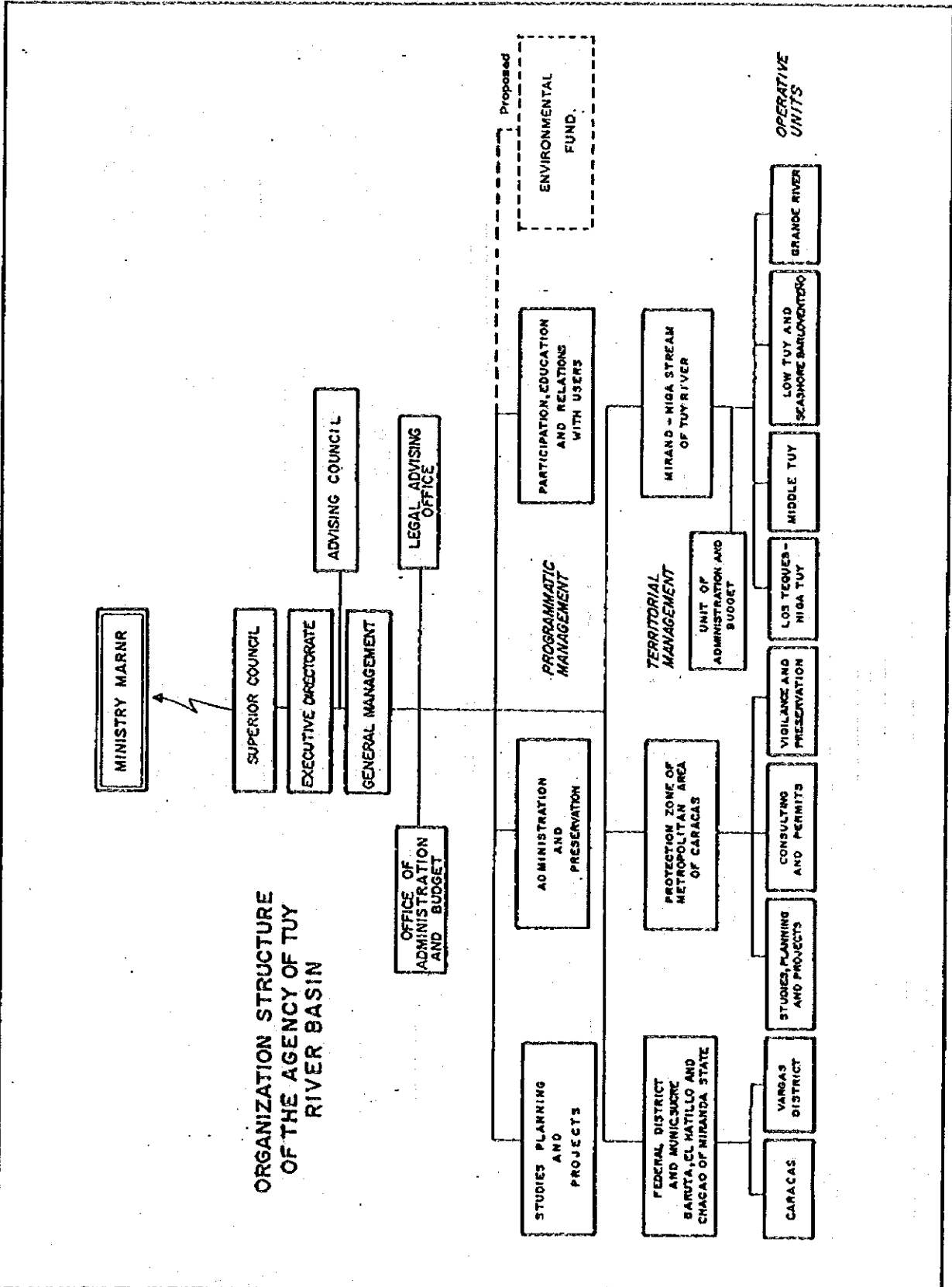


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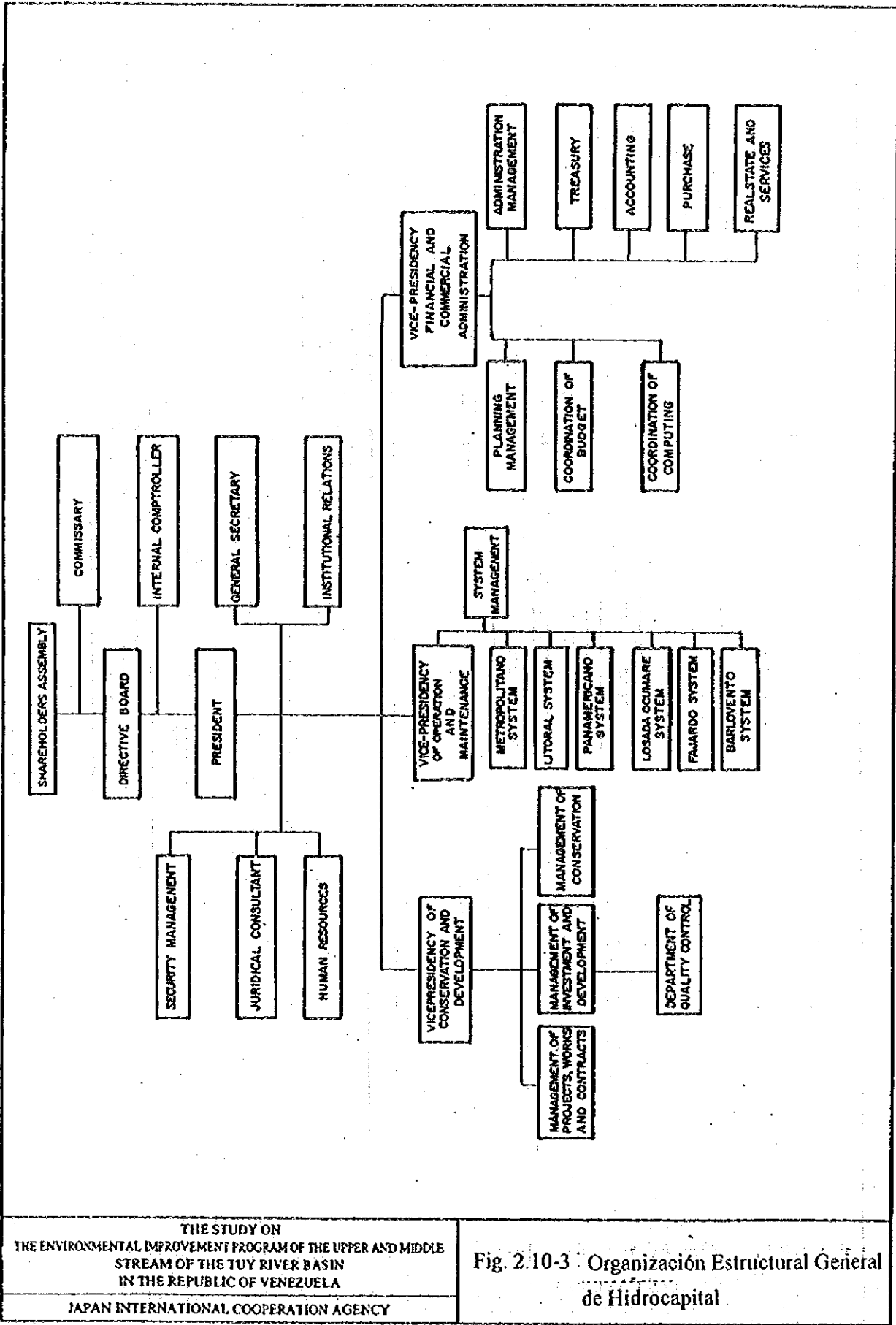
Fig. 2.10-1 Organigrama del Ministerio del Ambiente y los Recursos Naturales Renovables





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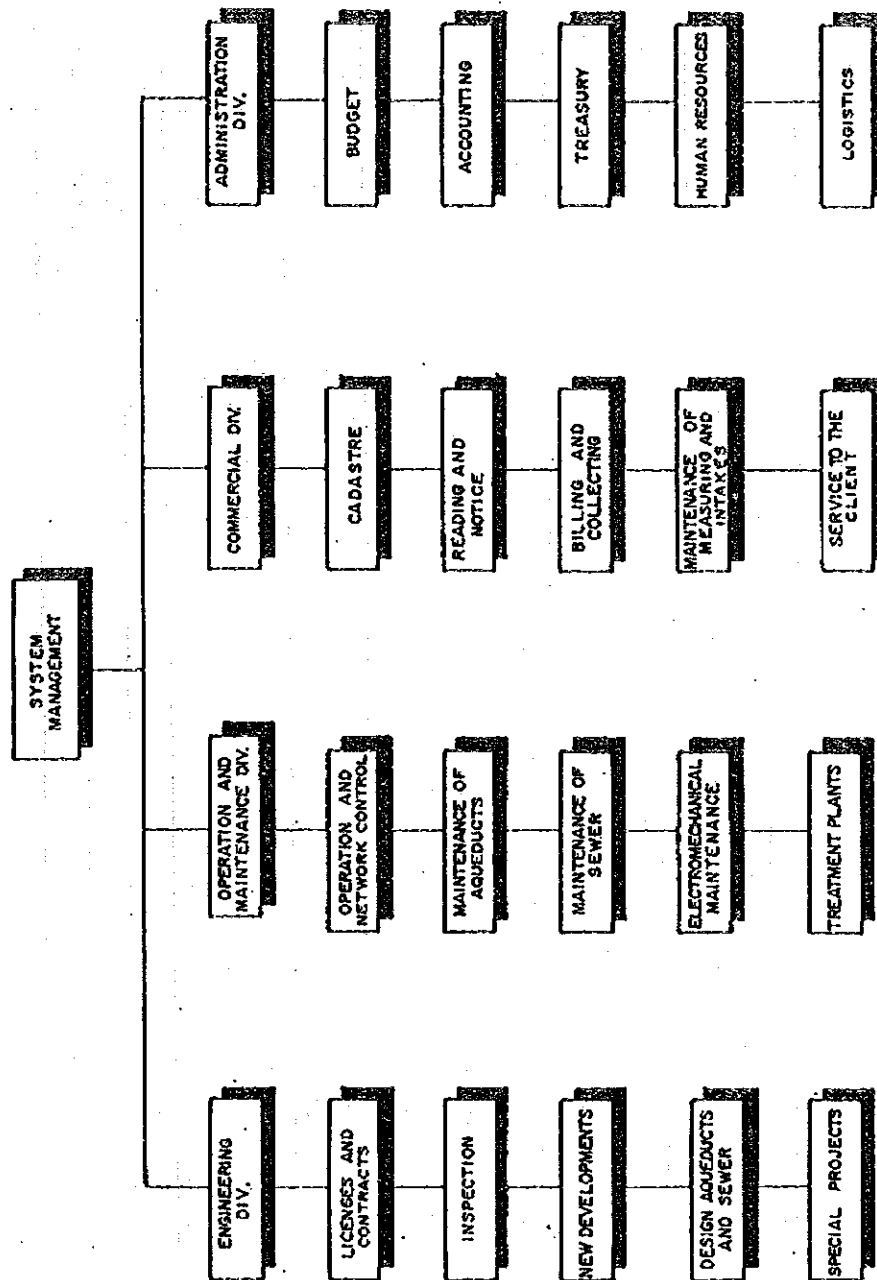
Fig. 2.10-2 : Organigrama de la Agencia de  
 Cuenca del Río Tuy



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Fig. 2.10-3 Organización Estructural General de Hidrocapital

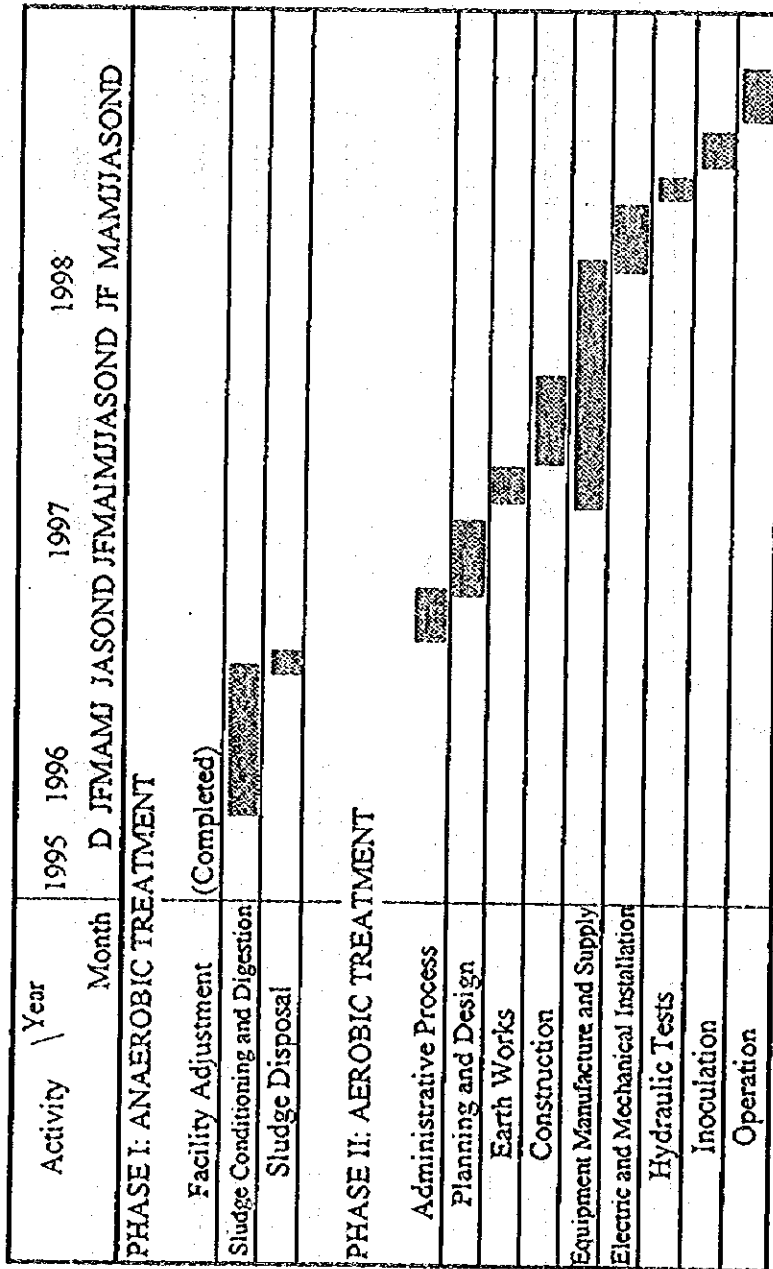
# ORGANIZATION STRUCTURE OF THE SYSTEMS



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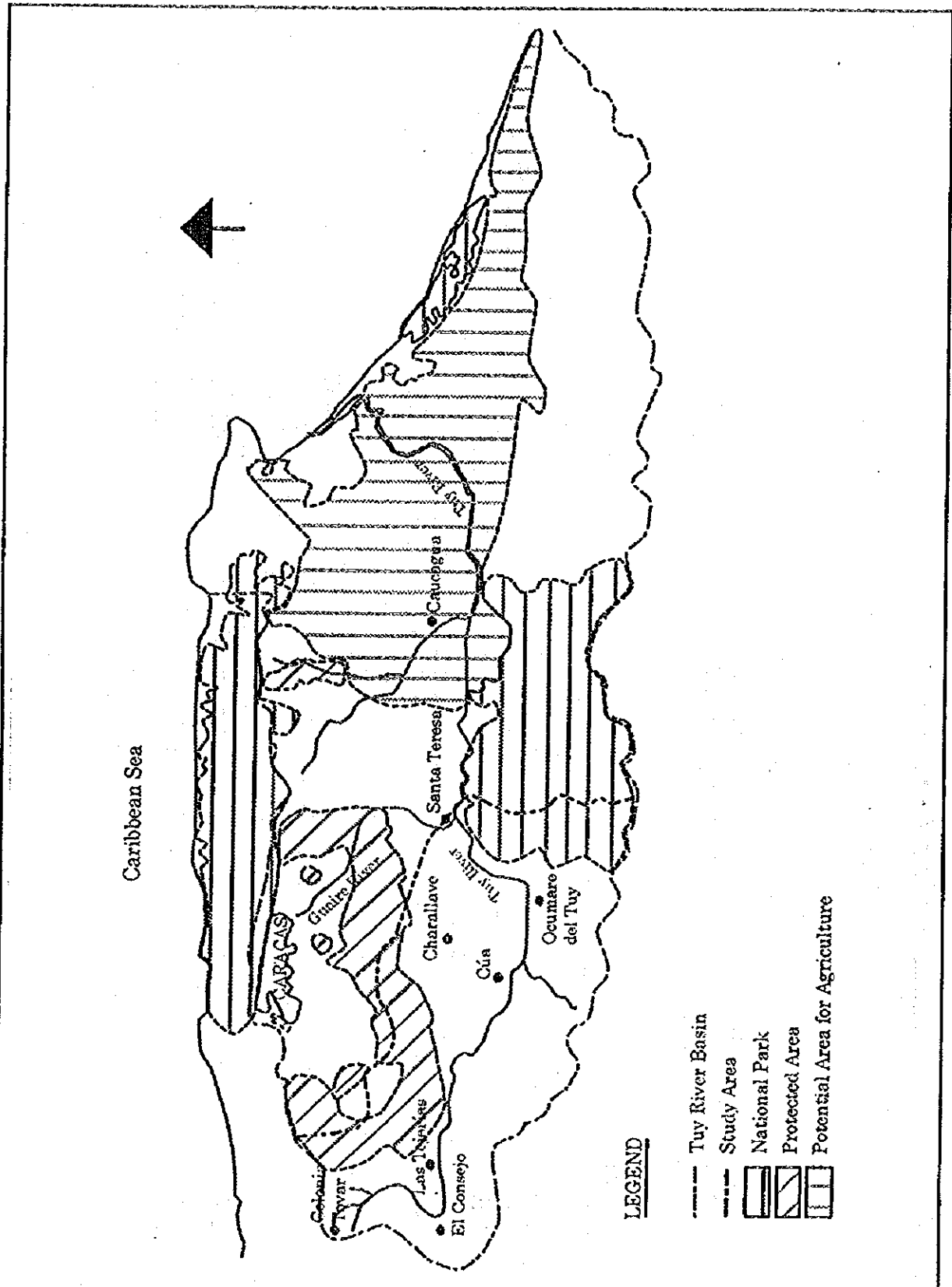
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Fig. 2.10-4 : Estructura Organizacional del Sistema de Hidrocapital



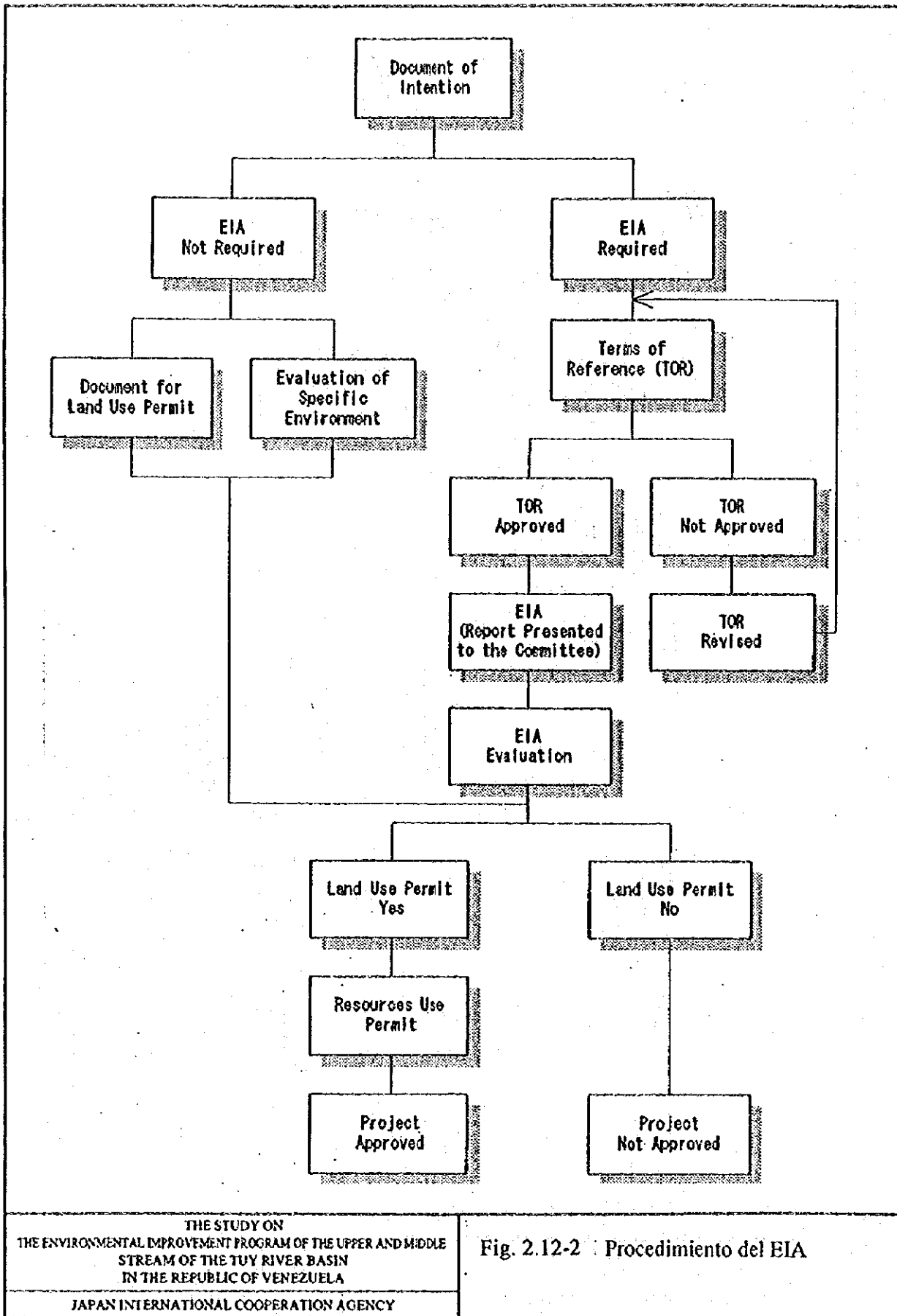
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Fig. 2.10-5 : Programa de Mejoramiento de  
 Tratamiento en la Compañía  
 Ron Santa Teresa



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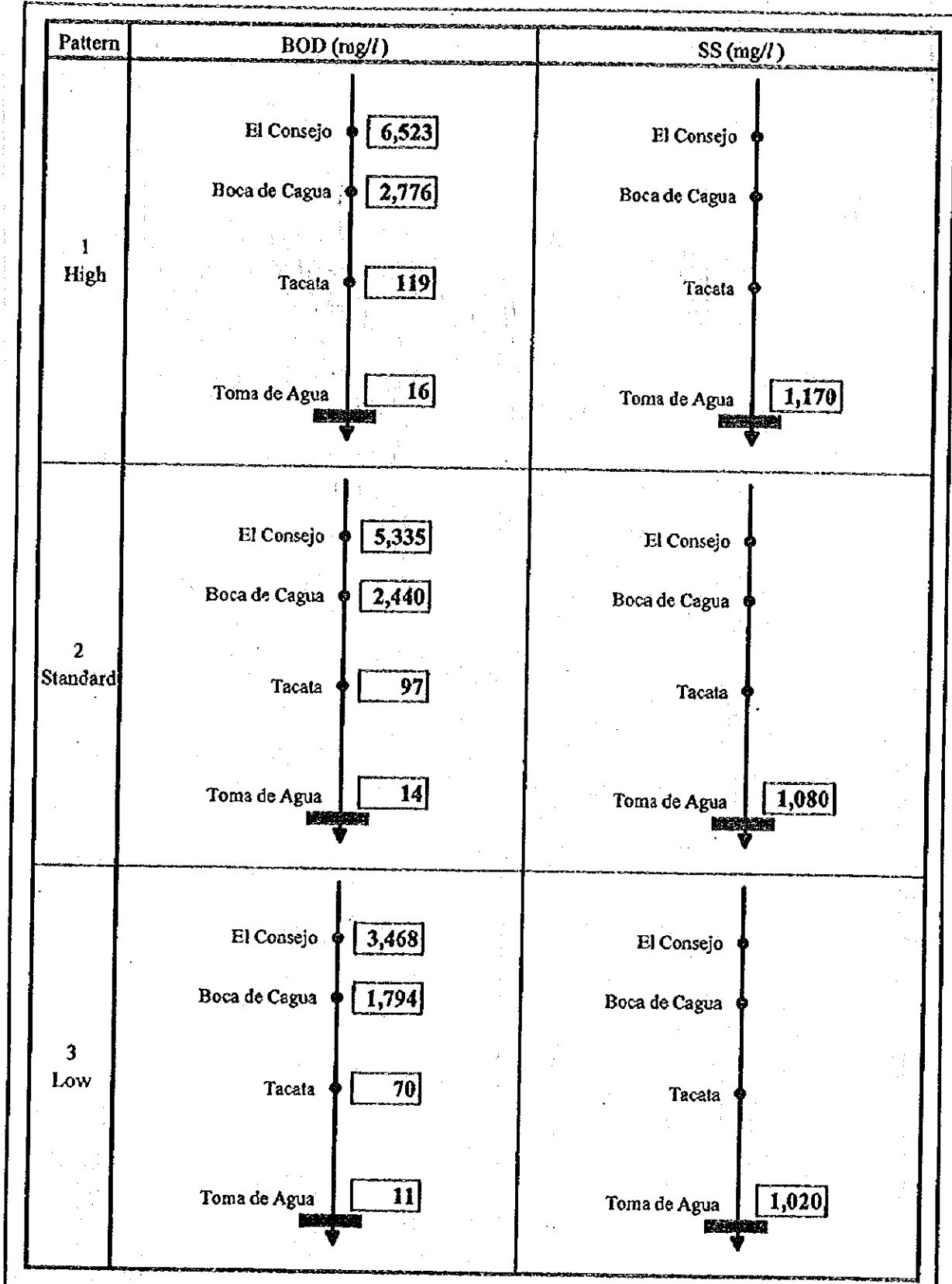
Fig. 2.12-1 Areas Bajo Régimen Administrativo Especial (A.B.R.E.)



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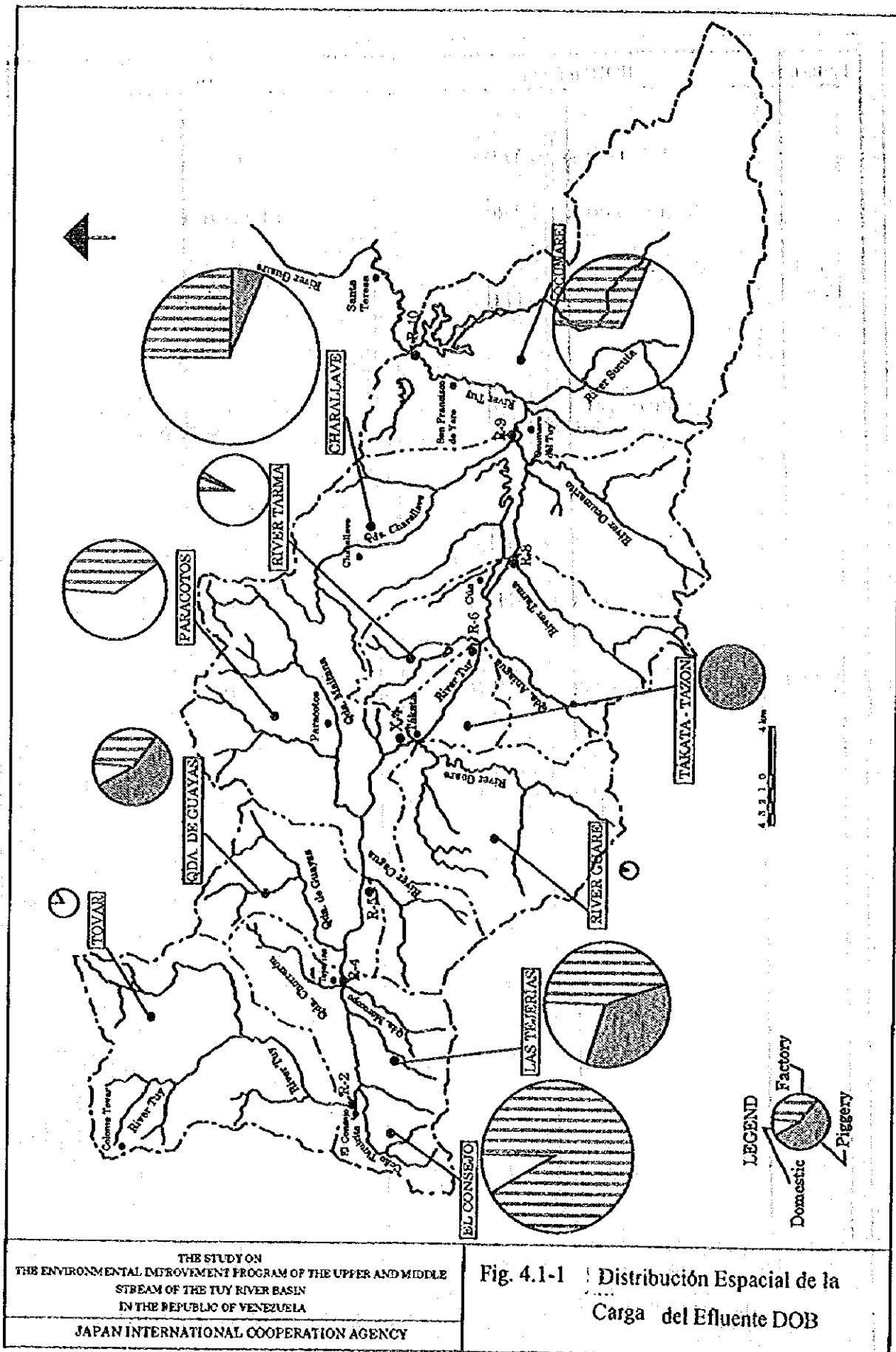
Fig. 2.12-2 Procedimiento del EIA



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 STREAM OF THE TUY RIVER BASIN  
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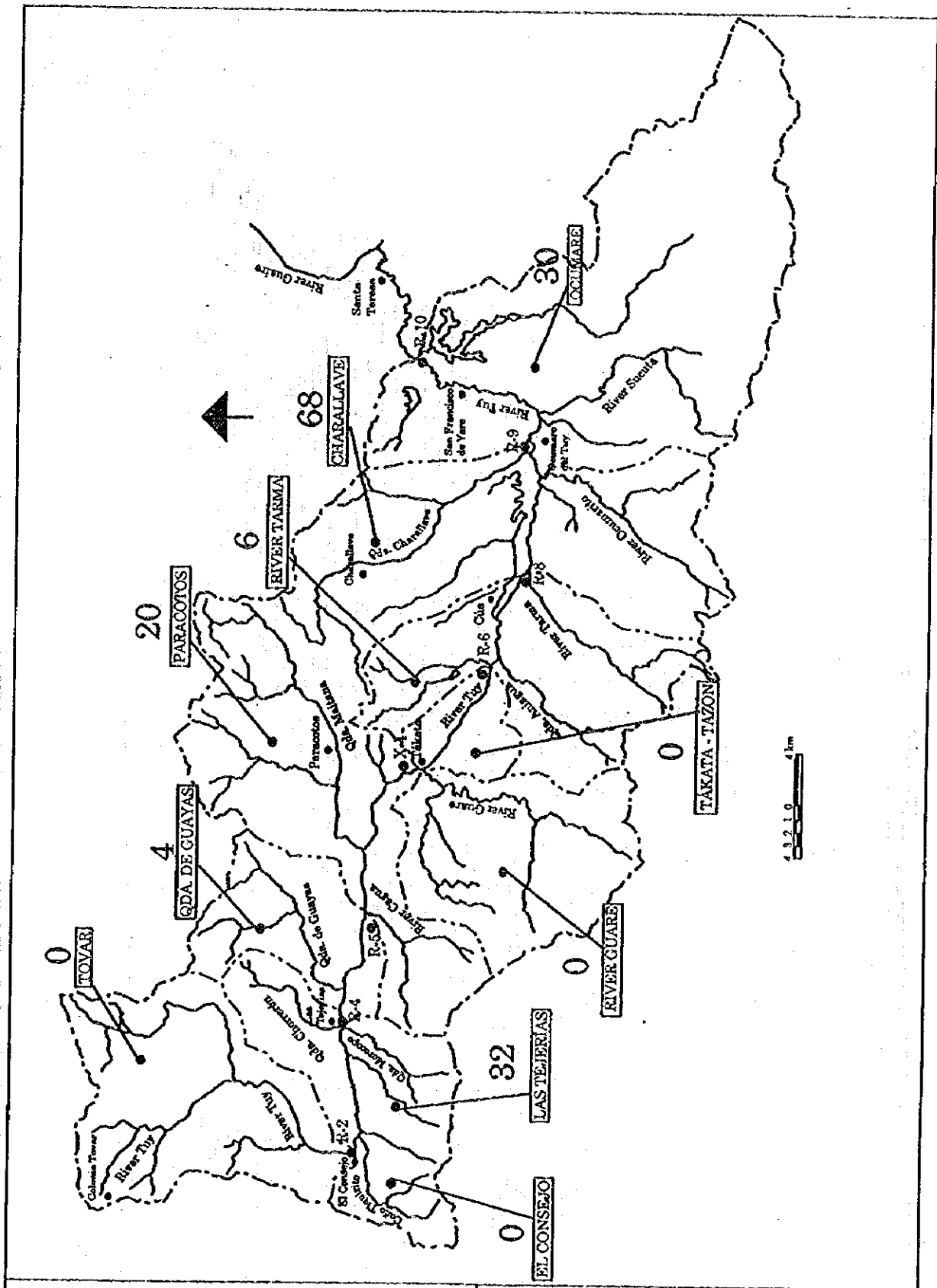
Fig. 3.3-1 Proyeccion Base de la Contaminacion



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Fig. 4.1-1 Distribución Espacial de la  
 Carga del Efluente DOB

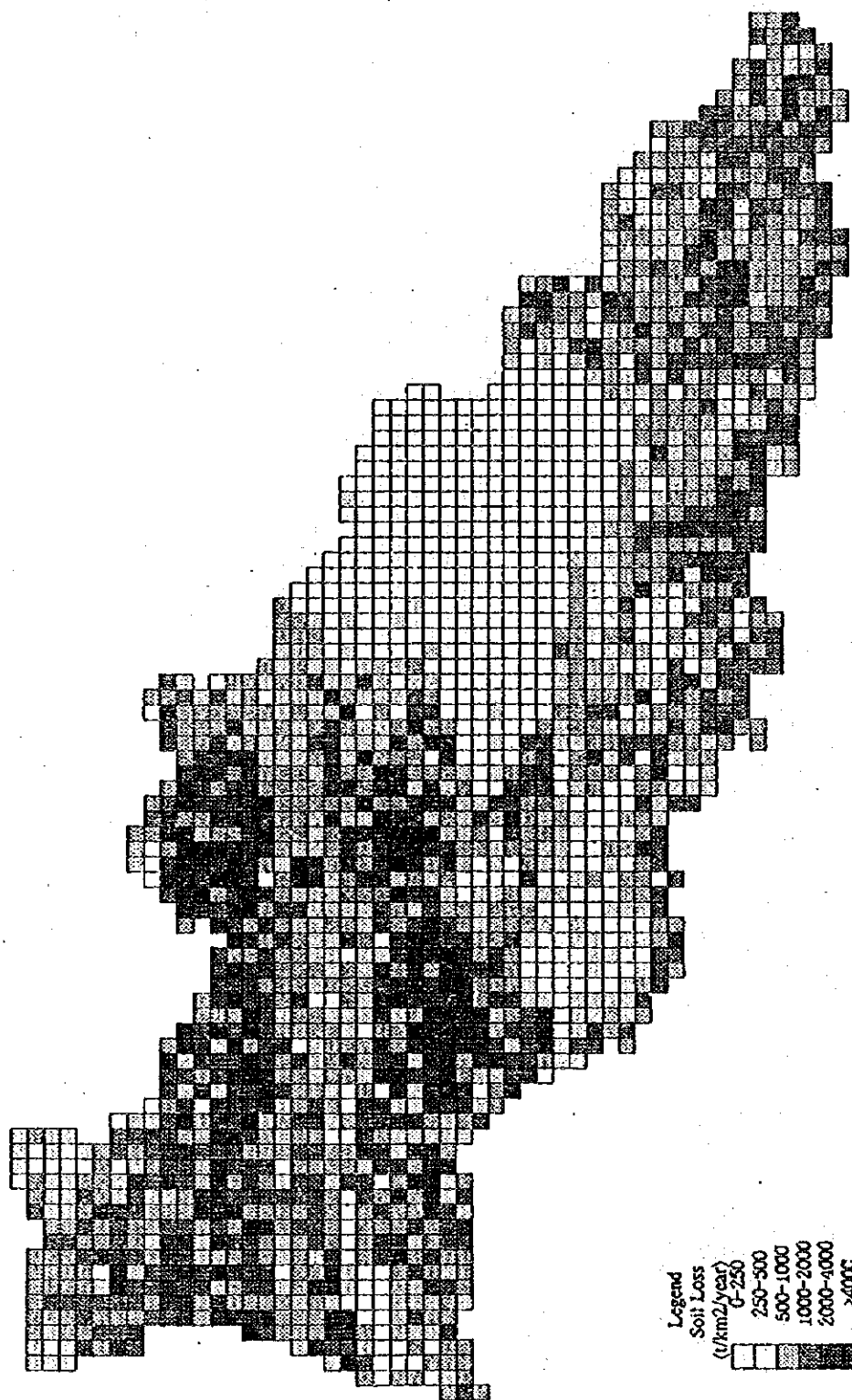




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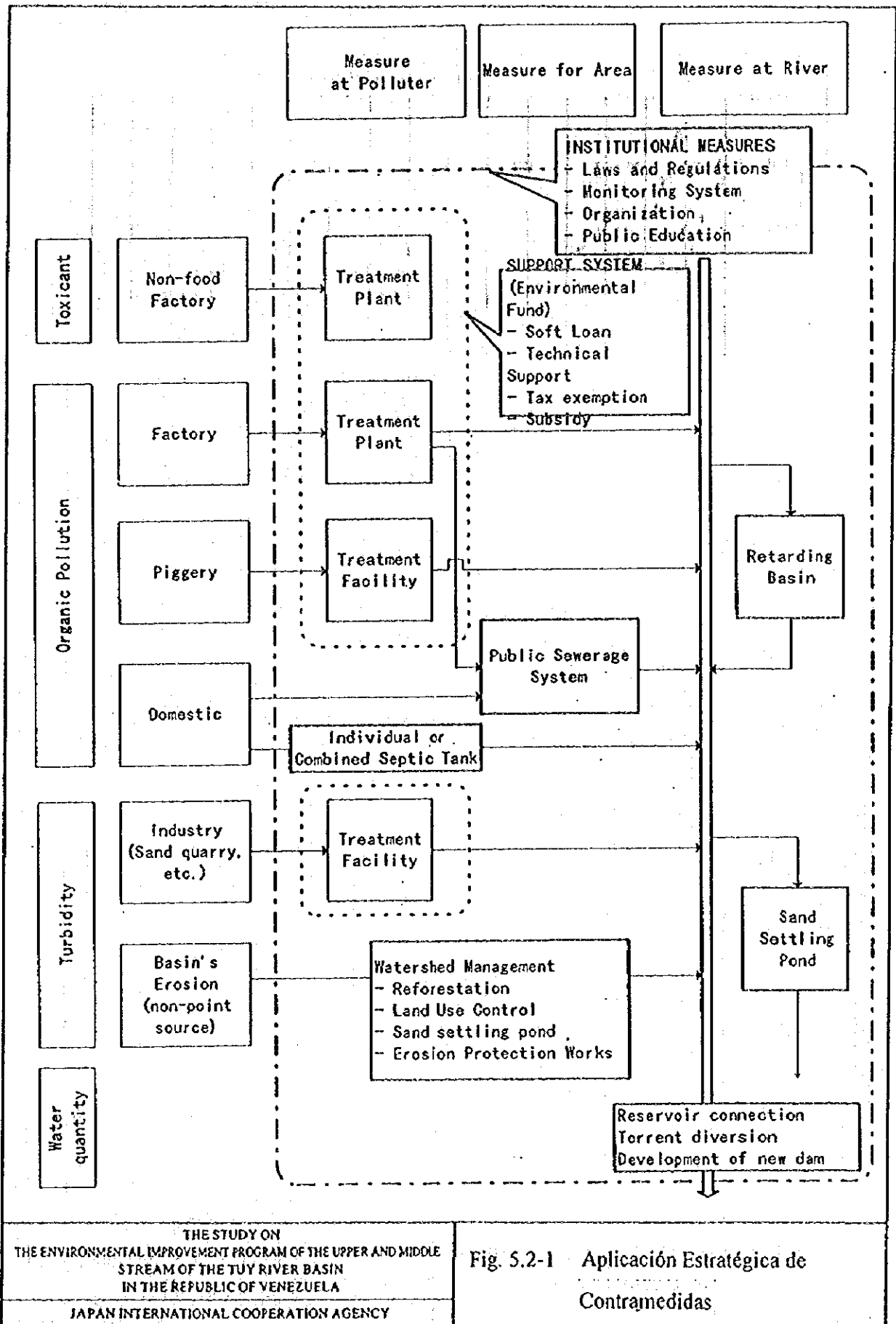
Fig. 4.1-2 : Distribución Espacial de las  
 Fábricas de Productos  
 No-Alimenticios



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93

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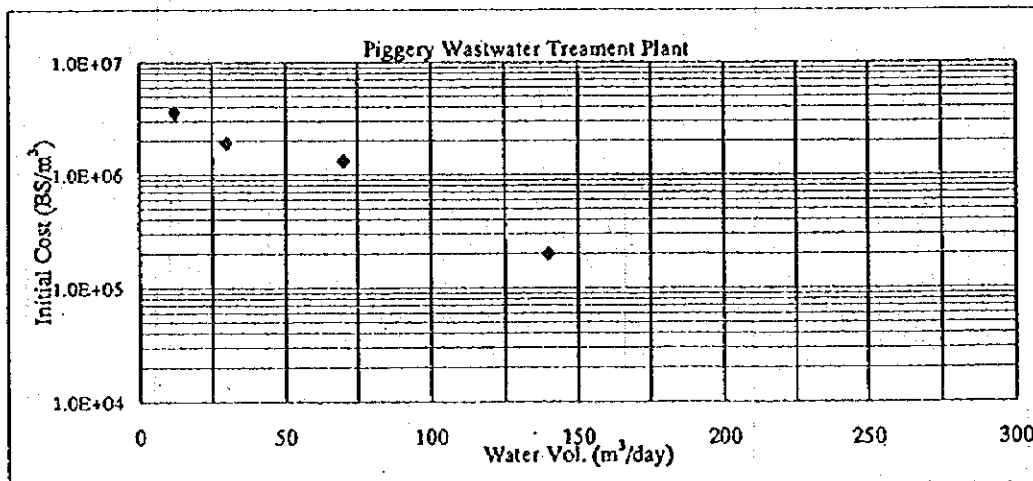
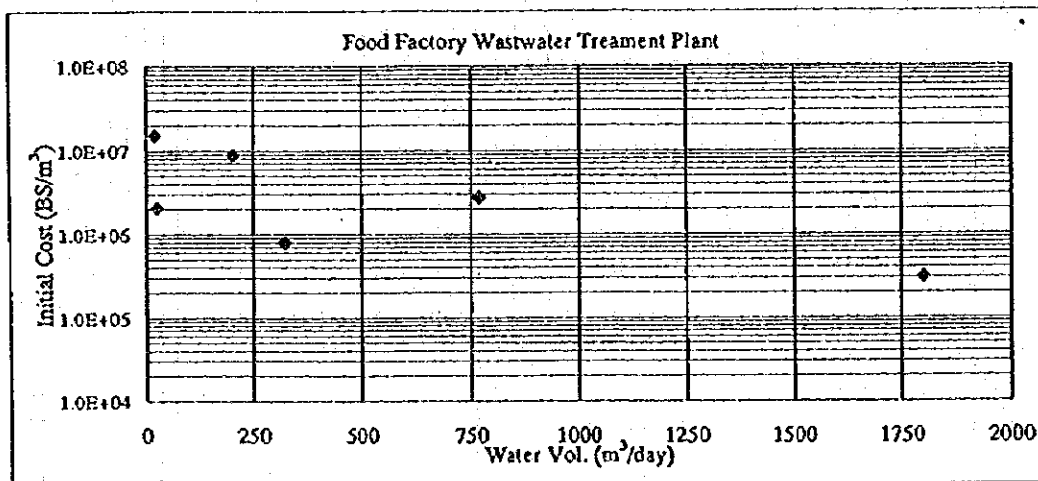
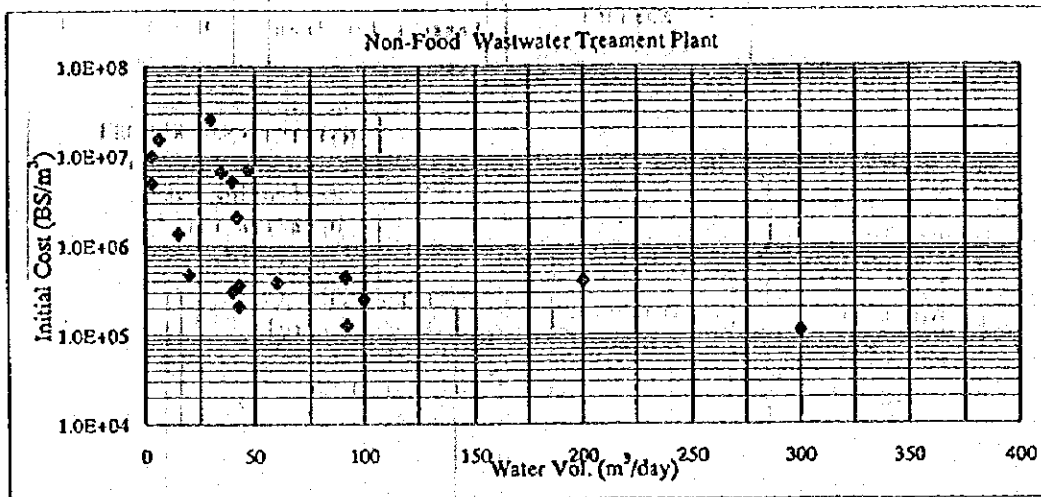
Fig. 4.1-3 Erosión de la Cuenca por Malla  
 de 1 x 1 km.



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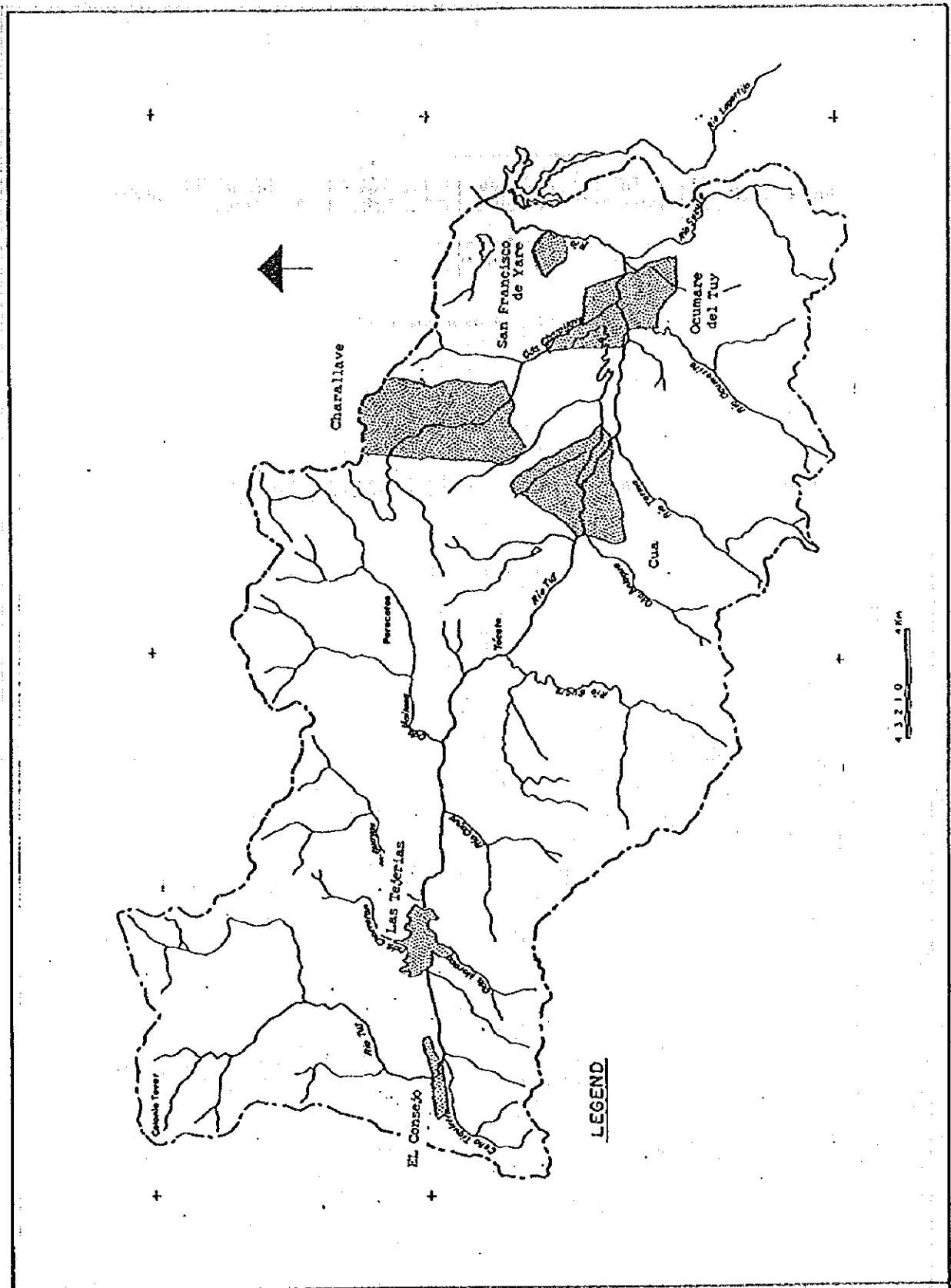
Fig. 5.2-1 Aplicación Estratégica de  
 Contramedidas



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Fig. 6.1-1 Costo Unitario del Tratamiento de Aguas Residuales

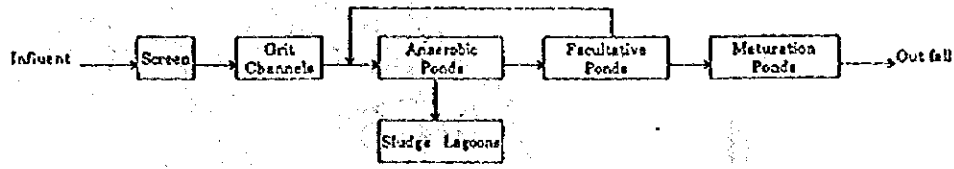


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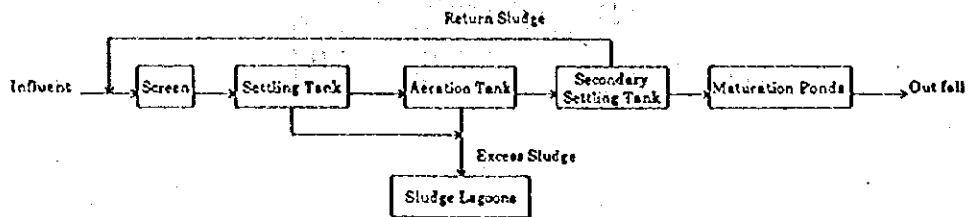
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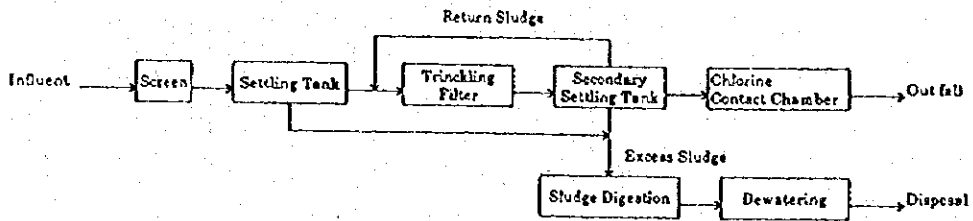
Fig. 6.1-2 Areas Cubiertas por el Sistema Planificado de Alcantarillado Público



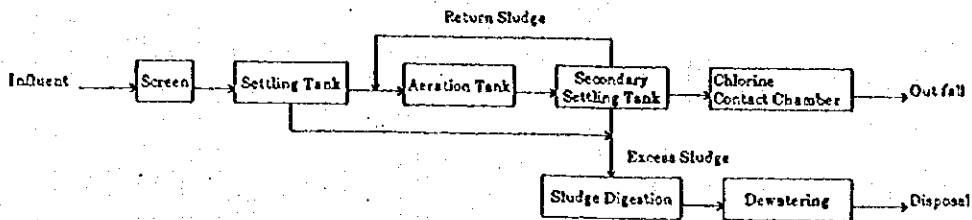
Flow sheet of Stabilization Pond System



Flow sheet of Simplified Activate Sludge Process



Flow sheet of Tricking Filter Process

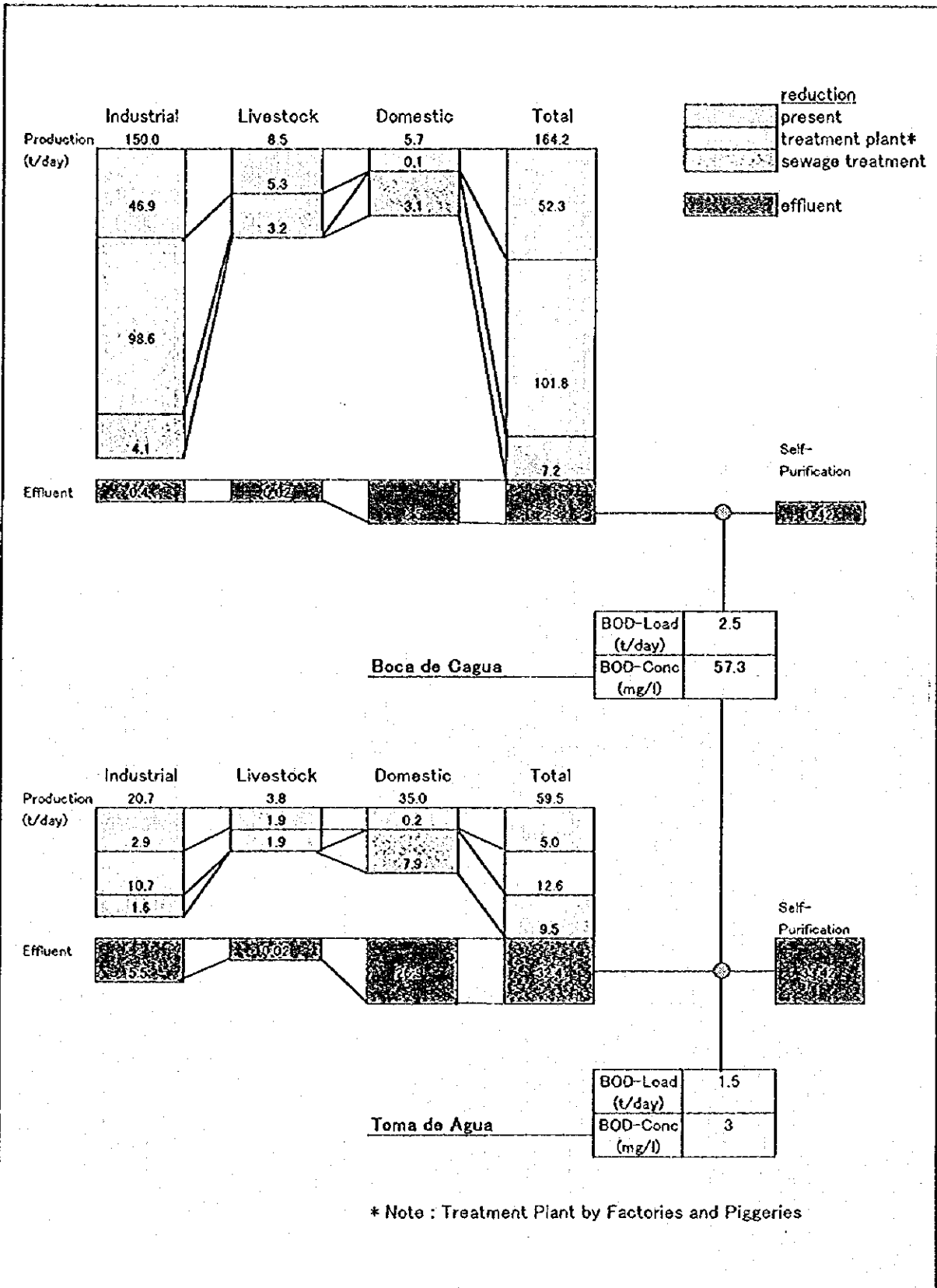


Flow sheet of Conventional Activated Sludge Process

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STREAM OF THE TUY RIVER BASIN  
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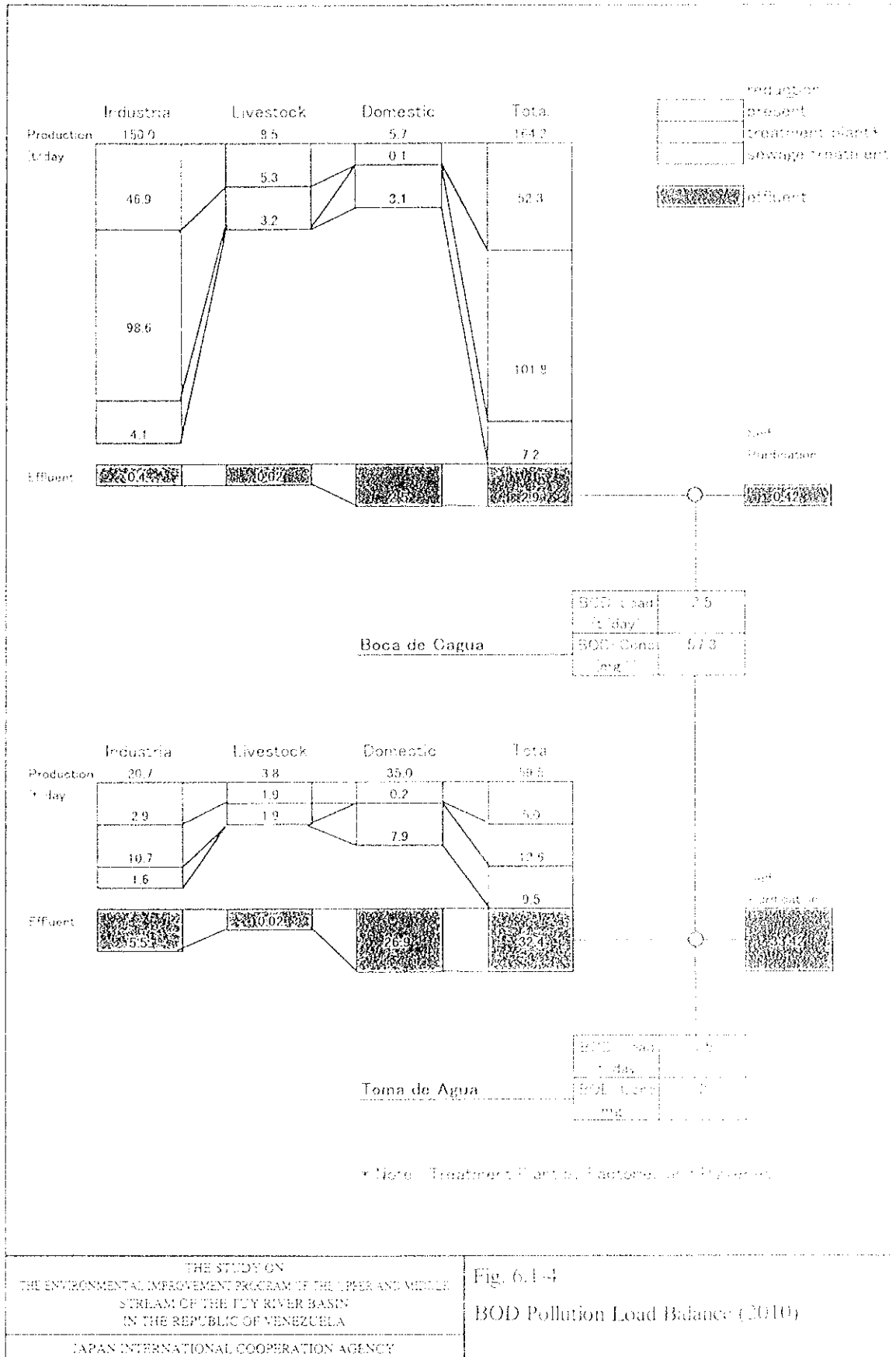
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Fig. 6.1-3 Flujograma del Proceso de  
Tratamiento de la Cloaca



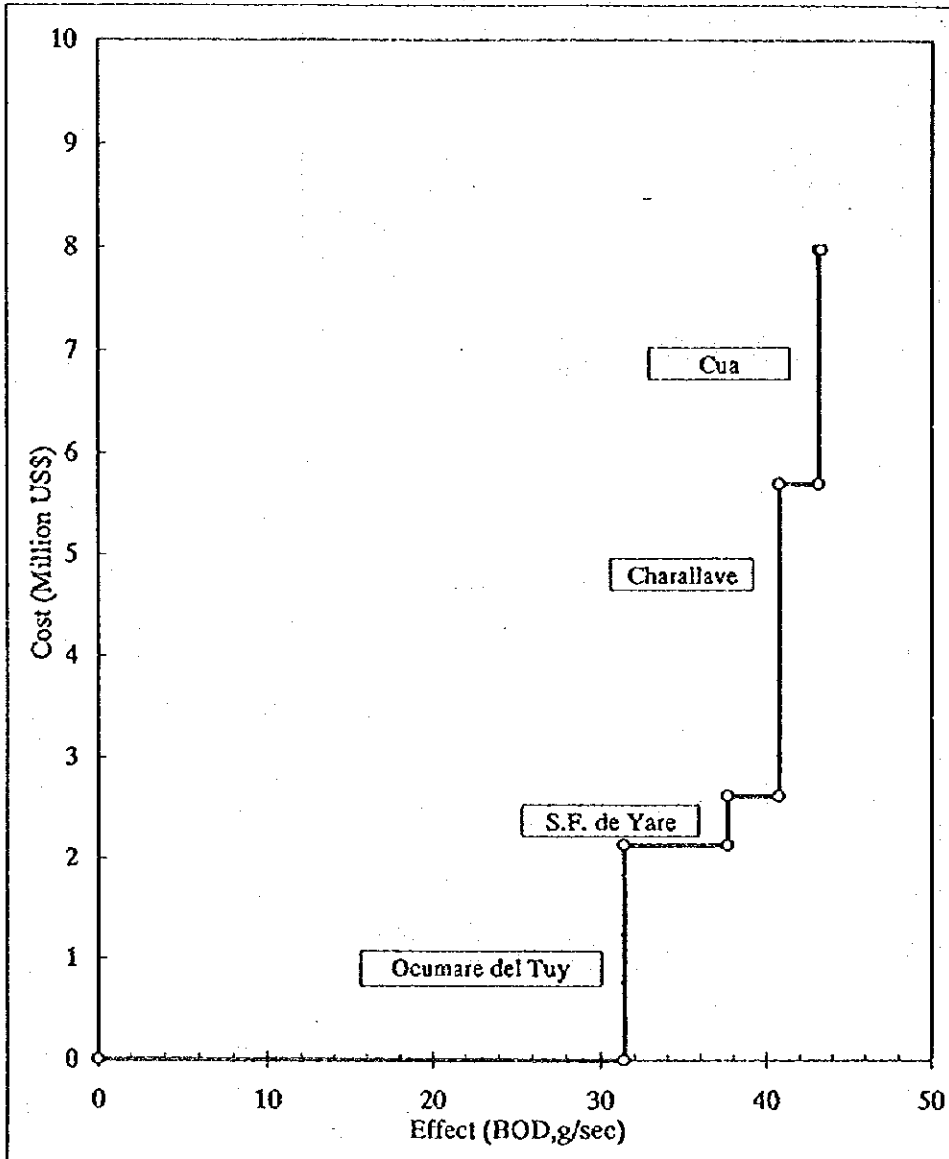
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Fig. 6.1-4  
 BOD Pollution Load Balance (2010)





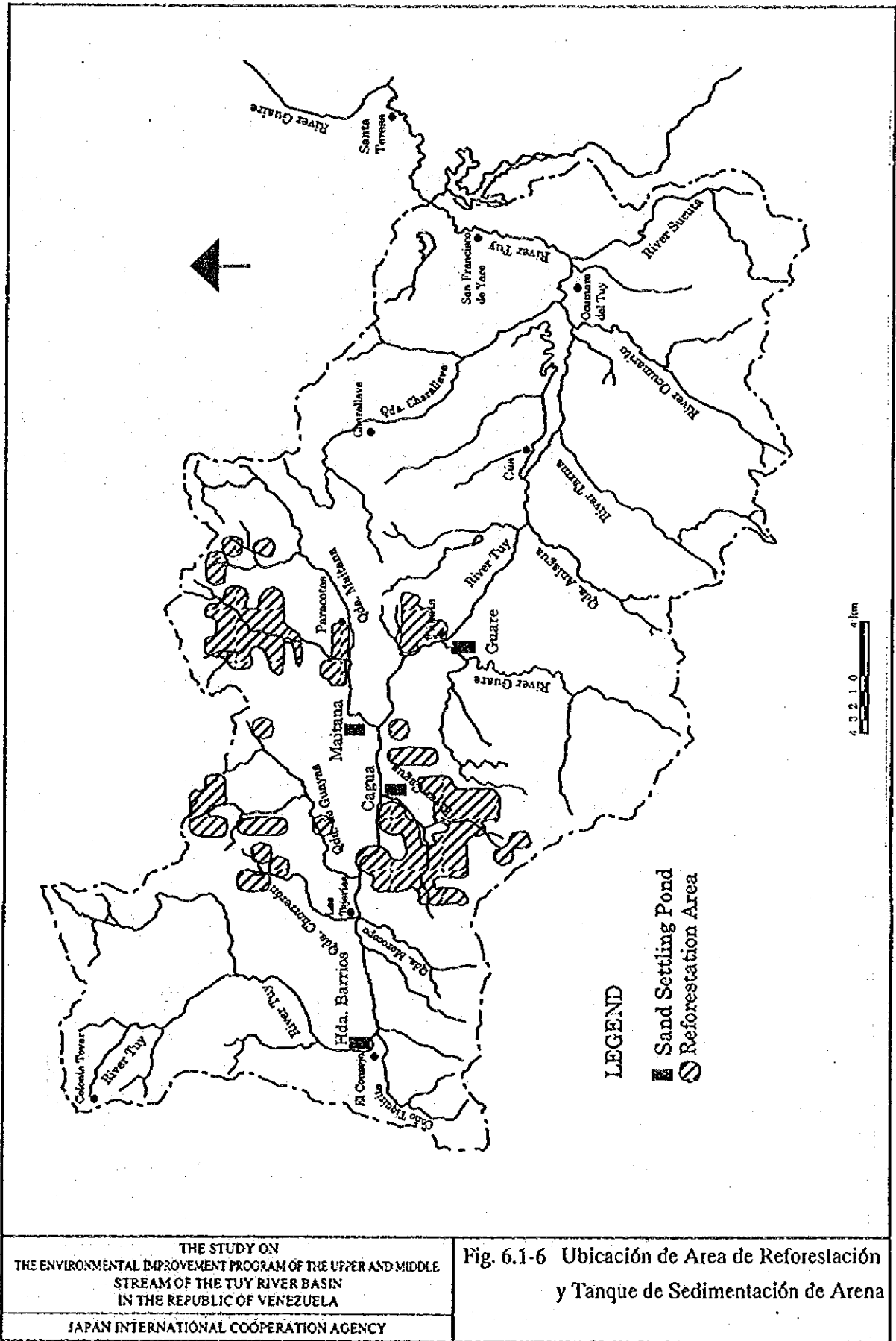
Sewer: Effect and Cost



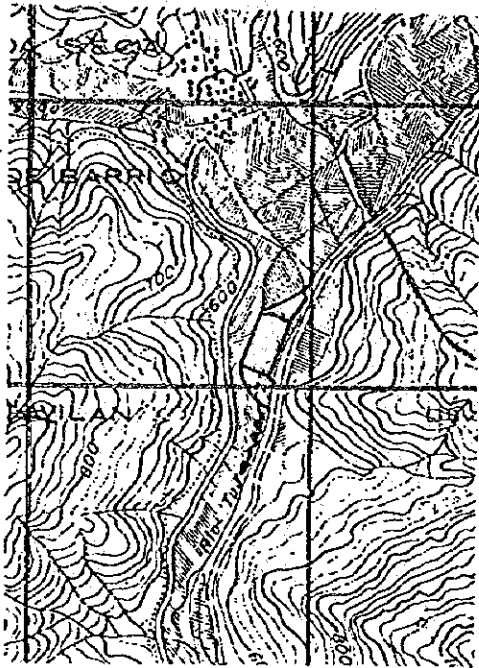
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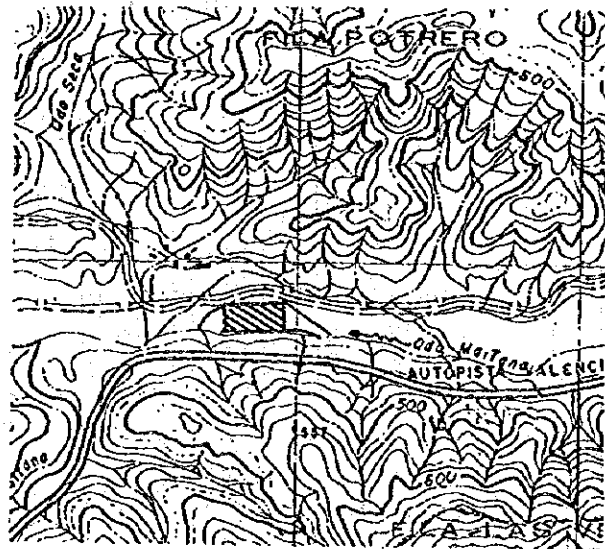
Fig. 6.1-5 Efecto y Costo del Tratamiento  
de Aguas Servidas por el Sistema  
de Cloacas



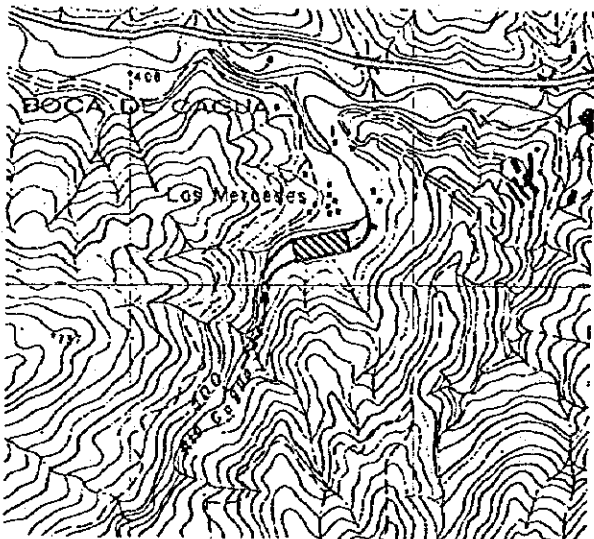
Upper Tuy (Hda. Barrios)



Qda Maitana



Cagua



Guare

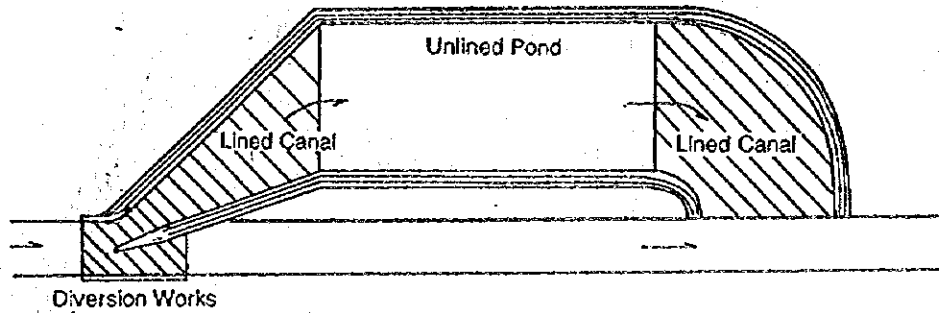


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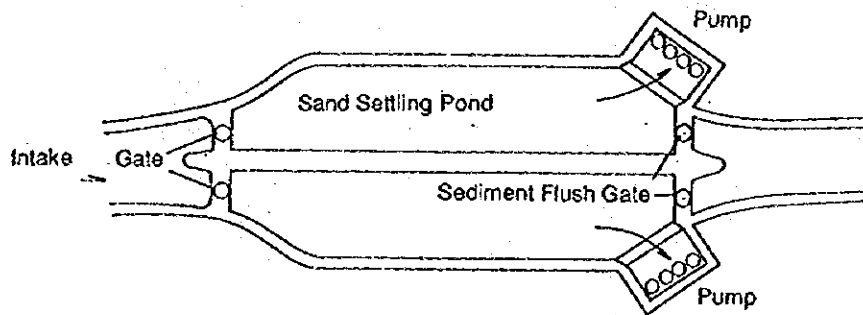
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Fig. 6.1-7 Localización de Tanque  
 de Sedimentación de Arena  
 en los Tributarios

### Sand Settling Pond on Tributaries



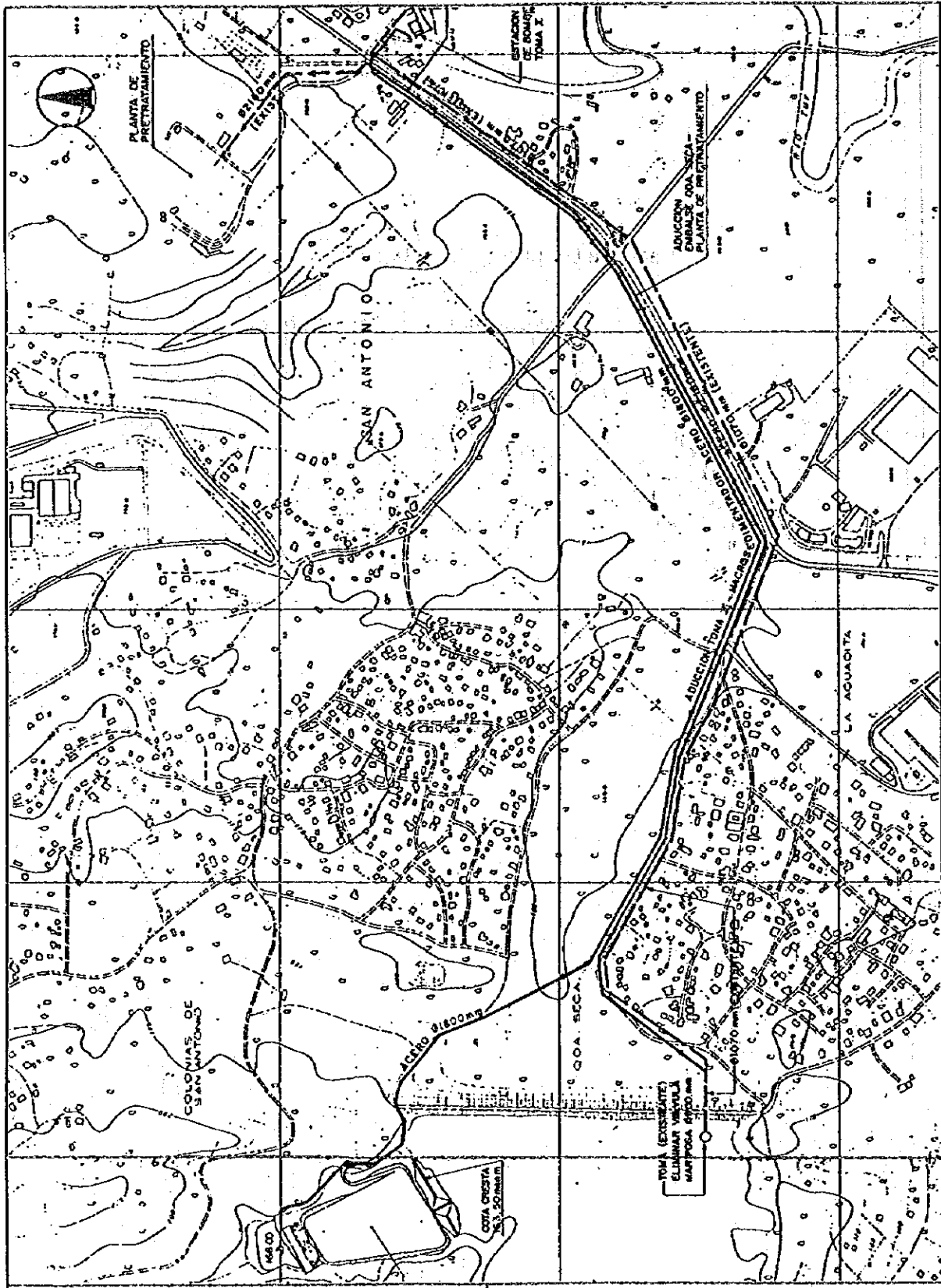
### Sand Settling Pond at Intake



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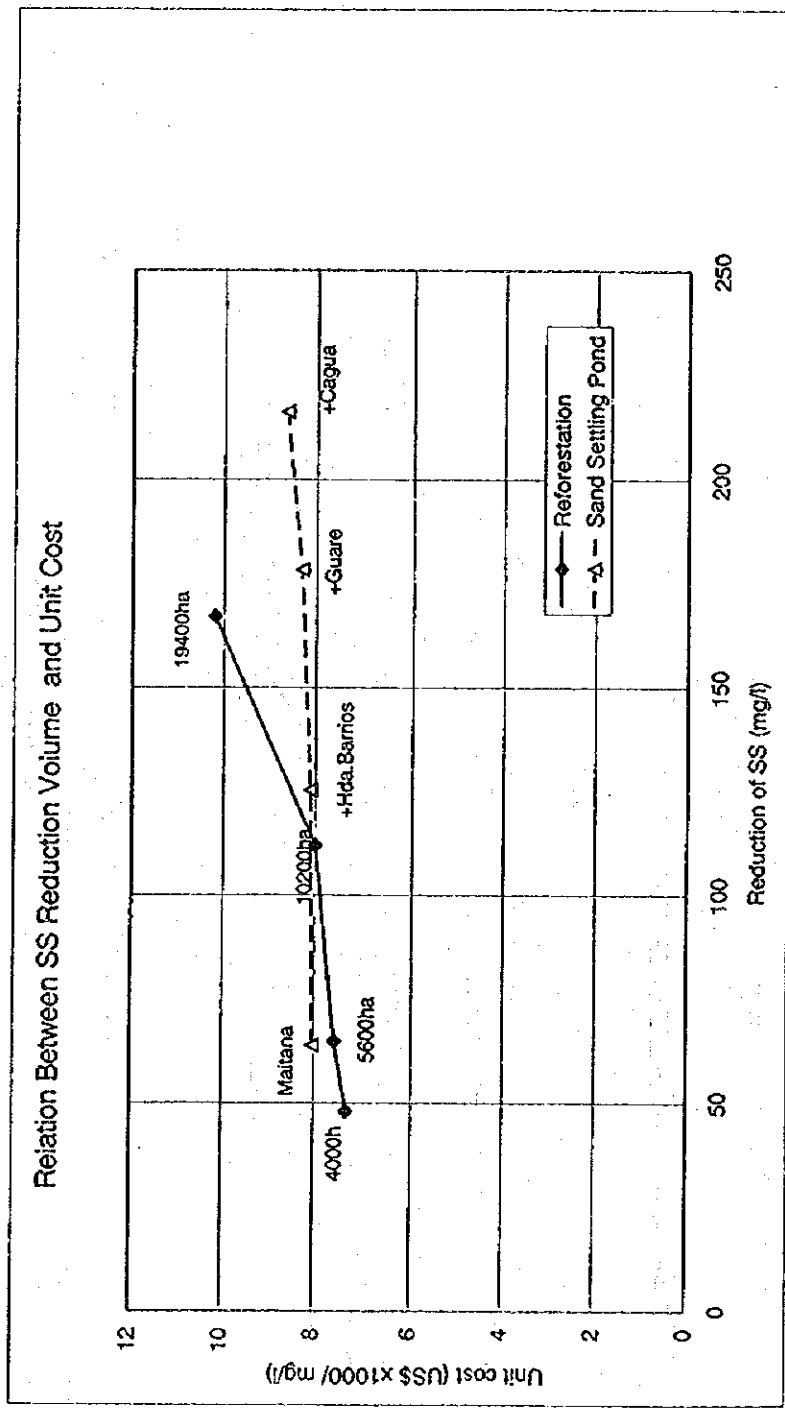
Fig. 6.1-8 Esbozo del Tanque de Sedimentación  
de Arena en los Tributarios  
y en las Tomas



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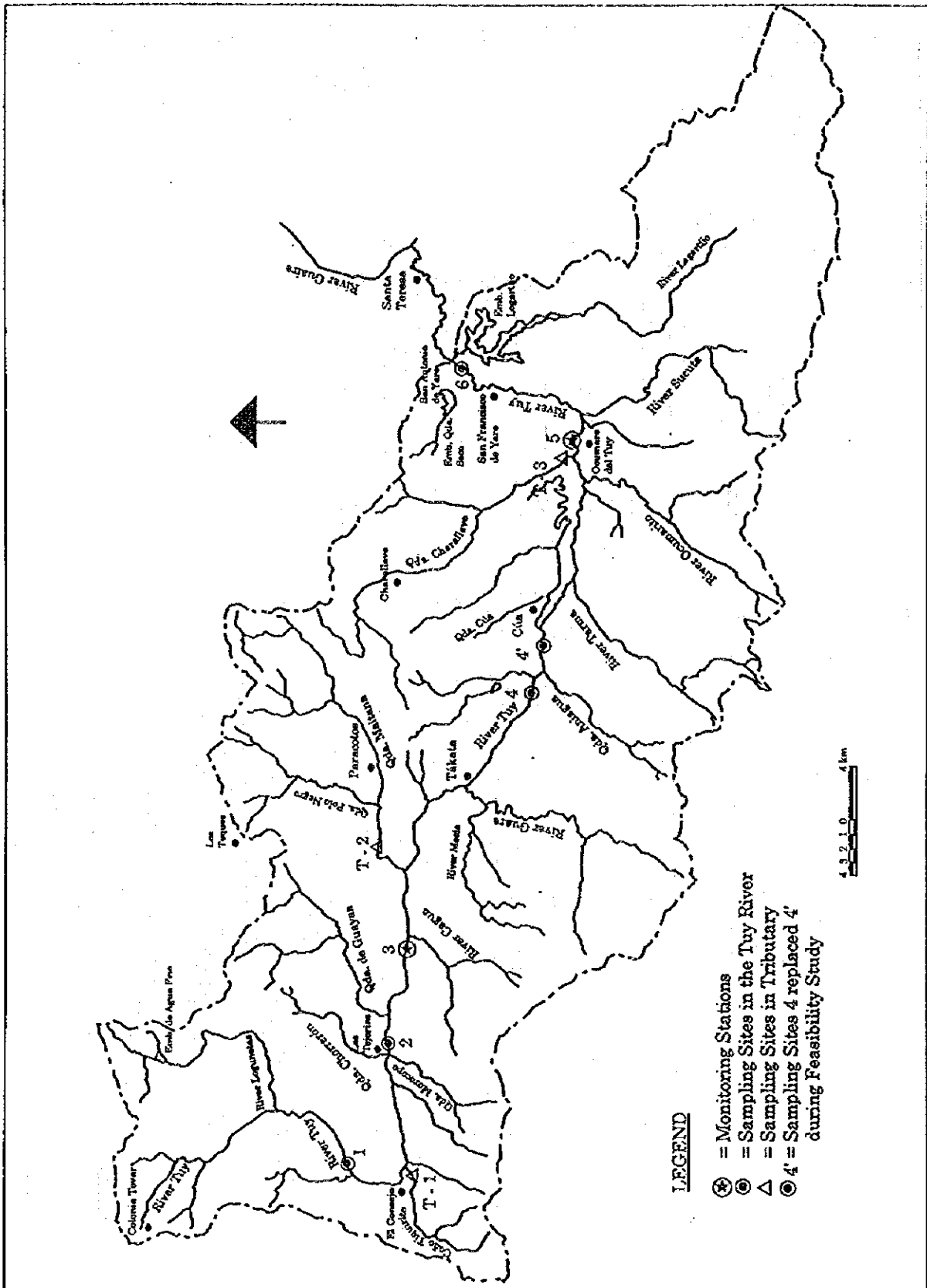
Fig. 6.1-9 Plan de Cañerías desde la Captacion hasta el Tanque de Sedimentación de Qda. Seca



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Fig. 6.1-10 Relación Entre el Volumen de Reducción de SS y Costo Unitario



- LEGEND**
- ⊗ = Monitoring Stations
  - ⊙ = Sampling Sites in the Tuy River
  - △ = Sampling Sites in Tributary
  - ⊙ 4' = Sampling Sites 4 replaced 4' during Feasibility Study

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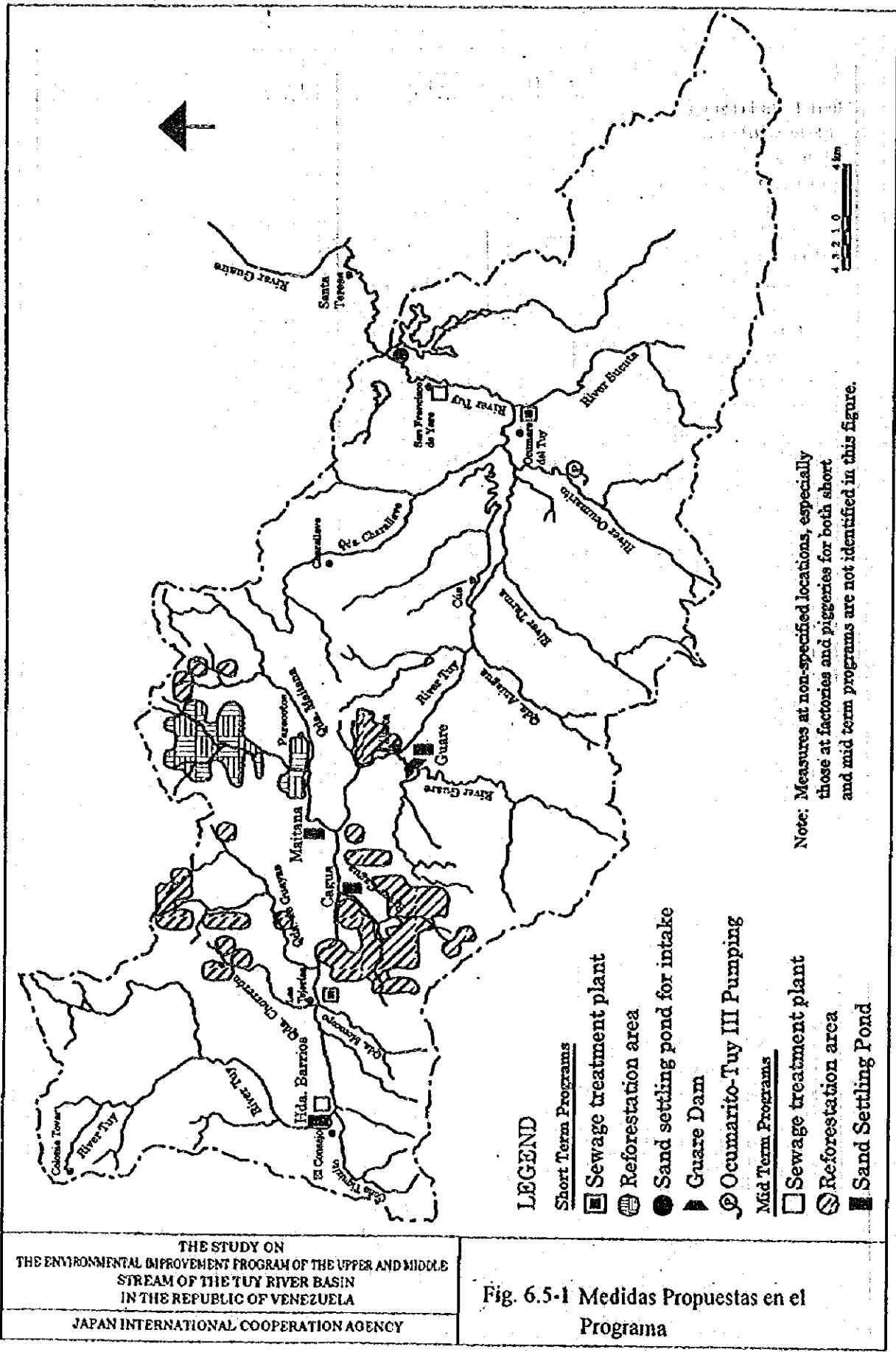
Fig. 6.1-11 Estaciones de Monitoreo Propuestas y Puntos de Muestreos

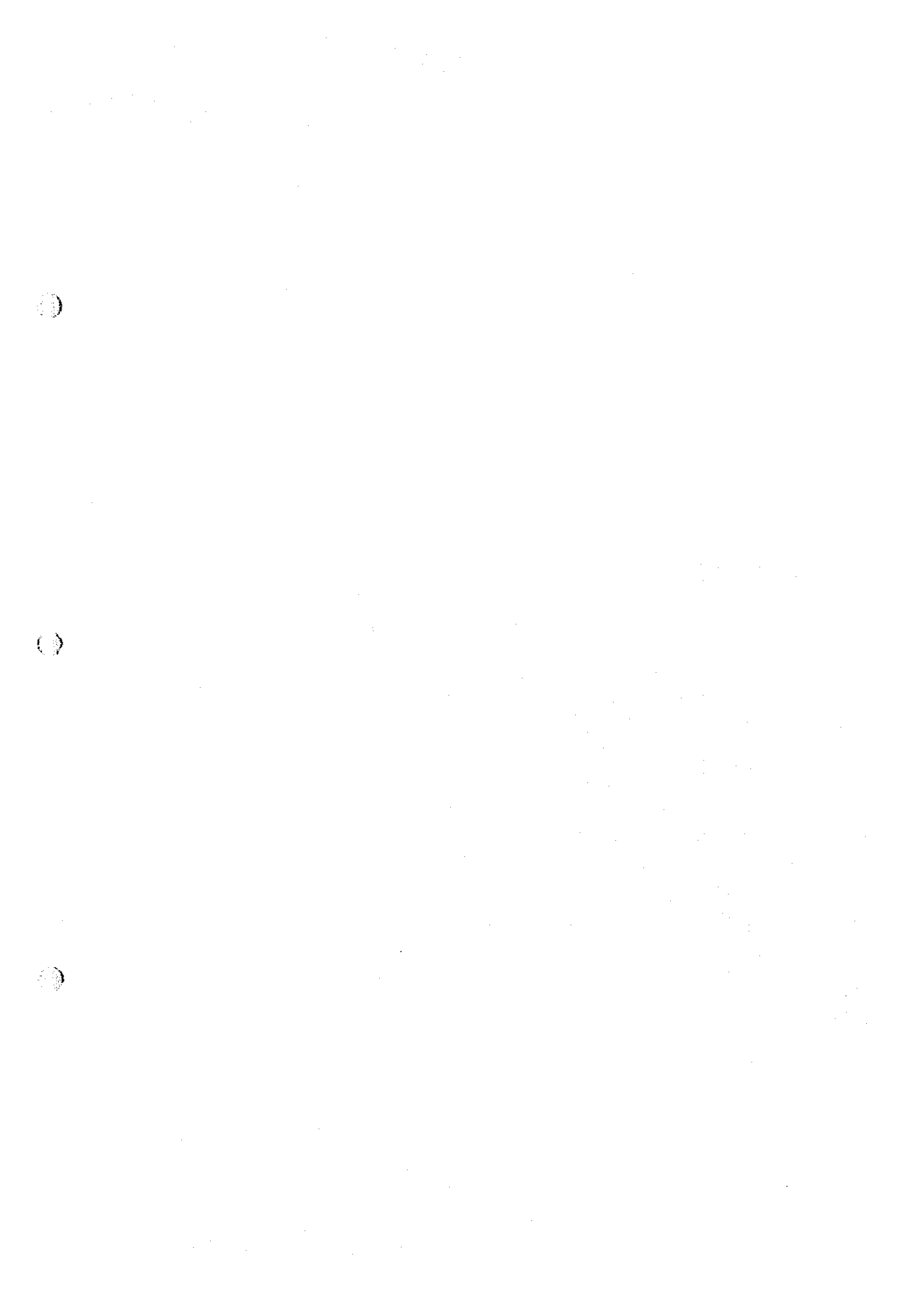
Item	Year												
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>Short Term Program</b>													
<i>Structure Measure</i>													
Water quality													
Factory (Food/non-food)													
Existing													
Newly developed													
Domestic wastewater													
Ocumare del Tuy													
Las Tejerías													
Turbidity													
Reforestation													
Water quantity													
Securement of water													
Ocumarito-Tuy III Pumping													
Guare Dam													
Factory													
For color/odor													
Turbidity													
Sand setting pond for intake													
<i>Institutional Measure</i>													
Laws and Regulations													
Organization													
Monitoring													
Public education													
Environmental Fund													
Pollution Charge													
<b>Mid Term Program</b>													
<i>Structure Measure</i>													
Water quality													
Factory (Food/non-food)													
Newly developed													
Domestic wastewater													
Ocumare del Tuy													
San Francisco de Yare													
El Consejo													
Turbidity													
Reforestation													
Sand setting pond for tributary													
<i>Institutional Measure</i>													
Sustainable enforcement													
Monitoring													
Strengthening of Control													
Public education													
Environmental Fund													
Pollution Charge													

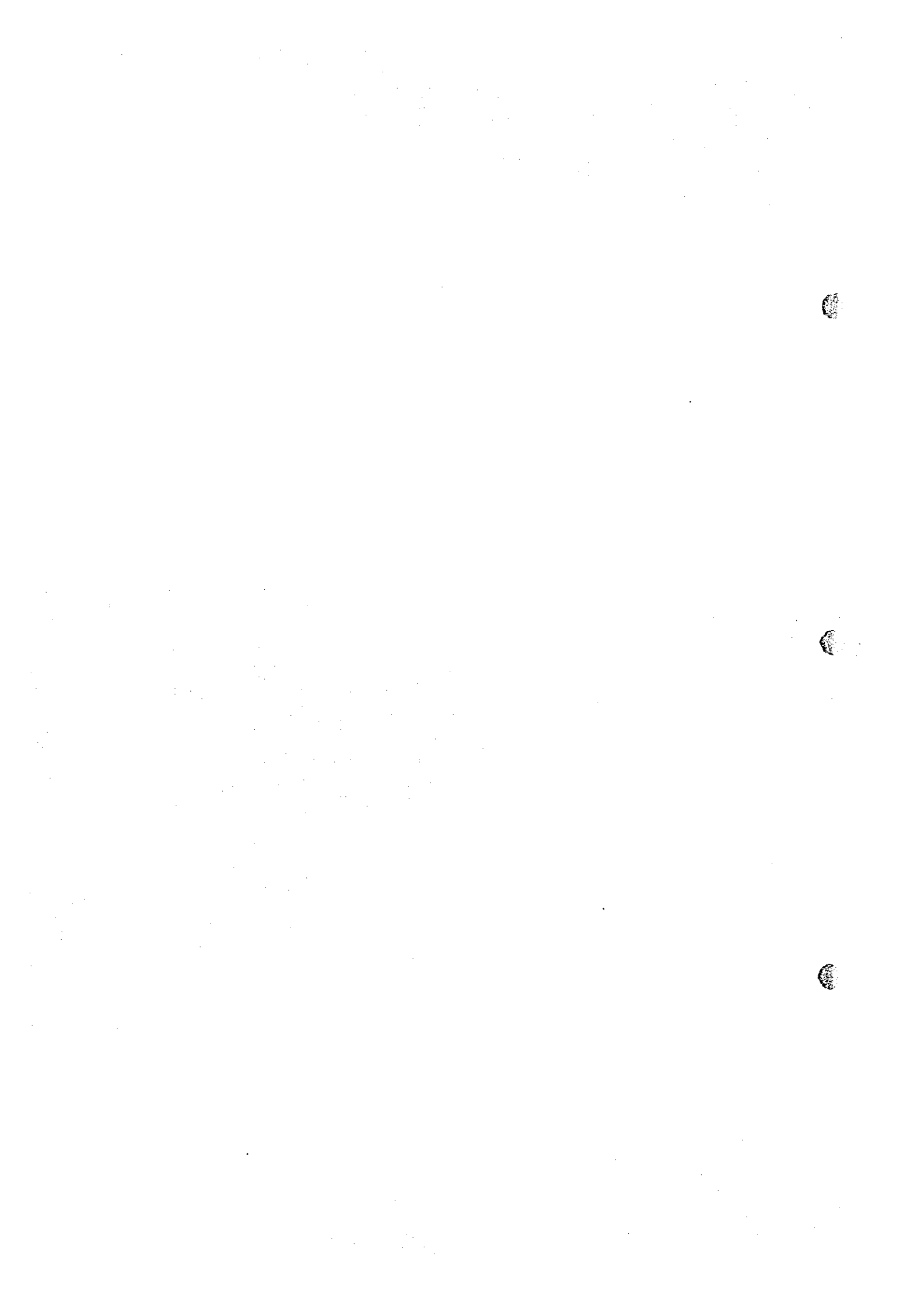
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Fig. 6.3-1 Programa de Implementación











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