JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF HOUSING, USE OF LAND AND ENVIRONMENT
THE ORIENTAL REPUBLIC OF URUGUAY

THE PROJECT ON
CAPACITY DEVELOPMENT FOR
WATER QUALITY MANAGEMENT
IN MONTEVIDEO AND METROPOLITAN AREA

FINAL REPORT
VOLUME 3: SUPPORTING REPORT

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COMPOSITION OF THE REPORT

Volume 1: Summary

Volume 2: Main Report

Volume 3: Supporting Report (CD version only)

- **Sector A Module No.1: Establishment of Policies and Strategies**
- **Sector B Module No.2: Pollution Source Management**
- **Sector C Module No.3: Ambient Water Quality Monitoring**
- **Sector D Module No.4: Dissemination, Education and Public Participation**
- **Sector E Implementation of Pilot Projects**
- **Sector F Technical Transfer**
- **Sector G Steering Committee Meetings**

ABBREVIATIONS

Organization, Programs and Projects

Abbreviation	:	English / *Spanish or Other Language*
APHA	:	American Public Health Organization
APRAC	:	*Asociación Pro Recuperación del Arroyo Carrasco* (Association for Carrasco Creeck Recovery)
CEADU	:	*Centro de Análisis y Documentación del Uruguay* (Center of Study, Analysis and Documentation in Uruguay)
CEPIS	:	*Centro Panamericano de Ingeniería Sanitaria* (Pan-American Center of Sanitary Engineering)
CIID Canada	:	*Centro Internacionnal de Investigacion para el desarrollo, Canada* (International Center of Investigation for the development, Canada)
CNDAV	:	*Comisión Nacional en Defensa del Agua y de la Vida* (National Water and Life Protection Commission)
COASAS	:	*Comisión Asesora de Agua y Saneamiento* (Advisory Commission for Water and Sanitation)
COTAMA	:	*Comisión Técnica Asesora del Medio Ambiente* (Technical Advisory Commission on Environment)
COMMAC	:	*Comisión Mixta de Monitoreo Ambiental Ciudadano* (Montevideo Citizen Environmental Monitoring Commission)
DGSA	:	*Dirección General de Servicios Agrícolas* (General Directorate of Agricultural Services)
DINAMA	:	*Dirección Nacional de Medio Ambiente* (National Directorate of Environment)
DINAMIGE	:	*Dirección Nacional de Mineralogía y Geología, Ministerio de Industria, Energía y Minas* (National Directorate of Mining and Geology, Ministry of Industry, Energy and Mining)
DINASA	:	*Dirección Nacional de Agua y Saneamiento* (National Directorate of Water and Sanitation)
DNH	:	*Dirección Nacional de Hidrografía, Ministerio de Transporte y Obras Públicas* (National Directorate of Hydrograph, Ministry of Transport and Public Works)
DNM	:	*Dirección Nacional de Meteorología, Ministerio de Defensa Nacional* (National Directorate of Meteorology, Ministry of National Defense)
ECOPLATA	:	*Apoyo a la Gestión Integrada de la Zona Costera Uruguaya del Río de la Plata* (Support to the Integrated Management of Coastal Zone of Uruguay along La Plata River)
EQED	:	Environmental Quality Evaluation Division

EnCD	:	Environmental Control Division
EPA	:	Environmental Protection Agency
FREPLATA	:	*Protección Ambiental del Rio de la Plata y su frente marítimo* (Environmental Protection of Plata River and its front to the sea)
GAAM	:	*Grupo Ambiental del Área Metropolitana* (Metropolitan Area Environmental Group)
GAM	:	*Grupo Ambiental de Montevideo* (Environmental Group of Montevideo)
GEA	:	*Grupo de Educación Ambiental* (Environmental Education Group)
GJM	:	*Grupo de Jóvenes MERCOSUR* (Group of Youth MERCOSUR)
GOJ	:	Government of Japan
IAAC	:	Inter-American Accreditation Cooperation
ILAC	:	International Laboratory Accreditation Cooperation
IMC	:	*Intendencia Municipal de Canelones* (Department of Canelones)
IMF	:	*Intendencia Municipal de Florida* (Department of Florida)
IMFIA	:	*Institución de Mecánica de los Fluidos e Ingeniería Ambiental, Facultad de Ingeniería, Universidad de la República Oriental del Uruguay* (Faculty of Engineering, Republic University of Uruguay)
IML	:	*Intendencia Municipal de Lavalleja* (Department of Lavalleja)
IMM	:	*Intendencia Municipal de Montevideo* (Department of Montevideo)
IMSJ	:	*Intendencia Municipal de San José* (Department of San José)
INIA	:	*Instituto Nacional de Investigación Agropecuaria* Institute of Agriculture and Livestock Investigation (in Chile)
JICA	:	Japan International Cooperation Agency (*Agencia de Cooperacion Internacional del Japón*)
LATU	:	*Laboratorio Tecnológico del Uruguay* (Technological Laboratory of Uruguay)
MDN	:	*Ministerio de Defensa Nacional* (Ministry of National Defense)
MGAP	:	*Ministerio de Ganadería, Agricultura y Pesca* (Ministry of Livestock, Agriculture and Fishery)
MIEM	:	*Ministerio de Industria, Energia y Mineria* (Ministry of Industry, Energy and Mining)
MTOP	:	*Ministerio de Transporte y Obras Públicas* (Ministry of Transport and Public Works)
MSP	:	*Ministerio de Salud Pública* (Ministry of Public Health)

MVOTMA	:	*Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente* (Ministry of Housing, Use of Land and Environment)
NIP	:	National Implementation Plan for Persistent Organic
OPP	:	*Oficina de Planeamiento y Presupuesto* (Office of Planning and Budgeting)
OSE	:	*Administracion de Las Obras Sanitarias del Estado* (Administration of Sanitarian Works of the State)
OUA	:	Uruguayan Organization of Accreditation
REDES	:	*Red de Ecología Social* (Social Ecology Network)
RENARE	:	*Dirección Nacional de Recursos Naturales Renovables, Ministerio de Ganadería, Agricultura y Pesca* (National Directorate of Natural Renewable Resources, Ministry of Livestock, Agriculture and Fishery)
SADCA	:	Southern African Development Cooperation for Accreditation
SAG	:	*Servicio Agrícola y Ganadero* (Agriculture and Livestock Service (in Chile))
SIGNAC	:	*Sistema de Informacion Geografica Nacional* (National Geographic Information System)
SISICA	:	*Sistema de Informacion de Calidad de Agua* (Water Quality Information System)
SISILAB	:	*Sistema de Informacion de Gestión de Laboratorio* (Laboratory Management Information System)
SUANCCE	:	Uruguayan System of Accreditation, Normalization, Certification, Calibration and Essays
UNDP	:	United Nations Development Program *(Programa de Desarrollo de las Naciones Unidas)*
UNESCO	:	United Nations Educational, Scientific and Cultural Organization *(Organización Educacional, Cientifico y Cultural de las Naciones Unidas)*
UNIT	:	Uruguayan Institute of Technical Terms
WQD	:	Water Quality Department
WQMC	:	Water Quality Management Committee

Others

AAS	:	Atomic Absorption Spectrophotometer
ADI	:	*Autorizacion de Desague Industrial* (Authorization of Industrial Discharge)
AWQM	:	Ambient Water Quality Monitoring

BOD	:	Biochemical Oxygen Demand *(Demanda Bioquimica de Oxigeno)*
COD	:	Chemical Oxygen Demand *(Demanda Quimica de Oxigeno)*
DDT	:	Dichloro-Diphenyl-Trichloro-ethane *(Dicloro-Difenil-Tricloro-etano)*
DO	:	Dissolved Oxygen *(Oxigeno Disuelto)*
EIA	:	Environmental Impact Assessment *(Evaluación de Impacto Ambiental)*
EIS	:	Environmental Impact Study
GAAM	:	*Grupo Ambiental del Area Metropolitana* (Metropolitan Area Environment Group)
GC	:	Gas Chromatography *(Gas Cromatográfico)*
GC-MS	:	Gas Chromatography and Mass Spectrometry
GIS	:	Geographic Information System *(Sistema de Información Geografica)*
HPLC	:	High Performance Liquid Chromatograph
IDL	:	Instrument Detection Limit
IEC	:	International Electrotechnical Commission
ISO	:	International Organization for Standardization
IPO	:	*Informe de Puesta en Operacion* (Report of Operation)
JCPP	:	Japan-Chile Partnership Programme
IPSM	:	Integrated Pollution Source Management
IWWM	:	Industrial Wastewater Management
LAN	:	Local Area Network
MECAEP	:	*Ministerio de la Calidad de la Educacion Publica* (Improvement of Quality of Primary Education)
MDL	:	Method Detection Limit
MPN	:	Most Probable Number
NGO	:	Non-Governmental Organization *(Organización No Gubernamental)*
NTU	:	Nephelometric Turbidity Unit
OJT	:	On the Job Training

O&M	:	Operation and Maintenance *(Operación y Mantenimiento)*
PCM	:	Project Cycle Management *(Manejo del Ciclo del Proyecto)*
PEA	:	Prior Environmental Authorization
Peso	:	*Pesos Uruguayos* (Uruguayan Pesos)
PME	:	Projects on Health and Environment
PSU	:	*Plan de Saneamiento Urbano* (Urban Sanitation Plan)
QA	:	Quality Assurance
QC	:	Quality Control
SADI	:	*Solitud de Autorizacion de Desague Industrial* (Application for Authorization of Industrial Discharge)
SOP	:	Standard Operation Procedure
SQL	:	Structured Query Language
SS	:	Suspended Solid
TSS	:	Total Suspended Solid
USD	:	United States Dollar *(Dolar Estadounidense)*
VHS	:	Video Home System
WQ	:	Water Quality

SECTOR A

MODULE NO.1: ESTABLISHMENT OF POLICIES AND STRATEGIES

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1. PRESENT INSTITUTIONAL AND ADMINISTRATIVE SETUP OF WATER QUALITY MANAGEMENT

The Chapter 4 describes current setup for enforcing water quality management in Uruguay, and institutional and administrative system thereof. This chapter examines the existing capacity and resources of DINAMA and other organizations concerned, which are direct objective of this Project.

1.1 Laws and Regulations

1.1.1 Overview

Uruguay has established a series of laws and regulations to protect and improve the water environment, as shown in **Table 1.1.1**. Of these, the ones directing governing and related with water quality are the Law No.17283 (General Environment Protection Law), the Decree-Law No. 14859 (Water Code), the Decree 253/79 (Water Quality Control Regulation and Standards) and the Decree No. 257/997 (by this Decree the DINAMA was re-structured).

1.1.2 General Policy for Water Environment

Some of the recent advances in Uruguayan environmental legislation were the establishment of General Law on Protection of the Environment (Law N.17283). In the Article 6, general principles of the environmental policy are given as tabulated below (Article 6):

A. Uruguay is characterized as "Natural Country", considering the sustainable development that integrates economical, cultural, and social aspects,
B. The prevention and prevision are the criteria with the highest priority against any others in the environmental management. Therefore, it is not possible to argue lack of absolute technical or scientific information to take preventive measures, when there is a danger of grave deterioration or irreversible degradation,
C. The gradual and progressive incorporation of new requirements must be considered for the effective integration of the environmental issues to the economic and social development,
D. The protection of the environment is constituted a compromise of the whole society, and, therefore, all persons and representative organizations have the right and duty for participating in relevant activities,
E. It must be recognized that the environmental management should involve many sectors and, accordingly, require the integration and coordination of the various public and private sectors concerned, ensuring the accomplishment of the nationally environmental policy and the decentralization of activities of environmental protection,
F. The environmental management must be based on an adequate management of the environmental information, securing its availability and accessibility by any interested part, and
G. The international cooperation on environmental matters must be developed and strengthened, promoting the elaboration of common environmental criteria.

The principles highlighted above will serve also as interpretative criterion to solve the questions that could rise from the application of the standards and environmental mandates, and in its relationships with another standards and mandates.

Table 1.1.1 Laws and Regulations for Water Quality Management

Laws and Regulations	Dated	Expedient Name	Profiles
Law No. 17283	November of 2000	General Environment Protection Law	This is a general law recently enforced for protecting all aspects of the environment including water quality.
Decree-Law No. 14859	December of 1978	Water Code	This is a fundamental legislation for water resources management, which covers surface water and groundwater, containing many dispositions to define rights and obligation of water users.
Decree 253/79 (with modification by Decree No. 232/988, No. 579/989 and No. 195/991)	May of 1979	Water Pollution Control Regulation and Standards	This setups the environmental standards and effluent standard of water quality, including legal procedures and instruments for the management of wastewater discharges.
Decree-Law No. 15239 (including the regulation 284/990)	December of 1981	Soil and Water Protection Regulation	This declares the national interest, and the use and conservation of soil and surface water for the purpose of agriculture and livestock.
Decree No. 85/983	March of 1983	Pollution Control Norm	This establishes pollution control norms for industries, especially slaughterhouses and other firms.
Decree No. 497/988	August of 1988	Liquid Waste Control Standard	This establishes the regulation for prohibiting the discharges of any kind of liquid waste from vacuum trucks into watercourses.
Law No. 16.466	January of 1994	Environmental Impact Assessment Law	This declares national interest on the environmental protection against any kind of degradation, destruction or contamination, establishing the requirements and procedures for environmental impact assessment.
Law No. 16.112	June of 1990	Establishment Law of MVOTMA	This declares the mandates of MVOTMA and duties.
Law No. 16.858	September of 1997	Irrigation Law	This law declares general interest for the irrigation water use.
Decree No. 435/994	September of 1994	Regulation for Environmental Impact Assessment	This provides the practical procedures on environmental impact assessment.
Decree No. 257/997	July of 1997	Decree that re-organize the DINAMA	This defines the responsibilities and duties of DINAMA including water quality, setting up organizational structures, functions, etc.
Law No. 9515	November of 1935	Law of Administration of Local Governments	This defines administrative structures, competence, duties, etc of local government units.

1.1.3 Legal Systems for Water Quality Management

(1) Major Players for Water Quality Management

DINAMA is a major player in the environment sector in Uruguay. In the administration of water quality management, a series of comprehensive and broad mandates for the legal execution are vested to DINAMA in the Decree No. 257/997 with the following provisions (Chapter II):

(a) Conduct planning, implementation, supervision, and evaluation of the plans for monitoring and evaluation of ecology system for the environmental resources including water resources, air, and ecosystems, including natural protected areas and coastal areas;

(b) Conduct planning, implementation, supervision, and evaluation of the plans for prevention of negative impacts by human activities and projects implementation, including promotion of environmental consciousness; giving priority to planning and execution of education, capacity building, information and dissemination activities for the adoption of behaviors consistent with the environmental protection and sustainable development (annexed text from Art. 11 of Law 17283);

(c) Conduct planning, implementation, supervision, and evaluation of plans to control public or personal activities that could impact on environmental quality, and also the same for recuperation and reparation planning that be approved (annexed text from Art.7 of Law 17283),

(d) Conduct planning and coordination for relating national and regional organizations for environmental protection, supporting the environmental management of municipal and local authorities and public institutions in general (annexed text from Art. 9 of Lay 17283). This includes support for the making of agreement between organizations or personals for the purpose of environmental protection.

(e) Conduct establishment and maintenance of relationships with relevant international bodies, to assurance the fulfillment of agreements and commitments related to the environment.

Besides DINAMA, numbers of governmental institutions are involved in water quality management in relation with water utilization, wastewater discharging, regional implementation of water-related measures, etc. DNH (MTOP), OSE, and RENARE (MGAP) are among them.

Meanwhile, the Law 9515 defines that municipal governments are responsible for maintaining the regional conditions of sanitation and hygiene (Article 35). In the connection of environmental management, the Decree 253/79 states that DINAMA may order relevant countermeasures to local governments (Article 31). The Law No. 17283 prescribes that DINAMA may contract parts of work in water quality management to local municipal governments (Article 8).

OSE and DNH are involved in water quality management, discharging their duties in the construction and operation of water supply and sewerage facilities, and the quantitative monitoring for water resources, respectively.

(2) Environmental Standard of Water Quality

In Uruguay, the environmental standard of water quality has been established in the Decree 253/79. The watercourses are classified into the Class 1 to the Class 4, a total of five classes (Article 3), according to the purposes of water utilization, as follows:.

- Class 1: Rivers and water bodies that can be used for drinking water supply to residents with conventional treatment.
- Class 2a: Rivers and water bodies utilized for irrigation and sprinkler on vegetables for eating raw and fruit tree.
- Class 2b: Rivers and water bodies utilized for recreational spots where human body contacts directly.
- Class 3: Watercourses used for preservation of fishes in general and other components of aquatic flora and fauna, or waters destined for irrigation and sprinkler of crops of which products is not consumed in its natural form or in those case that the product is consumed naturally and irrigation systems is applied where only the land is watered but not products.
- Class 4: Watercourses that runs through the urban or sub-urban areas where water quality must be maintained to be harmonized with the surrounded environment, or water courses destined to water crops which are not consumed by humans.

Table 1.1.2 shows water quality standard for each class as declared in the Article 5 of Decree 253/79.

The Decree 253/79 exerts many and important regulations for water quality management as well as the environmental standards. As such, the Decree 253/79 is regarded as a crucial administrative pillar in every aspect of water quality management, but the examination for amending this Decree is ongoing in COTAMA.

The environmental standard of water quality in Uruguay specifies simply 10 mg/l of nitrate expressed as nitrogen (NO_3^{--} as N). Thus, this value does not appear to aim at controlling the eutrophication phenomena.

On the other side, the environmental standard of water quality stipulates only total chromium as chromium compounds. Meanwhile, hexavalent chromium (Cr^{6+}) that is widely known as intensely toxic substance is not specified, despite pollution of hexavalent-chromium pollution is possible due to the existence of many tannery factories.

These are ones of the examples of deficiencies of the current standard.

Table 1.1.2 Environmental Standard of Water Quality

Parameters	Class 1	Class 2a	Class 2b	Class 3	Class 4
Odor	Not detected	Not detected	Not detected	Not detected	Not discomfort
Floating substances	Not detected	Not detected	Not detected	Not detected	Not detected
Color	Not detected	Not detected	Not detected	Not detected	Not detected
Turbidity (NTU)	Max. 50	Max. 50	Max. 50	Max. 50	Max. 100
pH	6.5 - 8.5	6.5 - 9.0	6.5 - 8.5	6.5 - 8.5	6.5 - 9.0
DO (mg/l)	Min. 5	Min. 5	Min. 5	Min. 5	Min. 2.5
BOD_5 (mg/l)	Max. 5	Max. 10	Max. 10	Max. 10	Max. 15
Fats and oils (mg/l)	Not detected	Not detected	Not detected	Not detected	Max. 10
Detergent (mg/l)	Max. 0.5	Max. 1	Max. 1	Max. 1	Max. 2
Phenol (mg/l) as C_6H_5OH	Max. 0.001	Max. 0.2	Max. 0.2	Max. 0.2	
Ammonia (mg/l) as N	Max. 0.02	Max. 0.02	Max. 0.02	Max. 0.02	
Nitrate (mg/l) as N	Max. 10	Max. 10	Max. 10	Max. 10	
Total phosphorus (mg/l) as P	Max. 0.025	Max. 0.025	Max. 0.025	Max. 0.025	
Suspended Solids (mg/l)		Max. 700			
Sodium Absorption Ratio		Max. 10			
Fecal Coliform (MPN/100ml)	Max. 2,000 (Max. 1,000)*	Max. 2,000 (Max. 1,000)*	Max. 1,000 (Max. 500)*	Max. 2,000 (Max. 1,000)*	Max. 5,000 80% of sample
Cyanide (mg/l)	Max. 0.005	Max. 0.005	Max. 0.005	Max. 0.005	Max. 0.05
Arsenic (mg/l)	Max. 0.005	Max. 0.05	Max. 0.005	Max. 0.005	Max. 0.1
Boron (mg/l)	-	Max. 0.5	-	-	-
Cadmium (mg/l)	Max. 0.001	Max. 0.001	Max. 0.001	Max. 0.001	Max. 0.01
Copper	Max. 0.2	Max. 0.2	Max. 0.2	Max. 0.2	Max. 1
Total Chromium (mg/l)	Max. 0.05	Max. 0.05	Max. 0.05	Max. 0.05	Max. 0.5
Mercury (mg/l)	Max. 0.0002	Max. 0.0002	Max. 0.0002	Max. 0.0002	Max. 0.002
Nickel (mg/l)	Max. 0.02	Max. 0.002	Max. 0.02	Max. 0.02	Max. 0.2
Lead (mg/l)	Max. 0.03	Max. 0.03	Max. 0.03	Max. 0.03	Max. 0.05
Zinc (mg/l)	Max. 0.03	Max. 0.03	Max. 0.03	Max. 0.03	Max. 0.3
Pesticides (Max. value)	Aldrin + dieldrin: 0.004 mg/l, chlordane: 0.01 mg/l, DDT: 0.001 mg/l, endosulphan: 0.02 mg/l, endrin: 0.004 μg/l, heptachlor + heptachlor Epoxy: 0.01 μg/l, lindane: 0.01 μg/l, metoxychloro: 0.03 μg/l, mirex: 0.001 μg/l, 2,4 D: 4 μg/l, 2,4,5 T: 10 μg/l, 2,4,5 TP: 2 μg/l, parathion: 0.04 μg/l, poliaromatics compounds: 0.001 μg/l.				Ten times of the values presented in the left column.

Note:

1) (*) marks stand for geometric mean with min. 5 samples.
2) Pesticides stipulated in the environmental standard of water quality are also specified in the standard besides the above-mentioned parameters.

Source: Decree 253/79.

(3) Regulations for Wastewater Discharge

The regulation for industrial wastewater in Uruguay is basically complied with the principle of "Command and Control". The Decree 253/79 states numbers of legal requirements for the qualities of wastewater discharged from industries.

The effluent standard of discharged wastewater, shown in **Table 1.1.3**, is specified depending on the discharge destinations: sewerage, rivers and ground (Article 11).

Table 1.1.3 Effluent Standard for Industrial Wastewater

Parameters \ Discharge Points	Drain to the Public Sewerage	Direct discharge to river	Infiltrate into soil
Floating matter	Not detected	Not detected	Not detected
Temperature	Max. 35°C	Max. 30°C but not exceed temp. of water area +2°C	Max. 35°C
pH	5.5 - 9.5	6.0 - 9.0	5.5 - 9.0
BOD_5 (mg/l)	Max. 700	Max. 60	
Solid deposit (mg/l)	Max. 10	Max. 150	Max. 10
Total solid (mg/l)			Max. 700
Fats and oils (mg/l)	Max .200	Max. 50	Max .200
Sulfide (mg/l)	Max. 5	Max. 1	
Phenol (mg/l)		Max. 0.5 (C_2H_5OH)	
Flow rate	Max.2.5 times of average flow rate	Max. 1.5 times of average flow rate	
Ammonia (mg/l)		Max. 5	
Phosphorus (mg/l)		Max. 5	
Coliform bacteria (MPN/100ml)		Max. 5,000	
Cyanide (mg/l)	Max. 1	Max. 1	Max. 1
Arsenic (mg/l)	Max. 0.5	Max. 0.5	Max. 0.5
Cadmium (mg/l)	Max. 0.05	Max. 0.05	Max. 0.05
Copper (mg/l)	Max. 1	Max. 1	Max. 1
Total Chromium (mg/l)	Max. 3	Max. 1	Max. 3
Mercury (mg/l)	Max. 0.005	Max. 0.005	Max. 0.05
Nickel (mg/l)	Max. 2	Max. 2	Max. 2
Lead (mg/l)	Max. 0.3	Max. 0.3	Max. 0.3
Zinc (mg/l)	Max. 0.3	Max. 0.3	Max. 0.3

Source: The Decree 253/79

Note: Pesticides stipulated in the environmental standard of water quality are also specified besides the above-mentioned parameters.

DINAMA, a directorate responsible for the environment in MVOTMA, is vested numbers of responsibilities in the regulation of industrial wastewater by the Decree 253/79. Major legal instruments for enforcing its competence are summarized below:

Authorization of Wastewater Discharge

Entities that generate wastewater in their industrial activities are obligated to be authorized by MVOTMA (Article 23 and 29). Entities are also obligated to obtain the permission from OSE beforehand, when they discharge wastewater into the water bodies classified as the Class 1 or the sewerage managed by OSE (Article 25). In practical, the "entities" are defined to include housings, thus, domestic wastewater from housing zones are the subject for the authorization.

Registering and Processing of Qualified Expert and Report of Operation

To plan, construct and operate wastewater treatment facilities, qualified expert must be selected and registered to MVOTMA (Article 26). The qualified experts are obligated to periodically report the operating status of the facilities to MVOTMA (Article 27).

Order of Improvement

In case wastewater treatment facilities do not meet the given standards, MVOTMA may order necessary countermeasures for the improvement to entities (Article 17 and 28).

Compliance Inspection

MVOTMA along with OSE and municipalities may enter the site of entities to inspect relevant facilities and take water sample for the effluent monitoring (Article 30).

Imposition of Fines against Violation

Entities are fined for the violation to the legal requirements of the Decree 253/79, such as: negligence of application for the Authorization, negligence of the submission of required information, incompliance for the improvement order, etc. (Article 32).

Apart from the Decree 253/79, the Municipal Department of Montevideo has established the resolution for the regulation of industrial wastewater discharge. This resolution, shown in **Table 1.1.4**, specifies the phased regulation values with lax values at the beginning as compared those of the Decree 253/79.

Table 1.1.4 Effluent Standard in Department of Montevideo

Parameters	Units	Discharge for Sewerage			Discharge for River Courses		
		1st stage Mar. '97	2nd stage Jul. '98	3rd stage Dec. '99	1st stage Mar. '97	2nd stage Jul. '98	3rd stage Dec. '99
BOD_5 for General	mg/l	-	1,000	700	150	100	60
Exceptions							
Textile Washing		-	-	3,000	300	150	60
Leather Tannery		-	2,000	1,000	300	150	60
(Decree 253/79)		(700)			(60)		
Total Chromium	mg/l	10	10	5	5	5	1
(Decree 253/79)		(3)			(1)		

Source: Municipal Government of Montevideo, Resolution 761/96, February 1996.
Note: This table shows only selected parameters.

This phased regulation schemes are explained as the expedient and viable way for attaining the actual accomplishment of water quality improvement.

(4) Basic Approaches of Water Quality Management

The current activities and various dispositions prescribed in the Decree 253/79, and other laws and regulations concerned have been thoroughly investigated. Based on these results, activities for enforcing water quality management in Uruguay may be expediently categorized into the following component approaches:

- Establishment of policy and strategies (Decree 253/79: Article 19),
- Classification of water bodies (Decree 253/79: Article 3, 5, 6),
- Control of pollution sources including industrial/domestic wastewater, discharge from solid waste disposal, wastewater from non-point sources, Decree 253/79: Article 3, 5, 11, 12, 13, 15, 17, 22, 27, 28, 29, 30, 32), and
- Ambient water quality monitoring (Decree 253/79: Article 9).

In addition, the prescription for diffusion, education and public participation related with water quality are found in the Law 17. 283: Article 11.

Apart from the actual implementation, it is judged that Uruguay, like other developed countries, has most provisions necessary for water quality management in its legal setting.

(5) Prior Environmental Authorization

The MVOTVA is the only official responsible organization for the management of environmental impact assessment in Uruguay as defined by the law 16.466 in January 1994. The regulation of the environmental impact assessment was approved on 21st of September of the same year by the decree 435/994. It describes 29 activities, constructions or works, which need to acquire Prior Environmental Authorization (PEA). The following are some of those relating to the present project:

- Construction of national or departmental roads,
- Construction of new ports,
- Construction of works for petroleum or chemical products,

- Construction of oil ducts or gas ducts that are longer than 10 km,
- Construction of wastewater emissaries when the pipeline that conducts the wastewater to the receiving body has a length of more than 50 m inside of this,
- Construction of treatment plant and final disposal for toxics and dangerous waste,
- Construction of domestic wastewater treatment plant for cities with more than 10,000 inhabitants,
- Extraction of minerals,
- Construction of industrial complex or the installation of industrial units when more than one (1) hectare of area is needed for their processing activities,
- Construction of tourist and recreation complex,
- Construction of dam with reservoir capacity of more than 10 million m^3 ,
- Construction of canals, aqueducts or pumping stations for irrigation, when discharge capacity is more than 2 m^3/sec,
- Construction of water intake with a capacity of more than 2 m^3/sec.

Basically, PEA procedure consists of the following four steps: (1) project communication, (2) classification, (3) request for PEA, and (4) decision. In this regard, general procedure of PEA is shown in **Figure 4.1.1** and further details are given as follows:

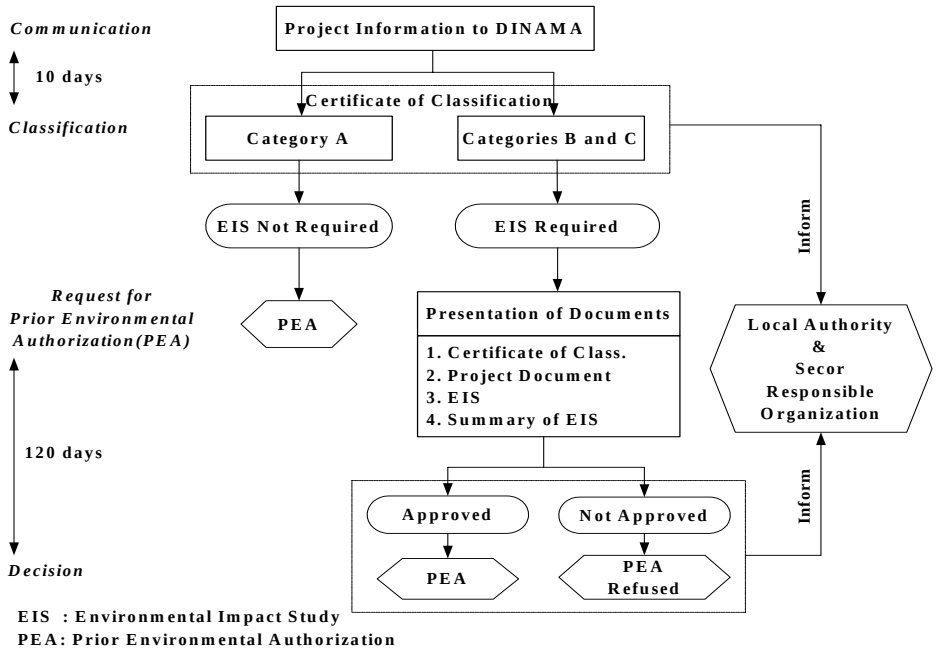

Figure 4.1.1 General Procedure of PEA

Project Communication

Person or persons interested in the implementation of project need to present project information to DINAMA as an initial step to PEA. Information required shall include the project description, identification of landowner, technical responsible, project-affected area, possible environmental impacts and its mitigation or

prevention measures. And as a result, the project needs to be classified in one of the three categories depending upon the following conditions:

Category A: Project or activities, by which no negative impacts can be predicted or impacts may be produced within an allowable level. In this case, environmental impact study (EIS) is not required.

Category B: Project or activities, by which negative impacts are predicted to a certain extent and partially affect environment, but these can be eliminated or minimized by taking an appropriate measure. EIS is required.

Category C: Project or activities, by which significant impacts are predicted on the environment, and it is absolutely necessary to take prevention or mitigation measures. EIS is required for complete assessment.

Classification

Within 10 (ten) days from the receipt of the project information, MVOTMA shall evaluate it and examine whether the proposed classification comply with definitions. If it is judged appropriate, MVOTMA will issue the certificate of classification and give instructions to the person or persons interested in the project implementation according to the category. Those who are approved as category "A" shall be authorized to obtain PEA under the resolution of MVOTMA. Upon the classification is made, it shall be informed to the local authority and sector responsible organization.

Request for PEA

For those classified as categories "B" and "C", EIS needs to be conducted by their own cost. EIS shall cover various aspects about the project with a view to emphasizing the need of describing impacts on natural and social environment. It is therefore important to include in the study the description of activities in each phase of the project, personnel involved, type of raw materials and foreseeable waste and so on. The documents required for PEA shall be a copy of the certificate of classification, project documents, EIS report and its summary. The evaluation method of EIS shall be decided by the professional team in this field of specialty.

Decision

MVOTMA will evaluate the project based on the results of EIS and if judged that negative impacts can be minimized or reduced to the allowable level by taking proper measures and are considered not to be a pollution source, PEA will be approved. This decision-making process will take at least 120 days, unless correction or modification is instructed to the interested entity about mitigation measures. The decision shall be informed to the local authority and sector responsible organization.

1.2 Organizations Concerned and Current Resources

1.2.1 National Directorate of Environment (DINAMA)

(1) General

The Water Code (Decree-Law N. 14.859) is a fundamental law in water quality management in Uruguay and originally MTOP was designated as an authority institution of this law. However, with the creation of MVOTMA in 1990, some competences were transferred from MTOP to MVOTMA. Currently, the function of MTOP through DNH is to manage water resources from the point of view of quantity and, meanwhile, MVOTMA through DINAMA from the point of quality.

(2) Tasks

DINAMA, one of directorates of MVOTMA created in 1990 by the Law No. 16112, is a central organization for enforcing water quality management in Uruguay, with a series of the wide competence. The Decree 257/979 defined in 1997 that DINAMA is responsible for the formulation, execution, supervision and evaluation of national plans of environmental protection and to propose the national policy taking into account a sustainable development.

Besides, the Decree 257/997 defines DINAMA's functions more specifically in the chapter III, as follows:

- To operate the Environmental Quality Measurement and Evaluation System, through the development of evaluation programs for air, water and ecosystems.
- To operate the Environmental Information System (including the Annual Report on Environment highlighted by Art. 12 of Lay 17283) related to air, water (including water resources inventory highlighted by Art.7 of Water Code), soil and biota and the development of technical standardization for methodologies of measurement and evaluation of the environmental quality;
- To operate the Environmental Control System, through the development of programs of emissions to the air, noise, wastewater, solid waste management, dangerous substances and activities in especial protected areas; and programs of recuperation and reparation that be approved (annex text of Art.7 of Law 17283)
- To support COTAMA's functions, providing technical and administrative assistances;
- To administrate the National Fund for Environment and the Fund for Protected areas (annexed text from Art. 16 of Law 17234 – National System for Protected Areas);
- To implement management tools not contained in the Law 17283 or another legal relevant framework (annexed text from Art.7 of Law 17283).

(3) Technical Advisory Commission on Environment (COTAMA)

COTAMA is an inter-institutional organization of MVOTMA that involves different sectors, for the advice and coordination in policy and environmental management matters, as stated in the Ministry Creation Law (Law No. 16.112).

Its main objective is to advise the Minister of MVOTMA on environmental matters. It is composed of 27 members including representatives from all ministries, OPP, Congress of Mayors, University of Republic, Trade Unions, Industrial and Commercial Association and NGOs. The Minister of MVOTMA is the president of COTAMA. The vice-president is the Director of DINAMA and the permanent secretary is the legal adviser of DINAMA. COTAMA adopts decisions of different nature and it may advise the MVOTMA on different environmental matters.

(4) Organizational Structure and Personnel

DINAMA, as shown in **Figure 1.2.1**, is organized by five line divisions: the Environmental Quality Evaluation Division, the Environmental Impact Division, the Environmental Control Division, the Natural Protected Area Division and the Administration Division. The total staff is 68 as of today including the national director and division directors.

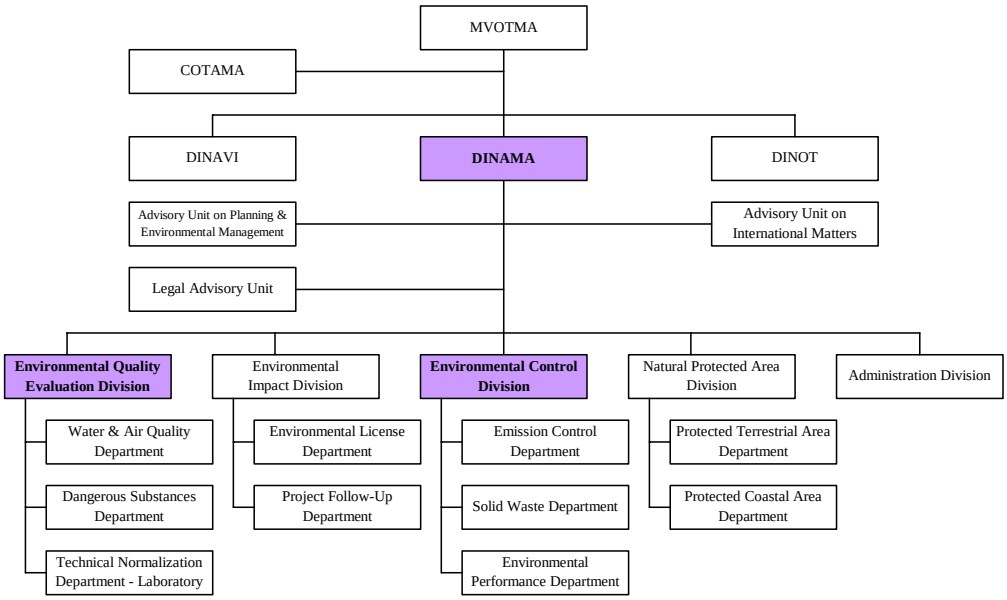

Figure 1.2.1 Organizational Structure of DINAMA

Among the divisions, the Division of Environmental Quality Evaluation and the Division of Environmental Control are directly involved in water quality management. Their main functions are summarized as follow:

<u>Division of Environmental Quality Evaluation</u>

- To ensure the implementation and efficient functioning of the system on measuring and environmental quality evaluation, through the development of evaluation programs of air, water and ecosystem,
- To initiate and maintain the system of environmental information related to air, water, soil and biota and the development of methodologies of measurement and evaluation of the environmental quality, and

- To propose the regulations and to control the activity of measurement of physicochemical and biological parameters undertaken by third parties.

Division of Environmental Control

- To ensure the implementation and efficient functioning of the system on environmental control, through the development of control programs of air, noise, wastewaters, solid waste management, dangerous substances and activities on special areas of protection, and
- To propose the regulations and to control the activities of the measurement of physicochemical and biological parameters undertaken by third parties.

DINAMA accommodated the unit specializing the environmental education in the past. Now, there is no specific unit to work with dissemination and education on water quality management.

Human resources allocated to both divisions are 31 in total, as detailed in **Table 1.2.1.** Of these, a total of 15 (2 for water quality management, 8 for measurement and analysis in laboratory, and 5 for industrial wastewater management) are working exclusively for water quality management. The numbers being allocated currently are very limited, especially in water quality monitoring/evaluation, when their vast duties in water quality management are considered.

With respect to dissemination and environmental education, there are three persons with university degree (a social communicator, a licentiate and master in education, an architect), working for editing, elaboration and publishing of a bimonthly newsletter "Ambiente Uruguay". On an irregular basis, these person works on dissemination campaigns but they were engaged in only few works on water quality dissemination in the last six years.

In the relation to public participation, there are two persons with university degree (a lawyer and an education licentiate), working in COTAMA Secretariat. COTAMA has a special working group on water resources, for updating the Decree 253/79.

Table 1.2.1 Staff Numbers of DINAMA

Categories of Personnel	Whole of DINAMA	EQED <1>	EnCD <2>	Staff for Water Quality Management of <1> & <2>
Senior Administrator (national and div. directors)	7	1	1	2
General Expert for Economic, Legal, Personnel, etc.	2	0	0	0
Technical Expert	33	9	8	8
Technicians and Laborers	14	4	4	5
Clerical Staff	12	3	1	0
Total	68	17	14	15

Note: EQED: Environmental Quality Evaluation Division, EnCD: Environmental Control Division

Individual technical level of staff is generally relevant to duties, with sufficient knowledge and skills necessary for their routine works. However, given that their current tasks are only a part of their original duties, its individual abilities are required to be much more strengthened so as to efficiently and effectively perform their works.

On the other hand, DINAMA's decision-making system and leadership as an institutional unit appears to be vague and, thus, the abilities of staffs may be constrained.

(5) Water Quality Laboratory

DINAMA accommodates a water quality laboratory (Technical Normalization Department) with a total of 8 employees (3 graduated and 5 assistants). In the connection of water quality management, its main tasks are to measure and analyze samples that are brought by the Division of Environmental Quality Evaluation (water samples) and the Division of Environmental Control (industrial effluent samples).

Equipment for Measurement and Analysis

The DINAMA's laboratory with the floor area of about 200 m^2 is well equipped for analyzing water and air quality, soil as well as materials contained in the wastewater. The equipments available now are used for various kinds of manual analysis, analysis of heavy metals, bacteria and pesticides, etc. It should be noted that Atomic Absorption Spectrophotometer (AAS) has been operated since its installation in late 1980s, and Gas Chromatograph (GC) and High Performance Liquid Chromatograph (HPLC) have been nearly seven years since their installation but they have been used for only a short-term. Major items of equipment are as follows:

- Manual Analysis: Drying equipment, incubator (for BOD_5), muffle, centrifugal separator, Soxhlet extractor,
- Instrumental Analysis: Conductivity meter, pH meter, ion electrode, gas chromatograph, UV-visible spectrophotometer, atomic absorption spectrophotometer, high-performance liquid chromatograph, and
- Microbiology: Autoclave, dry heat sterilization, laminar flow chamber, incubator, portable incubator, freezer, microscope.

The laboratory of DINAMA is able to measure and analyze almost all parameters listed in water quality standards, and it sometimes relies on contractors for the analysis of some specific parameters. The maximum capacity of the laboratory is reported to be 20 to 30 water samples a week. Until April 2004, the analysis of pesticides has never been implemented by DINAMA for practical purposes so that GC has never been used for over 6 months and therefore, the limit of detection was unknown.

The laboratory emits the results of the analysis of water and effluents.

Quality Assurance

For laboratory work, inter-calibration was conducted a few years ago with the laboratory of IMM to make a crosscheck of the analysis data. The sample was supplied by the Pan-American Center of Sanitary Engineering (CEPIS) in Lima, Peru. In addition, Inter-calibration is conducted several times a year with Aquacheck of UK. In 2003, for example, it has been implemented five times. The methods of sample preservation and analysis are in compliance with standards of US Environmental Protection Agency (EPA) and American Public Health Organization (APHA). Manual of analysis procedures is available in the laboratory but some parameters (especially for pesticides) are lacking in either water quality or wastewater standards. In this case, EPA or APHA becomes a problem-solving document.

Certification

The laboratory of DINAMA has a certificate of ISO9001: 2000 so that all routine works are carried out according to this system and procedures. Therefore, various forms and documents are used to make sure the effective workflow. Furthermore, the laboratory is currently in preparatory stage in order to obtain accreditation ISO/IEC17025 for 7 parameters (BOD_5, COD, Cr, Pb, SS, total coliform and fecal coliform).

(6) Procedural Manuals and Standards

Manuals for analysis and measurement of water quality are arranged in the laboratory of DINAMA. The basic methods applied are in compliance with the standards of US-EPA and APHA. These manuals covers almost all of parameters of water quality except for parameters like pesticides and others, which the laboratory does not handle and are opened publicly on the homepage of DINAMA. The laboratories in local municipalities can use the manuals prepared by DINAMA for their practical work and training.

The Division of Environmental Control has established manuals for the measurement of industrial wastewater flow and for the sampling of groundwater. Besides these, DINAMA has no any other kind of procedural manuals and standards. Practical works in industrial wastewater management, water quality monitoring, etc. are taking place depending on individual staff's knowledge and experience.

(7) Information System

Filing of Water-Related Information

While DINAMA owns its central library for collecting general documents and materials, the information of water-related matter is separately filed among the divisions or departments related to water resources development and water works projects. Basic data and information necessary for water quality management like geographic conditions, precipitation, water discharges of rivers and groundwater, sources of pollution loads, and pollution control facilities are not filed coordinately.

Organizations concerned with water quality management like the Municipal Department of Montevideo or OSE have been engaged in respective studies, generating massive data and information useful for DINAMA. The Division of Environmental Quality Evaluation, however, has not established systems to file such reports and publications.

In the Division of Environmental Control, documents for administrative processing, authorization of industrial wastewater, etc. have been stored in specified places. Especially, data and information relating with authorization are stored and well maintained in the database system called the "SADI (Application for Authorization of Industrial Discharge)".

Database System

As one of the results in industrial wastewater management, the "SADI" System has been established by the Division of Environmental Control, carrying data and information on all of 513 entities currently registered in DINAMA over the whole Uruguay. Main data and information stored in the database are names of entity, locations, industrial categories, etc. In this system, persons' names responsible for each wastewater treatment plant are also recorded.

In terms of water quality data monitored in the past, a database has not been provided, and measured data are just kept in the form of spreadsheet. Moreover, relevant information like sampling places is not filed properly. Therefore, these water quality data are not accessible for third parties practically, for the time being.

Website

DINAMA is equipped with LAN system within its office and the homepage publicizing its policy, activities and other environmental information. In terms of water quality management, the homepage publicizes the data and information of industries with SADI procedure. Qualified experts necessary for the authorization for industrial wastewater discharge are also available in the homepage.

The utilizations of the homepage for publication are widely varied depending on divisions. The Division of Environmental Control actively opens information related to industries, however, the Division of Environmental Quality Evaluation opens some information except the data related to water quality.

(8) General Facilities

As general facilities supporting various kinds of activities, the Division of Environmental Quality Evaluation and Division of Environmental Control have the office with the floor area of 450 m^2, two tuck-type vehicle (for the whole of DINAMA use) and 33 sets computers.

1.2.2 Governments of Local Municipalities

(1) Overview

Local municipal governments are responsible for the collection and disposal of solid waste, the construction of urban and secondary roads, environmental hygiene controls, etc. Although their functions do not include the provision of sanitation services (water supply and sewerage) except for the Municipal Government of Montevideo, municipal governments implements water and sanitation faculties in rural area. Likewise, currently municipal governments are more involved in the sectors of education and health.

Among main local sources of finances are the collection of revenues in land and vehicle taxes, garbage collection, commerce, maintenance of infrastructure and various fines. The other important sources of municipalities are the transference of budgets from the Central Government. The Law of National Budget determined the percentage allocated to the departments in the total resources of the country like: 3.2 % for the year 2001, 3.4 % for the year 2002 and 2003 and 3.5 % for 2004.

The constitutional reform in 1996 gave the bases of the institutional arrangement to accelerate the decentralization of the country. To realize this decentralization, the commission consisting of the association of Mayors and Central Government was organized and, along this initiation, OPP is preparing the decentralization policy.

In terms of decentralization of the environmental administration, the General Environment Law (No. 17283) empowered recently emphasizes that the participation of municipal governments into the environment management and widely opened public attentions are of the most importance along with the decentralization.

(2) Montevideo

Organization

The Municipal Government of Montevideo was restructured in 2000, composed of a total of eight line departments, as shown in **Figure 1.2.2**. Of these, the Environmental Development Department dealing with sewerage, industrial wastewater and monitoring of watercourses is the unit related to water quality management.

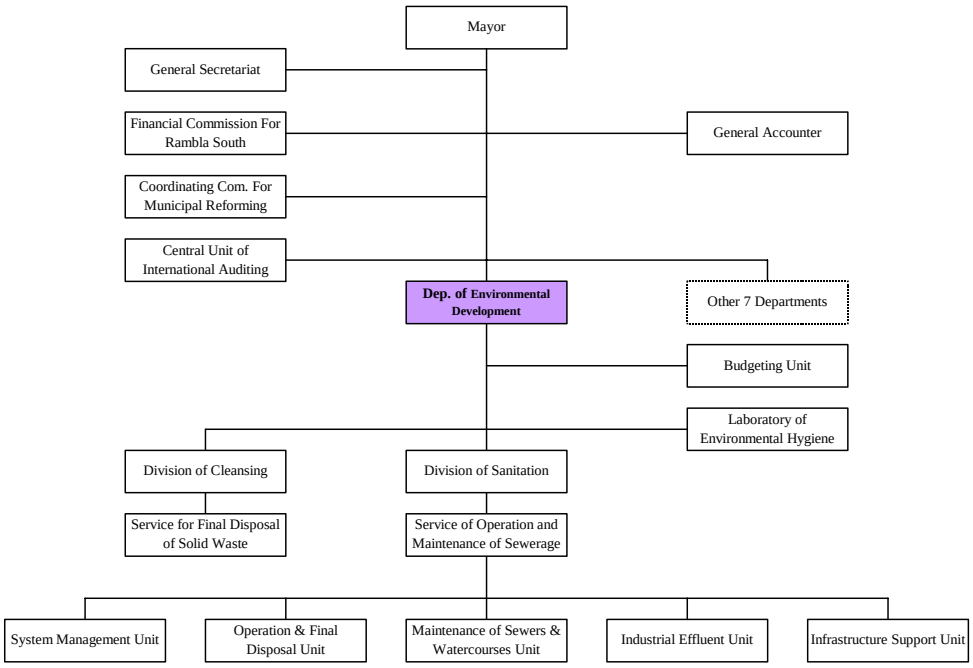

Figure 1.2.2 Organizational Structure of Municipal Government of Montevideo

The main functions of the Environment Development Department are summarized below:

- To study, project, manage and control all related to the environmental subjects,
- To control, administrate and manage the execution of all works of sewerage, cleansing, control of industries, control of streams and beaches,
- To foment the diffusion if environmental campaigns and workshop of environmental education,
- To elaborate technical reports on air composition, electromagnetic radiations, noise mapping and other aspects related to the environment,
- To regulate the storage, transport, maintain, manipulation and combustion of liquid and gas combustible products to be managed in safe manner and with the minimum possible contamination, and
- To mange all procedures related to connections and inspection on the environmental matters.

Human Resources

The Government of Montevideo is rich in the staff numbers. Among a total staff of about 8,700, about 1,800 including contract-based belong to the Environment Development Department, as shown in **Table 1.2.2**. The Department has two main divisions: the Division of Cleansing with about 1,400 employees and the Division of Sanitation with about 280 employees. The Department also accommodates other units such as: the Environmental Hygiene Laboratory Unit, the Executing Unit for Urban Sanitation, the Environmental Education Group, the Administration Commission for Swampy Areas of Santa Lucía, etc. **Table 1.2.2** stands for the staff numbers of these units related to water quality management.

Table 1.2.2 Staff Numbers of the Water-Related Units of Montevideo

Categories of Personnel	Units	Maintenance of Sewers & Water Courses	Industrial Effluent	Env. Hygiene Laboratory	Env. Education	Adm. Commission for Swampy Area
University Degree	(people)	9	3	11	1	1
Technical Degree	(people)	17	-	6	9	2
Administrative Degree	(people)	12	1	3	3	2
Laborers/Inspectors	(people)	99	-	-	-	1
Total	(people)	137	4	20	13	6

Individual capacity of staff in water quality management appears to be well relevant to respective tasks, because they have experienced many opportunities on this matter.

Laboratory

The Government of Montevideo owns a well-equipped laboratory in Punta Carretas to handle manual analysis and instrumental analyses, with 20 employee engaged in environmental measurement and analysis. The laboratory is capable of conducting manual analysis for physical/chemical analysis, and heavy metal and biological analysis but will not be able to analyze pesticides as there is no proper equipment for this purpose. Inter-calibration has been carried out with DINAMA to assure the precision of analysis data. It is informed that analysis methods are the same as DINAMA, which means that they follow EPA and APHA.

Information System

The Government of Montevideo has the LAN system in the Government office and has also established the website, publicizing much information on water-matters. It has issued annually the "IMM Environmental Report" since 2000, summarizing their activities in environmental sectors.

Dissemination, Education and Public Participation

There is an Environmental Education Group, with 15 persons: one with university degree, nine with technical degree, and three administrative. In public participation, the Government has formed GAM (Montevideo Environmental Group) with a very wide participation and has a working group on water resources. GAM has regular meetings to elaborate Montevideo Environmental Agenda. The Government supports all the activities needed for the functioning of GAM, with meeting rooms, materials and computers.

The Government of Montevideo also has formed the Citizen Environmental Monitoring Commission with municipality officers, NGOs and citizen environmental local commissions. The objective of this network is to monitor and control environmental problems and pollution sources with citizen participation. The Government has allocated necessary facilities in each local zone to meet together the local commissions.

(3) Canelones

In the Municipal Government of Canelones, the General Directorate of Environmental Management, the General Directorate of Health Attention and the Environment Inspectorate are related with water quality management, as shown in **Figure 1.2.3**.

The Government of Canelones has a total staff of about 4,800. Of them, 550 are engaged in water quality-related works, as shown in **Table 1.2.3** and majority of them are charged in physical labor works. Laboratory has limited equipment for measuring pH, DO, BOD and bacteriological analysis. Individual capacity of staff engaged in water quality management appears to be limited, because of the lack of proper training and actual experience.

With respect to dissemination, education and public participation, the Government of Canelones has neither specific department nor staff on water quality issues. Some representative from the General Directorate of Environmental Management and the General Directorate of Health Attention and Environment Inspectorate participate on an irregular basis in related seminars and workshops.

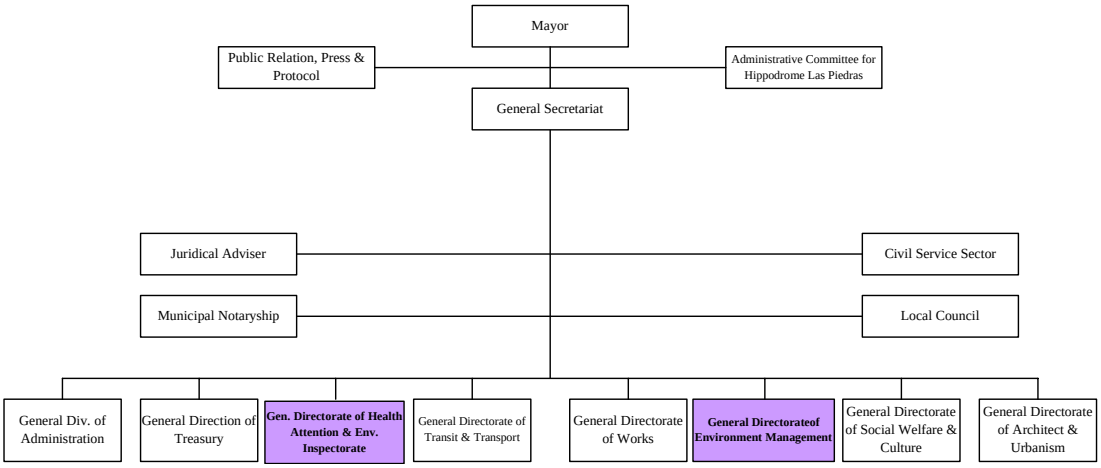

Figure 1.2.3 Organizational Structure of Municipal Government of Canelones

Table 1.2.3 Staff Numbers of Water-Related Directorate in Canelones

Categories of Personnel	General Direction of Environmental Management	General Direction of Health Attention and Environment Inspectorate	Laboratory
Senior Chief	4	4	1
University Degree	10	8	-
Technical Degree	5	2	2
Administrative	42	42	-
Laborers/Inspectors	433	13	1
Total	494	69	4

(4) San José

In the Municipal Government of San José, the Department of Hygiene, the Office of Land Use and Environment Office are related with water quality management, as shown in **Figure 1.2.4**.

The Government of San José has a total staff of 715. Of them, in water quality-related works, a total of about 70, as shown in **Table 1.2.4**, are engaged but majority of them are charged in physical labor works. Laboratory has limited equipment only for bacteriological analysis. Individual capacity of staff engaged in water quality management appears to be limited, because of the lack of proper training and actual experience.

Environmental education programs are dealt with the Office of Territorial Ordering and Environment together with different stakeholders of the society including primary and secondary schools. Two persons with university degree and two persons with technical degree are working in this office.

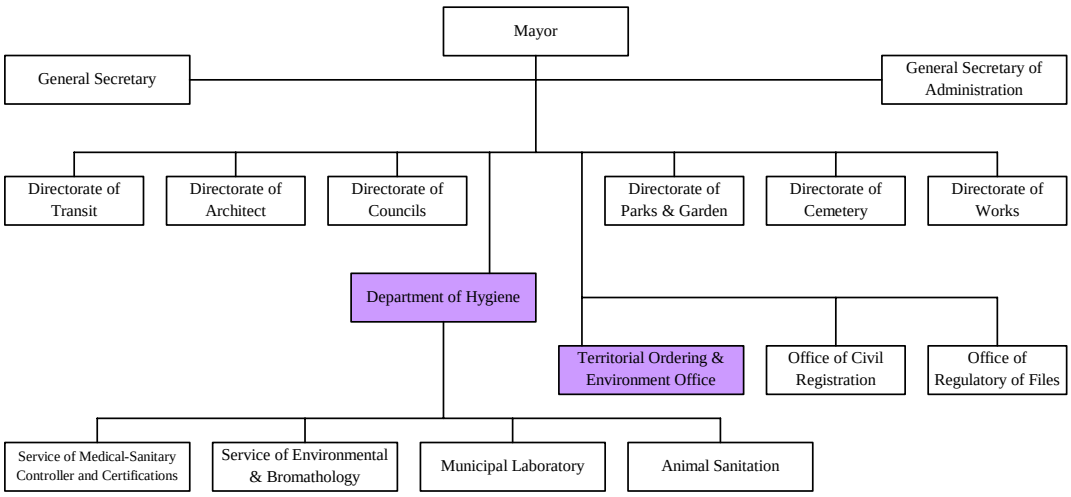

Figure 1.2.4 Organizational Structure of Municipal Government of San José

Table 1.2.4 Staff Numbers of Water-Related Department in San José

Categories of Personnel	Land Use and Environment Office	Department of Hygiene	Laboratory
University Degree	2	3	1
Technical Degree	2	-	-
Administrative	-	17	2
Laborers/Inspectors	-	41	-
Total	4	61	3

(5) Florida

In the Municipal Government of Florida, the General Directorate of Hygiene is related with water quality management, as shown in **Figure 1.2.5**. The total staff of the Municipal Government of Florida is 1,145. Of these, a total of 142, as shown in **Table 1.2.5**, are allocated to the General Direction of Hygiene. In water quality-related work, majority of them are charged in physical labor works.

Laboratory owns limited equipment for bacteriological analysis. Individual capacity of staff engaged in water quality management appears to be limited, because of the lack of proper training and actual experience.

The General Directorate of Hygiene is in charge of promoting massive education campaigns in order to improve the health of the population, but no area or staff is devoted to environmental education activities on water quality issues.

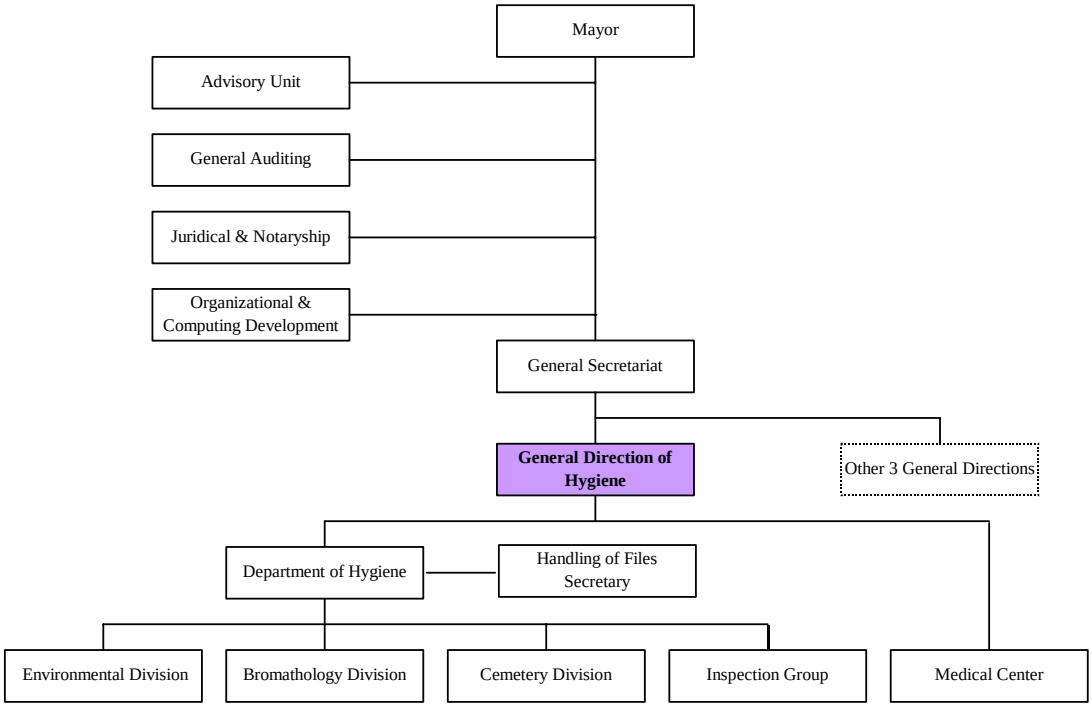

Figure 1.2.5 Organizational Structure of Municipal Government of Florida

Table 1.2.5 Staff Numbers of Water-Related Direction in Florida

Categories of Personnel	General Direction of Hygiene	Laboratory
University Degree	21	1
Technical Degree	5	-
Administrative	33	2
Laborers/Inspectors	83	-
Total	142	3

(6) Lavalleja

In the Municipal Government of Lavalleja, the General Directorate of Hygiene, Environment and Lifestyle is related with water quality management, as shown in **Figure 1.2.6**. The total staff of the Municipal Government of Lavalleja is 1,288. Among them, a total of 29, as shown in **Table 1.2.6**, are allocated to the General Direction of Hygiene, Environment and lifestyle.

In water quality-related work, majority of them are charged in physical labor work. Laboratory has limited equipment only for bacteriological analysis and pH. Individual capacity of staff engaged in water quality management appears to be limited, because of the lack of proper training and actual experience.

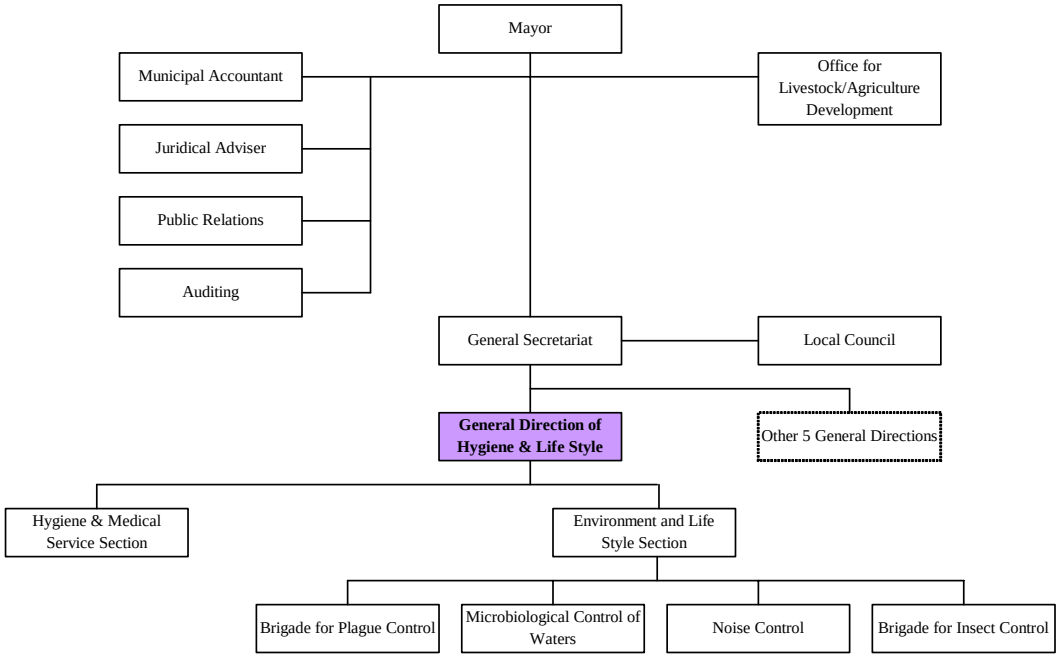

Figure 1.2.6 Organizational Structure of Municipal Government of Lavalleja

Table 1.2.6 Staff Numbers of Water-Related Direction in Lavalleja

Categories of Personnel	General Direction of Hygiene, Environment and Lifestyle	Laboratory
University Degree	6	1
Technical Degree	4	2
Administrative	7	-
Laborers	12	-
Total	29	3

1.2.3 Related Organizations in Central Government

(1) National Directorate of Hydrography (DNH)

General

DNH belongs to the jurisdiction of MTOP. The main law by which DNH is governed is the Water Code. Currently, the function of MTOP through DNH is to manage water resources from the point of view of quantity and, meanwhile, MVOTMA through DINAMA from the point of quality.

Tasks

According to the Law No.16858, water use permission or concession for irrigation can be issued by the executive power under MTOP. In this connection, DNH is responsible for giving such permissions and concessions. The Article 4 of the said law stipulates the following requisites for obtaining the permissions or concessions:

- The availability of water in quality and quantity must be verified, according to the regulation of the executive power,
- The applicant must have a soil and water use plan approved by MGAP, and
- The applicant must be the owner of the land to be irrigated or to own the rights for the land use.

By the same law, the Regional Advisory Council for irrigation is created. This Council is composed of a representative from MTOP as the president, a representative from the MGAP as a secretary, two (2) representatives from the water users and two (2) representatives of landowners.

The Council shall own the flowing duties:

- To coordinate with users in equitably distributing the available surface water, especially in drought periods,
- To emit opinion on new application for water extraction permission, and
- To advise on the works and measures to be adopted by the authority and water users, in order to increase the availability of water and promote a efficient use.

Inter-Relations with Water Quality Management

DNH and DINAMA must be connected in the following aspects so as to discharge their respective duties:

- DNH requires water quality data and information measured by DINAMA to authorize water permissions or concessions, and
- DINAMA requires hydrological data and information measured by DNH to assess the water environment.

At present, the above-mentioned collaboration appears to be constrained, mainly due to insufficient availability of water quality data in DINAMA and other reasons.

Opportunities for Public Participation

There is an instance of public participation in the Regional Irrigation Councils. While DNH Regional Officer has as a duty to take the presidency of each regional council, producers and irrigation users can take part in this public participation opportunity.

(2) Administration of Sanitation Works of the State (OSE)

General

OSE was created by the Law No. 11907 in 1952 as a decentralized organization of MTOP. OSE is, however, under the administrative tutelage of MVOTMA, based on the Decree 387/990. OSE is responsible for rendering water supply and sewerage service in the whole of country except for the sewerage service in the Department of Montevideo.

Tasks

The article 3 of the Law No. 11907 established the basic criteria for the provision of services: the provision of sanitary services and duties of institution must be done, prioritizing the social aspects over the economical ones from the viewpoint of hygiene. The article 229 of the Law No. 13737 in 1969, however, had transformed OSE to a commercial organization belonging to the State.

According to relevant laws, OSE is originally obligated to discharge duties in the connection of water-related matters, as follows:

- To take part in the management process of water use permission, and
- To carry out hygiene control of watercourses used for water supply services.

After the Water Code (Law No. 14859) enacted in 1978, the first duty has become not clear but the second one is considered still to be in existence. In fact, according to the Decree 253/79, OSE can intervene various management on the water bodies classified to the Class 1; namely, the authorization of discharges of wastewater in watercourses or in sewage collectors; and, the enforcement of inspections for industrial wastewater.

OSE, as the provider of water supply and sewerage, is required to obtain the permission of DNH as a water user and, at the same time, to be complied with environmental standard of water quality specified in the Decree 253/79 as a wastewater discharger.

Water Quality Laboratory

OSE has the water quality laboratories in the headquarters and Aguas Corrientes where a main water taking station is located. EPA and APHA are commonly used in the laboratory of OSE. OSE is able to handle manual analysis, heavy metals, microbiology and pesticides in the laboratory of headquarters. GC-MS can be used for the analysis of pesticides in this respect. Inter-calibration has been made with DINAMA.

Inter-Relations with Water Quality Management

OSE and DINAMA are deeply related in the following aspects so as to discharge their respective duties:

- The collaboration between OSE and DINAMA is crucial for preserving water quality, in planning of mitigation measures and in monitoring and evaluation of water quality status, and
- Mutual exchange of data and information on water quality data.

At present, the above-mentioned collaboration appears to be constrained, mainly due to insufficient availability of water quality data in DINAMA.

Environmental Education

There is an Educative Cycle Unit in OSE dependent upon the Public Relations Office and four of facilitators are engaged in specific education matters on water issues.

(3) General Directorate of Renewable Natural Resources (RENARE)

General

RENARE under the jurisdiction of MGAP exerts specific roles in legal procedures related with water use for agricultural/livestock purposes. The Decree-Law No. 15239 governs water and soil conservation, and irrigation for agriculture/livestock use, establishing necessary norms. The Law No. 16858 gives the competence to RENARE for the approval of the water and soil use plan as an indispensable requirement for obtaining water use permission.

Tasks

The duties of RENARE are connected with the conservation of natural resources like water and soil from the viewpoint of agricultural uses. Major tasks are enumerated as below:

- To formulate a national plan on the sustainable management of the renewable natural resources,
- To enforce laws related to activities on the use and management of renewable natural resources,
- To promote and regulate the use and integral management of renewable resources related to agricultural/livestock activities, taking into account the water basins,
- To administrate the natural resources under the jurisdiction of MGAP,
- To establish and maintain international relations to ensure the accomplishment of agreements or actions for the use and sustainable management of the renewable natural resources, and
- To formulate regulations and standards on the techniques for soil, water, fertilizers, inoculants and pesticides analysis.

Water Quality Laboratory

Laboratory equipment of MGAP, which can be utilized by RENARE, is well prepared for handling manual analysis, heavy metals, bacteria and pesticides/herbicides.

Dissemination and Environmental Education

About 13 temporal employee with university degree are mobilized for an irregular basis. They work for dissemination and education on soil and water issues in workshops and seminars. Some videos were produced for this purpose some years ago.

1.2.4 Other Organizations

Besides organizations mentioned above, the following governmental or non-governmental organizations are working in certain areas that generates data, which can be used for water quality management. For DINAMA, they are possible collaborators in the sense of providing basic data and information for water quality management.

LATU (Uruguayan Technological Laboratory)

Main tasks of LATU are to control and manage industrial standards as well as tests and analyses of materials, and provide services of water quality materials for industry, etc. It is provided with sophisticated equipment and techniques for manual analysis, heavy metals, bacteria and pesticides/herbicides.

DINAMIGUE (Directorate of Mining and Geology)

Main tasks of DINAMIGUE, under the jurisdiction of MIEM, are to manage mineral resources and soils, and study on geology and hydrogeology for mining development and environment. Its current activities related to water quality include: the integrated management of groundwater resources under the collaboration with DNH, DINAMA, etc., the preparation of national GIS (SIGNAC) with MTOP, the services for water quality analysis of physical and chemical property in its laboratory, etc.

DGSA (General Direction of Agricultural Services)

This institution is an executing unit of MGAP. It provides services to any kind of person or entity. Among of the services they provide, it can be mention that they own a Laboratory able to carried out analysis of pesticides in vegetal and water.

DNM (National Directorate of Meteorology)

Main tasks of DNM under the jurisdiction of MDN are to observe meteorological conditions, and process and issue related data and information.

IMFIA (Faculty of Engineering, Republic University of Uruguay)

IMFIA carries out the study and analysis on water-related projects and management nationwide. It is currently participating in ECOPLATA, FREPLATA and other national projects/studies.

APRAC (Association of Carrasco River Water Rehabilitation)

APRAC, composed of mainly NGOs, is a function for improving and preserving the environment of the Carrasco River Basin. APRAC have an environmental education program, which links the environmental modules with the regular curricula of public education systems. Its current activities include: the survey on environmental conditions, environmental education and campaign and assistance to the Municipal Government of Montevideo for wastewater treatment.

CEADU (Center of Study, Analysis and Documentation in Uruguay)

CEADU is a non-governmental function for conducting environmental education and campaign. It has a program on wastewater treatment with natural methods (Jardinera de Totoras). Its current activities include: preparation of materials for environmental education and campaign for "Clean Technology" and interview survey for environment matters.

GJM（Group of Youth MERCOSUR)

GJM, a non-governmental organization, has developed a manual made by teenager that reflects youth opinions and views on environmental problems, including water quality issues.

REDES

REDES, an non-governmental organization, edits the magazine "El Tomate Verde", an educative tool aimed to children and teachers and a website with water quality issues.

Montevideo Foundation (Project Globe)

The Montevideo Foundation (Foundation Montevideo) has a project on water quality monitoring by school children.

Bioaqua

The Bioaqua conduct capacity building activities for COMMAC (a NGO, Citizen Environmental Monitoring Commission) monitors.

2. CURRENT ACTIVITIES OF WATER QUALITY MANAGEMENT

2.1 Establishment of Policies and Strategies for Water Quality Management

Basic Policy and Strategies

Uruguay had adopted the "5-Year National Development Project (2000 to 2004)" with a total budget of around USD 14,000 million. Of these, USD 16.5 million had been allocated to DINAMA. According to the correspondent environmental 5-year plan for DINAMA, it is seen that DINAMA had aimed mainly:

- To formulate strong consciousness to the environment,
- To conserve the environment sustainably,
- To prevent the pollution,
- To preserve the quality of water resources,
- To setup natural protection areas,
- To establish the systems for the evaluation of environmental quality and management,
- To establish the system for environmental impact assessment,
- To improve environmental management system, and
- To enhance the decentralization of environmental management.

In terms of water quality, however, more specific policies directly governing the management are not available for the time being. At the same time, while the website of DINAMA carries only general mandates as the major player of water quality management, specific policies and strategies are not found, just only repeating their legal mandates.

Action Plans

It does not appear that, in DINAMA, there are action plans that indicate specific measures against problems facing now in water quality. There is no reasonable explanation on suspended classification of water bodies and for suspended monitoring of ambient water. Likewise, kinds of action plans for implementing respective approaches of water quality management are not in place.

Interpretation of Water Environment Status and Decision-Making

Originally, policy and strategy of water quality management should be examined and formulated by the decision-making from the viewpoint of comprehensive considerations on the water environment. However, because information derived from the interpretation of respective approaches is not applied for feedback to the policy-maker layer, any decision-making is difficult to be made at present. Proper system for comprehensive interpretation and decision-making are not in place in DINAMA. As such, it can be concluded that the systematic cycle required for water quality management is not functioning in DINAMA for the time being.

Amendment of Decree 253/79

Apart from policies and strategies, the amendment of the Decree 253/79, which is most influential to water quality management in Uruguay, is ongoing as the most recent activities of DINAMA. At present, the JICA Project Team is informed as the reasons for the amendment that (i) the said Decree has become outdated without sufficient justification, (ii) effluent discharge regulation in the Decree gives only the rate and it does not regulate total volume, (iii) others.

2.2 Classification of Water Bodies

The environmental standard of water quality has been already established in the Decree 253/79, dividing into five classes applicable for the water utilization in rivers. However, the classification of water bodies, in which particular class is designated for each water body, has not been made yet.

DINAMA had been engaged in the classification of water bodies in the past. The result of this effort is presented in the document "Water Quality Goal 2000", as shown in **Figure 2.2.1**. This work, however, has been suspended, and in Uruguay, there exists no target water quality of water bodies that is the most crucial pre-condition for water quality management.

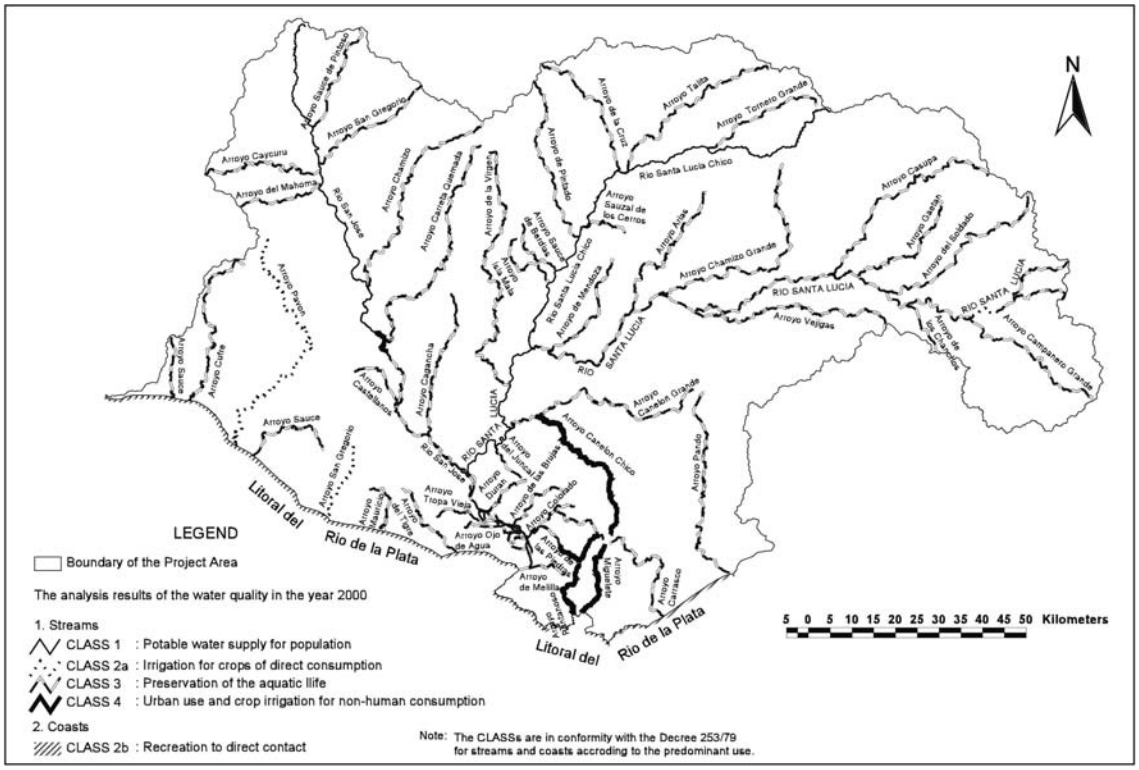

Figure 2.2.1 Classification of Water Bodies (Draft)

SECTOR B

MODULE NO. 2: POLLUTION SOURCE MANAGEMENT

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Annex:

(1) Joint Work Agreement for Industrial Wastewater Control (Draft)

Project Supplementary Document:

(2.1) Industrial User Inspection Manual
(2.2) Industrial Wastewater Sampling Manual (First Version)
(2.3) Guidance for Industrial Wastewater Flow Rate Measurement
(2.4) Guidance for Sampling, Preservation and Transportation of Underground Water
(2.5) Guidance of Industrial Wastewater Treatment Technologies

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1. PRESENT MEASURES AGAINST POLLUTION SOURCES

In this report, the status is discussed as of November 2004 as a basis for the formulation of First Draft Integrated Master Plan.

1.1 Overview

In general, pollution sources may be classified into: point sources and non-point sources. Domestic wastewater (gray wastewater and night soil), industrial wastewater and other wastewater generated from fixed places belong to point pollution sources. Meanwhile, such land areas as agricultural lands, urban areas, etc., which discharge sorts of pollutants belong to non-point pollution sources.

In the Project Area, the pollution derived from non-point sources is significant, because the Project Area has vast agricultural land like livestock farm, fields, etc. Therefore, this could become major issues in water quality management. Nutrients discharged from agricultural lands appear to be one of major causes for possible eutrophication in the Santa Lucía Basin. Meanwhile, rainwater that contains pollutants from urban areas exerts the pollution with coliform in coastal areas. Nevertheless, the studies and measures for non-point sources are not tackled at present, placed behind the mitigation against point sources.

In this section, current status of mitigation measures now being undertaken or being planned by various sectors in the Project Area is described.

1.2 Industrial Wastewater

(1) Structure of Industries

In Uruguay, all industries that discharge wastewater are obligated to get the authorization of DINAMA and the effluent quality discharged from them must be complied with the effluent standard designated in the Decree 253/79. Namely, the basic principle applied is the "Command and Control". As of today, a total of 516 entities are authorized and registered in the whole of Uruguay, and, among them, 331 entities (about 60 %) are located in the Project Area, including some housing zones discharging domestic wastewater. As shown in **Figure 1.2.1**, of 331 industries in the Project Area, Montevideo accounts for almost 50 % and Canelones accounts for 33 %. This means nearly half of industries in the whole of Uruguay concentrate in the Project Area.

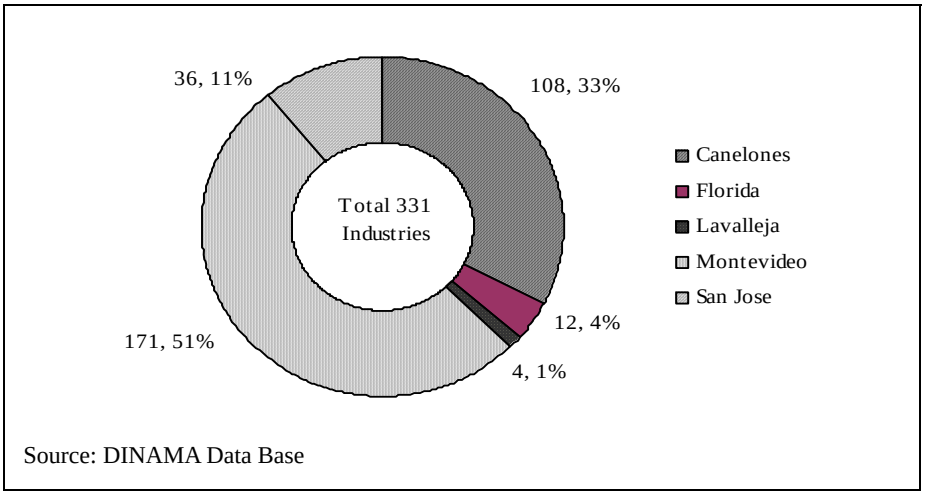

Figure 1.2.1 Distribution of Industries by Municipalities

The categories of industries located in the Project Area are mainly occupied by livestock-related ones like: meat processing, leather tanning etc., which are relatively of heavy-pollution type, as shown in **Figure 1.2.2**. It should be remarked that large numbers of leather tanning are located in the Project Area, because they use hexavalent chromium, strong toxic substance for a living thing, in the tanning process.

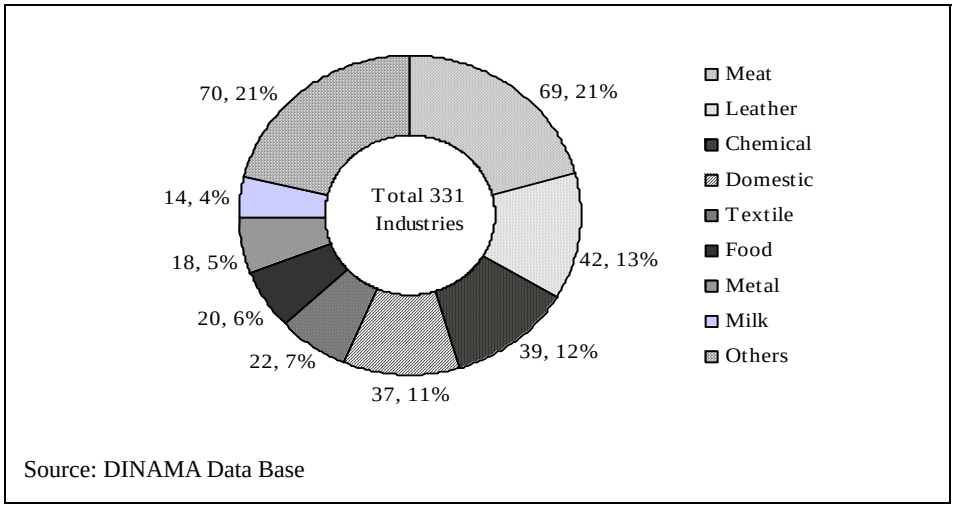

Figure 1.2.2 Industrial Categories

(2) Discharge of Industrial Wastewater

In the whole of the Project Area, industrial wastewater with about 100,000 m^3/day of discharge and about 50,000 kg-BOD/day of pollution load is generated[1]. In terms of wastewater discharge (m^3/day) generated in industries, domestic wastewater (wastewater discharged from residential houses or zones) is the largest one as shown in **Table 1.2.1**. Meanwhile, in terms of generated BOD (before treatment, kg/day), meat and leather occupy a large portion, accounting for over 50 % of the total pollution load.

Table 1.2.1 Largest 4 Categories in Generated Wastewater and Pollution Load

[1] : The Project Team calculated pollution load derived from industries using unit rates, based on the data of SADI.

Order	Wastewater Discharge			Generated BOD (before treatment)		
	Industrial Categories	Discharge (m^3/d)	Rate (%)	Industrial Categories	BOD (kg/d)	Rate (%)
1	Domestic	23,890	23.1	Meat	15,615	31.4
2	Fuel oil	20,072	19.4	Leather	12,397	24.9
3	Meat	19,518	18.9	Milk	4,986	10.0
4	Leather	9,537	9.2	Domestic	4,778	9.6
5	Others	30,257	29.3	Others	12,013	24.1
	Total	103,274	100.0	Total	49,789	100.0

Source: The JICA Project Team calculated based on the Industrial Inventory made by DINAMA.

Figure 1.2.3 shows the points of wastewater discharged from industries. A total of 45 % industries discharge their wastewater into rivers, after treating to the required water quality level in the effluent standard, 35 % industries depend on sewers, after necessary pre-treatment in their sites. It should be remarked that ground infiltration, in which the likelihood of groundwater pollution is possible, is still permitted in Uruguay. Also, it should be reminded that, in Montevideo where large numbers of industries are operating, discharged wastewater into sewers simply empties to the La Plata River, since the sewerage of Montevideo is not equipped with the treatment plant.

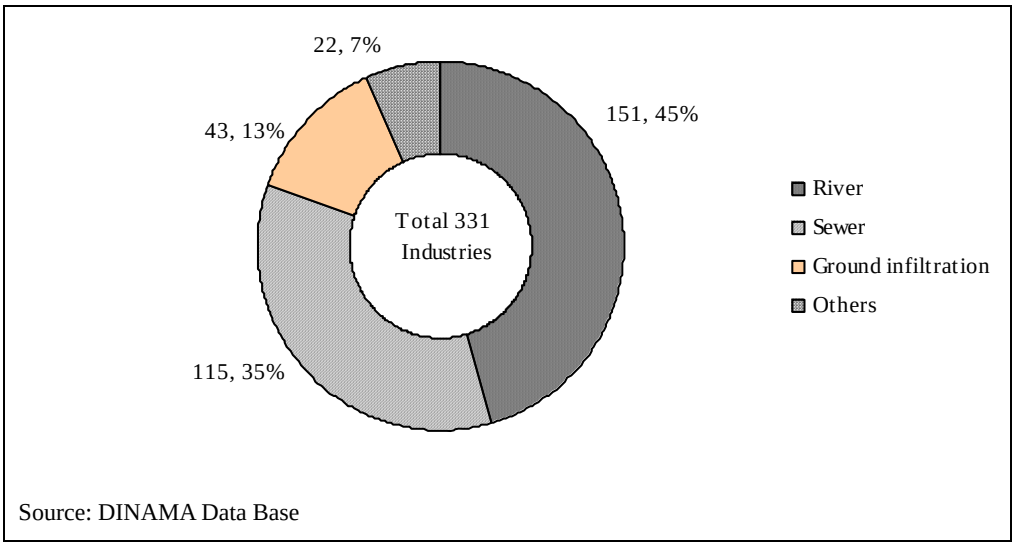

Figure 1.2.3 Discharge Destinations of Industrial Wastewater

(3) Actual Status of Industrial Wastewater Treatment

Data and information explaining actual status of industrial wastewater treatment are not available. According to the Decree 253/79, DINAMA is supposed to verify the wastewater treatment schemes to be applied in the stage of the authorization. Therefore, proper treatment facilities with technologies suitable for respective characteristics of wastewater should be provided. Periodical report is also submitted to DINAMA to secure the operation and maintenance of treatment facilities.

As for the compliance with the water quality required in the effluent standard, there is no reliable information. In this regards, the Municipal Government of Montevideo has reported

the result of the water quality inspection for the effluent discharged into rivers, sewers, etc., by industrial categories including a total of 60 entities, as shown in **Table 1.2.2**.

This table largely suggests that, in the BOD of wastewater discharged from industries, as high as more than half industries (63 %) fail to observe the effluent standard, even in Montevideo where industrial wastewater management is actively conducted. Likewise, it has been clarified that, among 60 entities, 17 entities are not complied in oil and fats, 6 entities in suspended solids, 10 entities in total chromium and 7 entities in lead. As such, it is conceivable that there are so many cases of water quality violations in the whole of Uruguay.

Table 1.2.2 Result of Water Quality Inspection in Municipality of Montevideo

Basins	Total Numbers of Industries	Numbers belonging to Incompliant Categories	Possible Incompliance rate in BOD (%)
Pantanoso Basin	19	15	79
Miguelete Basin	29	13	45
Carrasco Basin	1	1	100
Montevideo Bay	4	2	50
Coastal Basin	7	7	100
Total	60	38	63

Source: Data was derived from the calculation by using "Environmental Report 2002, Municipal Government of Montevideo, 2003".

1.3 Domestic Wastewater

(1) Overview

The implementation of sewerage works in Uruguay except for the Municipality of Montevideo is exclusively enforced by OSE, in financing, planning, constructing and operating/maintaining. As of today, the coverage rate (at the population base) of sewerage is 48 % in the whole of Uruguay, around 80 % in the Municipality of Montevideo and 28 % in the rest of countries.

(2) Sewerage in Montevideo

Montevideo is the first city where sewerage was introduced in South America. The sewerage of the Municipality of Montevideo is undertaken by the Municipal Government of Montevideo, differently from other Municipalities implemented by OSE. At present, the sewerage in Montevideo shown in **Figure 1.3.1** covers 1,100 ha (equal to 21 % of the total land area of 53,000 ha) and 1.1 million people (equal to 79.5 % of total population 1.4 million).

The sewerage of Montevideo is basically of the "combined type", which collects and transports wastewater and rainwater with the same sewers. Major portions of collected sewage including industrial wastewater as well as domestic one are dumped into the bottom of the La Plata River through the discharge pipe of 1.8 m in diameter and 2.3 km in length at Punta Carretas, after the simple treatment with grid separation and screening. As such, there is, at present, no sewage treatment plant for removing pollutants contained in sewage in Montevideo.

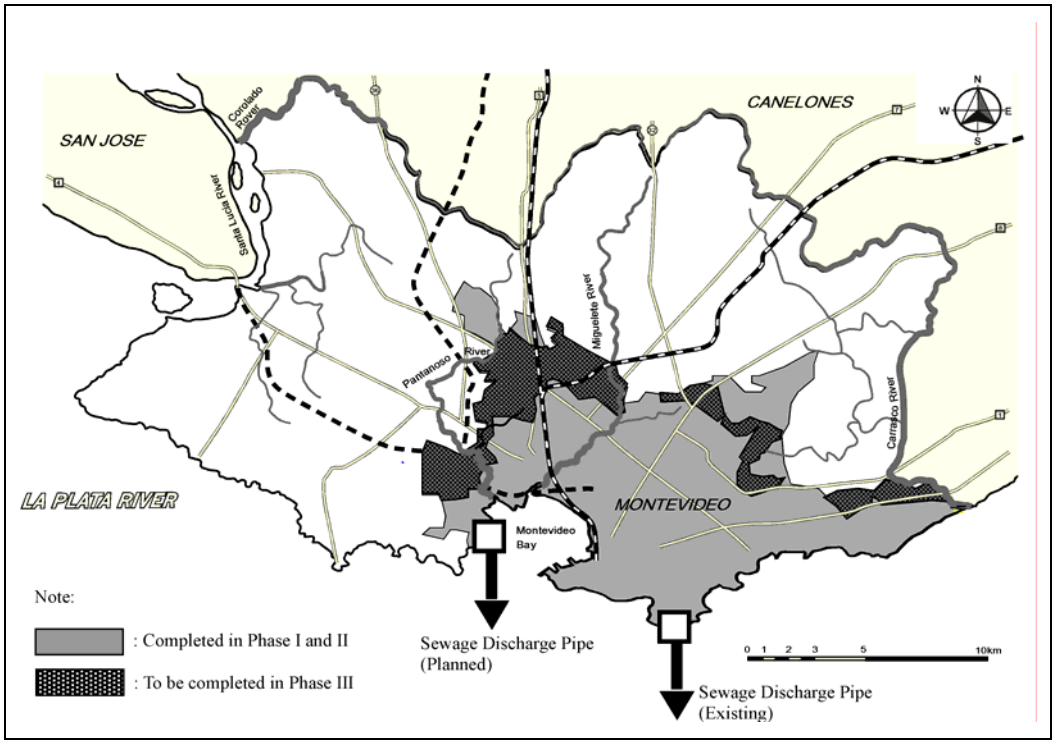

Figure 1.3.1 Sewerage Development Plan of Montevideo

Historically, the development of sewerage in Montevideo proceeded in the following phased programs:

- PSU I (Urban Sanitation Plan I): The target of this phase was to improve the water quality, especially in the eastern coastal beaches between the Carrasco River and Punta Carretas.
- PSU II: The target was to improve the water quality, especially in the western coastal beaches from Punta Carretas to Rock Fill Sarandi, and to extend the sewerage to the eastern area in Punta Rieles and La Chacarita.

At of today, the sewerage development in Montevideo is entering the PSU III. This phase is ongoing with the following specific objectives:

- The expansion of sewers networks, increasing the population coverage to 88 %,
- The expansion of rainwater drainage, increasing the drainage area by 600 ha,
- The acceleration of projects for industrial wastewater control program and the improvement of water quality in receiving bodies, and
- Institutional improvement of related divisions responsible for the environmental quality and for industrial effluent, etc.

(3) Other Municipalities

Coverage rate of sewerage in the local municipalities with the population of over 10,000 and 5,000 are 42 % and 38 % as of 1998. Almost all the collection methods of sewerage engaging OSE are of the "separated-type", collecting separately wastewater and rainwater, and rainwater drainages are constructed by local governments, separately. Common problems to sewerage are that there are breakdown and clogging at many points resulting into a high-rate infiltration due to over-aged facilities (largely 30 to 40 year old).

Table 1.3.1 shows the profile of existing sewerage in the Project Area. Though a total of 12 sewerages are being operated, many of them are under over capacity and need to be expanded. Most of treatment plant receives sludge collected from septic tanks in none-served areas by vacuum vehicles. Some sewerage collects and treats industrial wastewater as well as domestic wastewater.

Eutrophication becomes a realistic concern in the Santa Lucía Basin. Conceivably, this is why recent treatment plants planned by OSE are furnished with the nutrient removal process (nitrogen and phosphorus).

The sewerages' situation of capital cities of respective local municipalities and their functions are briefly described as follows:

Table 1.3.1 Profile of Sewerage by OSE

Municipalities/ Locations	Living People (people)	Served People (people)	Coverage (Population base) (%)	Design Population (people)	Length of Main Sewers (km)	Type of Treatment Plant
- Canelones						
Aguas Corrientes	1,040	1,040	100	1,400	10.0	Stabilization pond
Canelones	19,335	9,970	52	9,700	28.9	Imhoff tank
La Paz	19,625	3,530	18	11,700	26.5	Stabilization pond
Las Piedras	66,095	11,650	18	7,330	30.3	Secondary treatment type
Pando	24,368	7,870	32	10,600	24.9	2-step anaerobic reactor
Santa Lucía	16,601	8,190	49	15,700	38.3	Activated sludge tank
- San José						
Libertad	8,314	3,680	44	2,400	16.6	Stabilization pond
San José	34,927	15,490	44	9,300	50.3	Imhoff tank
- Florida						
Casupa	2,595	-	-	2,200	3.4	Extended aeration tank
Florida	31,448	14,110	45	29,700	46.2	Activated sludge with phosphorus removal
Sarandi Grande	5,650	2,460	44	3,400	16.9	Extended aeration tank
- Lavalleja						
Minas	37,092	15,500	42	5,800	45.5	Imhoff tank (under construction of new plant)

Source: Sector Analysis of Water Supply and Sanitation in Uruguay, WHO, 2001.

Canelones

At present, the sewage treatment plant consists of only two imhoff tanks as primary treatment. Therefore, effluent with undesirable quality is discharged into the Canelon Chico River. Besides, because large slaughterhouses are also located in Canelones City, the Canelon Chico River receives high-level contamination, especially in terms of nutrients. Nitrogen removal is called for in both sewage treatment plant and slaughterhouse so as to recover the water quality of the Canelon Chico River that is one of the tributaries of the Santa Lucía River, a crucial potable water source for Montevideo.

San José

San José City has only imhoff tanks as primary treatment plant with low treatment efficiency. Besides, because many vacuum tankers for collecting septic sludge come and discharge to this plant, people nearby often claim for offensive odor. The study for the secondary treatment is reportedly ongoing.

Florida

In Florida City, an expansion work of old imhoff tanks has completed. This new facilities covers 75 % population in 2015 and are equipped with the coagulated sedimentation for the removal of phosphorus.

Lavalleja

New treatment plant for Minas City, which will treats effluent form the existing plant, is now under construction. The coverage rate of sewerage will increase to 80 % after the completion of this facility. This plant accommodates the section for removing nitrogen: denitrogen and nitrification tanks.

1.4 Solid Waste Disposal

Solid waste management, which municipal governments are responsible for, is very modest in the Project Area. Almost all the final disposal sites are of simple dumping type without any care for sanitation, landscape and negative impact to the nearby environment. Major dumping sites are listed in **Table 1.4.1** and, besides these, at Arequita in Lavalleja and the riverside land of the Pintado River in Florida, solid waste dumping is likewise taking place.

From the standpoint of water pollution, solid waste disposal exerts two issues. One is leachate coming out dumping sites, especially in raining. Another is illegal dumping of residues into river courses caused by informal solid waste handling. Leachate is a common concern in dumping sites in the Project Area, because all of sites are not equipped with adequate water-seal structures and rainwater drainage. In many dumping sites, it can be observed that leachate directly enters rivers that are often used for potable water source.

The second issue is explained in the connection of social problem, because this is caused by informal collectors and separators of solid waste. In Montevideo, a large portion of solid waste are collected and separated for the purpose of recycling. After that, remaining residues predominantly consisting of organic garbage are discarded into nearby rivers. These practices can be seen in many places along urban rivers. According to the estimation[2] made by the Municipal Government of Montevideo, the BOD loading caused by this practice reaches as high as 63 % of total pollution load, by far exceeding those from domestic wastewater and industrial wastewater.

[2] : "Work shop of Water Resources 2002", the Municipal Government of Montevideo, 2002.

Table 1.4.1 Profile of Solid Waste Dumping Sites

Municipalities	Montevideo	Canelones	San José
Locations	Plant 7	Cantera and Canada Grade	Rincon de La Bolsa
Incoming Waste (ton/ day)	1,600	250 in Cantera 320 in Canada Grande	53
Land Area of Sites (ha)	20	7 ha in Cantera 1.5 in Canada Grande	10
Estimated Remainig Life (years)	10	Almost terminated in Cantera 5 in Canada Grande	10
Leachate Control	Under planning	Not existing	A little care taking place

Source: "Inception Report, Master Plan of Solid Waste in Montevideo and Metropolitan Area", FICHTNER-LKSUR Associate, December 2003.

2. PRELIMINARY POLLUTION LOAD ASSESSMENT

2.1 Overview

Various kinds of pollution are generated and discharged into the water environment. In the Project Area, major pollution sources are domestic wastewater, industrial wastewater and wastewater originated from solid waste as point sources, and urban rainwater, runoff from fields and farmlands for livestock as non-point sources. BOD, nitrogen and phosphorus may be major pollution indexes. The water environment in question is in the Santa Lucía basin and the La Plata Basin in this Project.

2.2 Preconditions for Assessment

To discuss the basic direction of water quality management in future, it is meaningful to clarify how much pollution loading is generated and discharged, even in the magnitude order. Pollution load calculation was made under the following assumptions:

- Domestic wastewater generated from the urban areas in **Table 1.3.1** is treated by existing treatment plant with correspondent removal rate of BOD, nitrogen and phosphorus,
- Industrial wastewater mentioned in the section 1.2 are treated up to qualities prescribed in the Decree 253/79 in terms of only BOD,
- As non-point sources, urban areas in Montevideo and fields and farmlands for livestock in Canelones, San José and Florida and Lavalleja discharge BOD, nitrogen and phosphorus with assumed rates being often applied in Japan, and
- Pollution loads originated from solid waste are neglected in this calculation.

2.3 Calculation Results and Assessment

Figure 2.3.1 shows pollution load discharged into the water environment from the Municipalities in the Project Area, which were roughly calculated based on the following assumption:

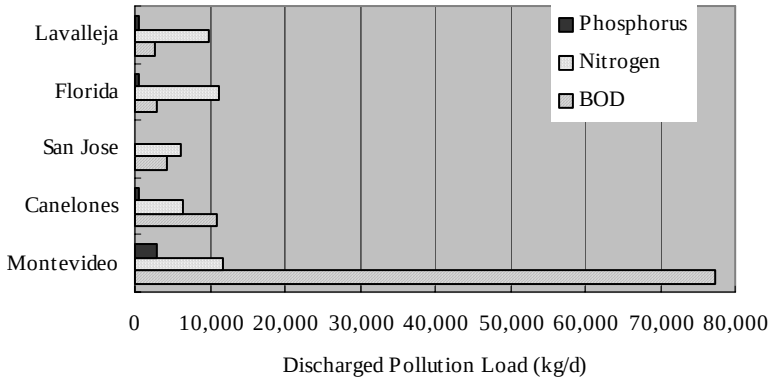

Figure 2.3.1 Pollution Load Discharged into Water Environment

As seen from this result shown in **Figure 2.3.1**, it is evident that Montevideo is discharging a huge amount of pollution loads, especially BOD into the La Plata River, because of its large population and no sewage treatment. Meanwhile, in other Municipalities located along the Santa Lucía River, a significant amount of nitrogen and phosphorus are discharged from both domestic wastewater and agricultural lands. As shown in **Figure 2.3.2**, in this rough calculation, 90 % of nitrogen is derived and 63 % of phosphorus from non-point sources.

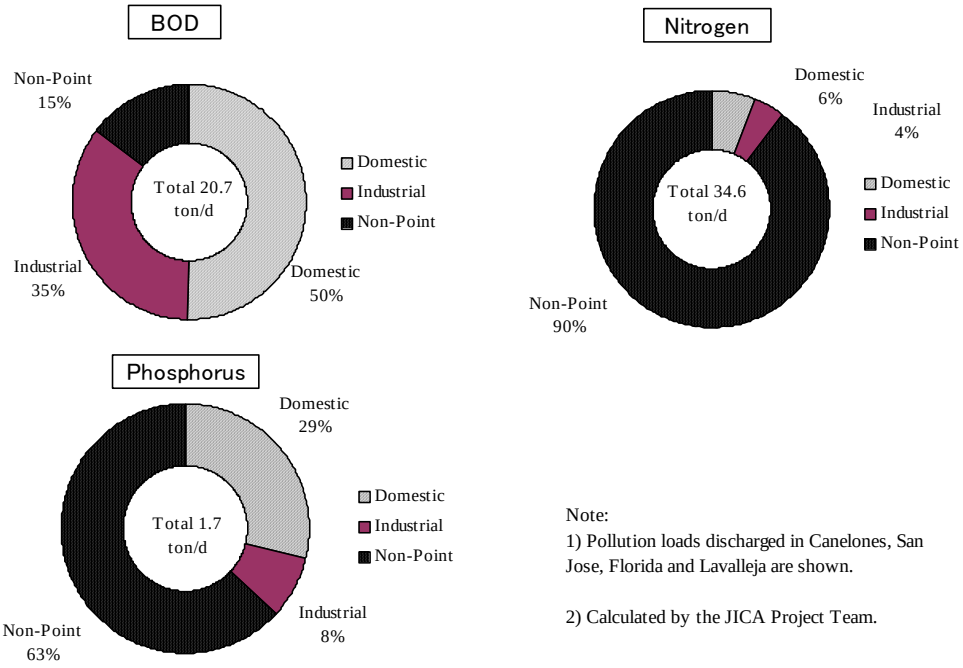

Figure 2.3.2 Sources of Discharge Pollution Load

3. PRESENT MANAGEMENT ACTIVITIES FOR POLLUTION SOURCES

3.1 Industrial Wastewater Management

Based the Decree 253/79, DINAMA is engaged in activities for industrial wastewater management in the whole of Uruguay. In the Municipality of Montevideo, however, the Municipal Government exerts active interventions differently from other Municipalities, as detailed below.

Management by DINAMA

All industries discharging wastewater must be authorized and registered by DINAMA. As of today, 516 industries in the whole Uruguay and 331 industries in the Project Area are registered. These authorized industries are publicized in the homepage of DINAMA, with the information like names of industry, locations, industrial categories, names of qualified experts responsible for wastewater treatment, etc.

A series of actual procedures from the application to the operation is shown in **Figure 3.1.1**. After submitting the SADI (*Solitud de Autorizacion de Desague Industrial*, Application for Authorization of Industrial Discharge), entities must obtain DINAMA's permit and then can start the construction works. Then, industries must submit IPO (*Informe de Puesta en Operacion*, Report of Operation) prior to the operation and finally can attain ADI (*Autorizacion de Desague Industrial*, Authorization of Industrial Discharge) on the condition that they completely satisfy all environmental requirements. In the course of the completion of treatment plant and its operation, DINAMA has the competence to inspect at any time, when necessary.

All activities of industrial wastewater discharge are supervised and controlled by DINAMA as mentioned above. In the period of operation, DINAMA conducts the inspection 3 to 4 times a year for major industries (about 10 industries) in the whole country, as a rule. Meanwhile, these inspections are limited to 1 to 2 times for industries located in the Municipality of Montevideo, considering another inspection of several times made by the Government of Montevideo.

Table 3.1.1 shows the records on legal actions taken by DINAMA. In the actual operation of industrial wastewater treatment, there are no evident data explaining whether the prescribed effluent standards are actually observed or not. Based on large numbers of various violations, significant numbers of incompliance appear to exist.

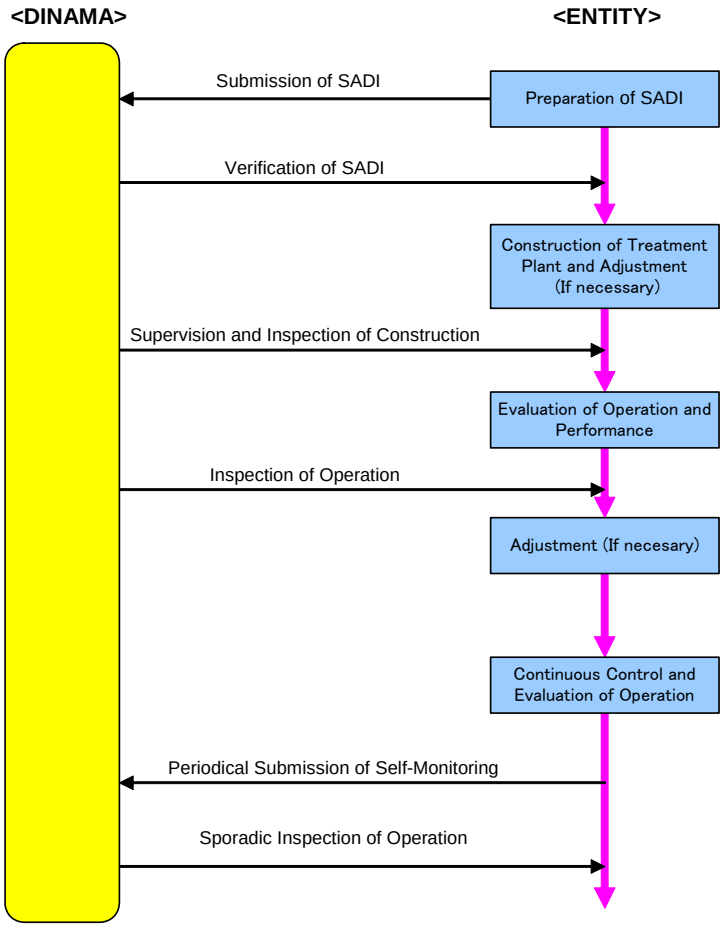

Figure 3.1.1 Procedure of Industrial Wastewater Management

Meanwhile, it should be remarked that all industries are not necessarily equipped with satisfied provisions meeting all environmental requirements, as judged from the fact that only 10 % of industries successfully obtain the ADI.

Another objective of the industrial wastewater management by DINAMA is to analyze and assess the influence of industrial wastewater for the water environment, besides the regulation of industrial effluent. No action, however, can be seen in this respect at present.

Management by Municipal Governments

Municipal governments are involved in industrial wastewater management in a certain extent. Actual interventions of municipal governments are limited to the approval for the start of construction works and sporadic inspections of industries on requests by nearby residents. This is, however, an exception in the Municipality of Montevideo.

Table 3.1.1 Activities and Legal Proceedings Made by DINAMA

Items	Times	2001	2002	2003
Numbers of Inspections	(times/year)	233	463	280
Numbers of Water Sampling	(times/year)	306	373	276
Numbers of Measured Parameters	(parameters/year)	2,194	3,002	2,037
Numbers of Self-Monitoring Reports	(sets/year)	251	78	38
Numbers of Violations[1]	(cases/year)	187	71	35
Numbers of Legal Processing				
- Imposing of Fines	(cases/year)	3	5	15
- Ceasing of Operation of Factory	(cases/year)	0	0	2
- Ordering of Facility Improvement	(cases/year)	204	32	15

Source: The JICA Project Team was given the data by DINAMA.

Notes:

1: In violations for water quality, mal-operation, reporting, etc. are included.

2: The above data represent the ones for the whole of Uruguay

The Government of Montevideo has actively deployed the actions of industrial wastewater management by itself in the combination with the sewerage development project, separately from DINAMA. Its activities include: setting up of local effluent standards differently from the Decree 253/79, permitting of industrial discharge, enforcement of compliance monitoring of effluent and inspection of industries, etc.

The results of industrial wastewater management by the Government of Montevideo have been publicized in the "Environmental Report" issued yearly. As seen from **Table 3.1.2**, inspections take place systematically based on the classified categories (the first to the third priority), depending on industrial categories. Massive activities with inspections of more or less 300 times and measurement/analysis of about 1,300 parameters a half year have been conducted as shown in **Table 3.1.3**.

Table 3.1.2 Inspection System for Industrial Wastewater in Municipality of Montevideo

Inspection Categories	Numbers of Industries	Frequency of Inspection a year	Industrial Categories
First Priority	23	4	Wool scouring, tannery, vegetable/animal oil and grease, dairy product, slaughter house, meat and poultry, fish processing, petroleum refinery, yeast production.
Second Priority	72	2	Textile, metal industry, paints production, pulp and cardboard, bottle laundry, detergent production, chemical product, canned fruit and vegetable.
Third Priority	-	2	Industries with small pollution loading.

Source: "Environmental Report 2002", Municipal Government of Montevideo, 2003

Table 3.1.3 Inspection Dimension in Municipality of Montevideo

Modality of Inspections	Times	Semester of 2002	Semester of 2003
Inspections with Water Sampling	(times)	220	169
Total Inspections	(times)	331	261
Measured Parameters	(-)	1,470	1,229

Source: "Environmental Report 2002", Municipal Government of Montevideo, 2003

While the situations of industrial wastewater management in Municipalities are widely different depending on Municipalities as shown in **Table 3.1.4**, the compliance inspection by municipalities specializing industrial wastewater, however, has little taken place at this moment, except for the Municipal Government of Montevideo (IMM).

Meanwhile, the influence of industrial wastewater to the water environment over a long-term has not been analyzed and assessed by DINAMA for the time being.

Table 3.1.4 Industrial Wastewater Management in Municipalities

Municipalities	Montevideo (IMM)	Canelones (IMC)	San Jose (IMSJ)	Florida (IMF)	Lavalleja (IML)
Numbers of Industries[1]	171	108	36	12	4
Major Categories of Industries	Leather, Chemicals, Meats	Meats, Chemicals, Leather, Foods	Meats, Chemicals, Foods	Meats, Textile	Meats, Construction materials
Numbers of Staff in Charge	Total 9 (All specialize IWWM, including 4 temporary staff)	Total 13 (All are engaged other assignments. No staff specializes IWWM)	Total 3 (All are engaged other assignments. No staff specializes IWWM)	Only 1 (Staff is engaged other assignments. No staff specializes IWWM)	Only 1 (Staff is engaged other assignments. No staff specializes IWWM)
Municipal Regulations for IWWM	Effective	Effective	No	No	No
Actual Situations of Inspections	Periodical inspections take place according the classified schedule.	No periodical inspection. Sporadic inspection time to time takes place together with other purposes.	No periodical inspection. Visits to industries take place upon claims.	No periodical inspection. Visits to industries take place upon claims.	No periodical inspection. Visits to industries take place upon claims.
Actual Situations of Effluent Water Quality	Despite periodical inspection, many violations have been reported.	Actual situation is not known but many violations are suspected.	Actual situation is not known but violations are suspected.	Actual situation is not known but violations are suspected.	Actual situation is not known but violations are suspected.

Note 1: Source: SADI record in DINAMA

Measured Parameters in Compliance Monitoring of Industrial Wastewater

Water quality parameters measured by DINAMA and Municipal Government of Montevideo in compliance monitoring of industrial wastewater are shown in **Table 3.1.5**.

Table 3.1.5 Measured Parameters in Compliance Monitoring of Industrial Wastewater

Organization & Program	DINAMA	IMM		
Frequency		4 Creeks & Montevideo Bay		
Parameters	Basically annually	Quarterly	Bi-annually	Annually
Floating substances				
Temperature	○			
pH	○			
BOD_5 (mg/l)	○	○	○	○
Solid deposit (mg/l)				
Total suspended solid (mg/l)	○	○	○	○
Fats and oils	○	○	○	○
Sulfide (mg/l)	○	○	○	○
Detergents (mg/l) as LAS				
Phenol (mg/l) as C_6H_5OH				
Flow rate	○	○	○	○
Ammonia (mg/l) as N				
Total phosphorus (mg/l) as P				
Coliform bacteria (MPN/100ml)	○	○	○	○
Cyanide (mg/l)	Heavy metals are case by case			
Arsenic (mg/l)				
Cadmium (mg/l)				
Copper				
Total Chromium (mg/l)	○	○	○	○
Mercury (mg/l)				
Nickel (mg/l)				
Lead (mg/l)				
Zinc (mg/l)				

Note: 4 creeks are as follows: Miguelete, Pantanoso, Carrasco and Las Piedras.

Quarterly-based monitoring is required for such industries as wool factory, tannery, oil and fat factory, milk factory, slaughterhouse, fish processing factory, oil refinery plant, etc.

Bi-annual-based monitoring is required for such industries as textile, metallurgical industry, painting factory, pulp industry, bottle washing plant, detergent factory, basic chemical factory, food and canning factory, etc.

Annual-based monitoring is required for industries categorized in the third priority, producing or potentially contributing to 10 % of the total pollution load.

3.2 Intervention in Domestic Wastewater Management

At present, activities being made by DINAMA as the intervention in domestic wastewater management are limited to the supervision of the construction works of sewerage undertaken by OSE.

While the intervention in domestic wastewater management aims to coordinate and supervise the development projects of sewerage system, and to analyze and assess the influence of sewage for the water environment, no actions by DINAMA can be seen in this regard.

3.3 Intervention in Solid Waste Management

(1) Domestic Solid Waste

The intervention in solid waste management by DINAMA aims to coordinate and supervise the development projects of solid waste disposal projects from the viewpoint of water pollution. Furthermore, analysis and assessment on the influence to the water pollution caused by solid waste dumping to water bodies and leachate from dumping sites are other objectives. Despite the fact that significant influence caused from solid waste to water pollution is widely known in the Project Area, actions by DINAMA can little be seen in this respect.

(2) Industrial Solid Waste

COTAMA had conformed a working group denominated "Gesta Industrial Solid Waste" integrated by various stakeholders related to the subject of industrial solid waste. This working group had formulated a technical proposal for the regulation of the integral management of solid waste originated by industrial, agriculture/industrial and services activities.

3.4 Intervention in Non-Point Source Pollution Management

The objective of the intervention in non-point source pollution management by DINAMA is to coordinate and assist the actual measures taken by MGAP. In addition, analysis of the pollution originated from non-point sources from agriculture lands is another objective.

Despite there is a possible threat of eutrophication for raw water sources in the Santa Lucía Basin, which are predominantly used for the potable water of the metropolitan area, DINAMA doesn't indicate correspondent actions in this respect. Meanwhile, DINAMA is indicating its intention to initiate for the contamination of pesticides in the water environment, asking JICA for providing necessary equipment and relevant technology transfer.

4. PROPOSED PLAN OF INDUSTRIAL WASTEWATER MANAGEMENT

4.1 Background

Industrial wastewater management (IWWM) is one component comprised of pollution source management (Module No. 2). The objectives of IWWM are to control industrial wastewater discharge through various activities like authorization of wastewater discharge, compliance inspection, monitoring of effluent water quality, etc.

Presently, the industrial wastewater management is conducted in a certain range as a routine job mainly by Environmental Control Division (EnCD) of DINAMA. The results of activities of industrial wastewater management, however, are modest and not satisfactory from the viewpoint of the compliance for the Decree 253/79.

Major problems identified in the present activities of IWWM are summarized hereunder:

- Lack of strategic compliance inspection

  Present compliance inspection is conducted once a year for approximately half number of registered enterprises. Incompliance to the effluent standards and various kinds of violations occur frequently, without strategic compliance inspection of industries, in terms of quantity (frequency) and quality (contents of the inspection).

- No clear and unified standards for authorizing industrial wastewater discharge and processing related things

  DINAMA has enforced a certain level of industrial wastewater management as of today. However, the issuance of Authorization of Industrial Discharge (ADI) has been made for only 10% of the registered enterprises due to stagnant work in the authorization processing and no confirmed standards. As a result, this has weakened the overall regulation system of the industrial wastewater management with the Decree No. 253/79.

- Lack of collaboration between DINAMA and Municipalities

  The Decree No. 253/79 delegates DINAMA to conduct nationwide industrial wastewater management. Meanwhile, Municipalities also have the responsibility to inspect industrial wastewater in their territory from the viewpoint of conserving hygiene environment. For the moment, the collaboration between DINAMA and Municipalities is rarely seen except for IMM, though the both have similar purposes in IWWM.

To address problems mentioned above, the reinforcement of IWWM is proposed in the Project, hereunder.

4.2 Needs of Capacity Development

The problems in IWWM were thoroughly analyzed from various aspects, comparing with the envisioned water quality management ultimately to be attained in Uruguay. As a result, it has been clarified that DINAMA itself as the leading agency in IWWM needs strongly to address the deprived human resource (especially numbers of staffs concerned) which is a common underlying problem.

Based on the result of the problem analysis, the needs of capacity development to reinforce the IWWM were identified as follows:

- Strengthening of individual capacity

While the leading staffs of EnCD have a certain individual capacity necessary industrial wastewater management, the rest of them still lack knowledge and experience in this field. The staffs of Municipalities involved are also substandard in the individual capacity, generally. Thus, the individual capacity of them needs to be strengthened for the reinforcement of IWWM.

- Development of industrial wastewater-related manuals

Procedural and managerial manuals of the regulation are required to realize appropriate industrial wastewater management which is based on clear and unified standards. Technical guidance on industrial wastewater is also needed for staffs involved to share the common fundamental knowledge necessary for the management.

- Establishment of collaboration mechanism between DINAMA and Municipalities

DINAMA has the task to conduct nationwide IWWM under the mandate of the Decree 253/79, and Municipalities are also engaged for IWWM from the viewpoint of conserving hygiene environment in their territory. Implementation by Municipalities, however, is not appropriately conducted due to the lack of various resources, except for Montevideo. Considering that DINAMA and Municipalities have the task to conduct IWWM for similar purposes, the collaboration system between them should be established to conduct IWWM, efficiently and effectively.

4.3 Proposed Strategies of Capacity Development

The approaches of the capacity development for the reinforcement of IWWM were thoroughly discussed and studied employing PCM method. Based on this, the plan of the capacity development for the reinforcement of IWWM was designed.

JICA Project Team, as detailed in the Main Report, proposes the “Outputs” and “Activities” (which signify the “Strategies” and “Actions”, respectively) for the capacity development in line with the identified needs. The proposed plan encompasses the development of the capacity of individual level, organizational level and society/institutional level, aiming at the reinforcement of IWWM until the year of 2013, as shown in **Table 4.3.1**.

Table 4.3.1 Proposed Plan for Reinforcement of Industrial Wastewater Management

Strategies (Outputs)	Actions (Activities)
Strengthening of individual capacity of staffs of DINAMA and relevant units on IWWM (Output 2.5)	1. JICA Project Team provides technology transfer on IWWM to DINAMA's staffs through the manual preparation work. 2. JICA provides the technical training associated with IWWM in Japan. 3. DINAMA (EnCD) provides technology transfer on IWWM to municipalities' staff.
Development of industrial wastewater-related manuals (Output 2.4)	1. DINAMA and JICA Project Team jointly develop (and DINAMA modifies, when necessary) procedural and managerial manuals necessary for IWWM. 2. DINAMA and JICA Project team jointly develop technical guidance on industrial wastewater.
Establishment of collaboration between DINAMA and Municipalities (Output 2.3)	1. The consensus between DINAMA and Municipalities on the collaboration for IWWM is reached. 2. The Agreement of collaboration between DINAMA and Municipalities on IWWM is concluded. 3. DINAMA provides (and continues to provide) Municipalities with data/information associated with SADI and engineering data of industries. 4. DINAMA and Municipalities conduct (and continues to conduct) coordinated IWWM and compliance inspections. 5. DINAMA and Municipalities mutually exchange (and continues to exchange) the inspection results in a sustainable manner.

4.4 Planned Actions and Achievement in JICA Project Period

Specific actions were designed to produce the respective Outputs. Among designed actions, some of them have been already undertaken in the Pilot Project (April of 2004 to March of 2005) and the Phase III (April of 2005 to March of 2006). Planned actions and major achievements during this period are described below.

(1) Strengthening of Individual Capacity of Staffs of DINAMA and Relevant Units (Output 2.5)

(a) Technology transfer on IWWM (Action 1)

<Planned Action>

It has been assessed that most key staffs of EnCD have had already a certain level of knowledge and experience necessary for IWWM. However, some staffs, especially younger staffs, need the capacity building for obtaining more practical knowledge and skills on IWWM. Therefore, it was planned that the technology transfer was conducted through the collaborative work of manual development based on OJT.

<Achievement>

In the Pilot Project, JICA Project Team provided staffs of DINAMA and IMC with technology transfer, throughout the manual development in the Pilot

Project. The subject matters were technical and managerial things related with IWWM, including inspection procedures in Japan, wastewater treatment technologies, relevant management practices commonly applied into classified industries, etc.

(b) Technical training in Japan (Action 2)

<Planned Action>

While IWWM in Uruguay are conducted in a certain degree at present, it was identified that its technical and managerial skills of staffs remained unsophisticated and their activities were limited to a narrow range. Thus staffs of DINAMA and related Municipalities engaged in IWWM need to learn more updated knowledge and practices on IWWM. Therefore, the technology transfer through the group training in Japan was planned

<Achievement>

In the Pilot Project, JICA provided IMC's staffs with technology transfer through the group training course in Japan titled "Industrial Wastewater Treatment II". This is more precisely described in the **Sector F**.

(c) Technology transfer from DINAMA (EnCD) to Municipalities' staff (Action 3)

<Planned Action>

It is proposed that the DINAMA (EnCD) and Municipalities jointly conduct coordinated IWWM and industrial inspection under the Agreement. However, the present capacities of Municipalities are substandard in terms of individual level and organization level. Thus, the technology transfer from EnCD to Municipalities is planned concerning the field of IWWM and industrial inspection to realize such collaboration.

<Achievement>

This Action was started with the workshop for discussing the collaborative IWWM in IMF, in September 2006.

(2) Development of Industrial Wastewater Related Manuals (Output 2.4)

(a) Procedural and management manuals (Action 1)

<Planned Action>

While DINAMA has conducted a certain level of IWWM, the actual practices, especially, compliance inspection of industries, are not unified. These have resulted into deviated and stagnated judgments in the authorization process of industrial discharge. Thus, it was attempted that DINAMA and the JICA Study Team jointly develop manuals for procedural and management for the compliance inspection.

<Achievement>

In the Pilot Project, DINAMA and the JICA Project Team jointly acted to formulate a series of manuals procedural and management manuals for IWWM. After discussing the necessity and requirement of manuals, it was decided to start the development of the following manuals as shown in **Table 4.4.1**.

Among them, some of manuals have been completed in the period of the JICA Project but the rest of them still require continuing the development work. Item 3 (Guidance for Industrial Wastewater Flow Rate Measurement) and Item 4 (Guidance for Sampling, Preservation and Transport of Underground Water) have been completed. They are carried in the DINAMA's website, already are being used by industrial users.

With respect to Item 1 (Industrial Wastewater User Inspection Manual), the draft document has already prepared. It is waiting for the approval of the DINAMA's legal adviser. Meanwhile, the draft document of Item 2 (Industrial Wastewater Sampling Manual) has already been prepared. However, after completing the draft, it happened that all the staffs of EnCD engaged in the Project including the Division Director and the chief left the preparation works of manuals for their personal reasons, thereby resulting into the suspension of these works. Thus, EnCD's new members are now working for reviewing this draft.

Item 5 (Registration Manual of Competent Professional) and Item 6 (Self-Monitoring Report Manual) have not started yet. Recently (in 2005), some amendments have been made in the EIA-related regulation. Item 5 and Item 6 have to restart, take into account of possible changes associated with the amendment of the EIA regulation.

Item 7 (Authorization Manual of Industrial Wastewater Discharge) had been started in the Pilot Project. It was predicted that this work would take a long time, because the work should include some modification of a part of the SADI Procedure. Therefore, this work was postponed to the next phase, in light of the human resources of EnCD.

The following product documents resulted through the JICA Project period are presented in:

- **Project Supplementary Document (2.1)**: Industrial User Inspection Manual
- **Project Supplementary Document (2.2)**: Industrial Wastewater Sampling Manual (First Virsion)
- **Project Supplementary Document (2.3)**: Guidance for Industrial Wastewater Flow Rate Measurement
- **Project Supplementary Document (2.4):** Guidance for Sampling, Preservation and Transportation of Underground Water

Table 4.4.1 Procedural and Management Manuals

Item No.	Titles	Purposes of Manuals	Contents
1	Industrial User Inspection Manual	This is a guideline to be used for DINAMA inspectors (and possibly municipal inspectors) to enforce the inspection of industrial wastewater.	• General instructive document describing on how to carry out the inspection of industrial wastewater facilities.
2	Industrial Wastewater Sampling Manual	This is a guideline to be used for DINAMA inspectors (and possibly municipal inspectors) to carry out the sampling of industrial wastewater.	• Instructive document describing on how to carry out sampling of industrial wastewater.
3	Guidance for Industrial Wastewater Flow Rate Measurement	This is a technical guideline to enforce the resolution of the effluent measurement (to be issued October 2004)	• Technical descriptions of flow rate measurement (methodologies, constructions, calculations, etc.) by means of open channel weir, • Detail explanation of triangular, rectangular, and other type.
4	Guidance for Sampling, Preservation and Transportation of Underground Water	This is a technical guideline to be used for sampling underground water.	• Instructive document describing on how to preserve and transport underground water.
5	Registration Manual of Competent Professional	This is a program to be used for registering the competent professional with digitized information, aiming to realize a computerized registration procedure.	• Programmed electric format for the input of information on the competent professional, • Instructive documents on how to use the input format.
6	Self-Monitoring Report Manual	This is a program to be used for receiving the self-monitoring report from industries with digitized information, aiming to realize a computerized procedure.	• Programmed electric format for the input of information on the self-reporting, • Instructive documents on how to use the input format, • Instruction on the selection of water quality laboratory, etc.
7	Authorization Manual of Industrial Wastewater Discharge	This is a guideline to be used for decision-making in various steps to give authorizations along the established procedure of SADI.	• Instructive document indicating criteria on how to examine and render authorizations in various step of SADI.

(b) Development of technical guidance on industrial wastewater (Action 2)

<Planned Action>

While DINAMA has conducted a certain level of IWWM, the actual practices, especially, compliance inspection of industries, are not unified and the basic knowledge in the field of industrial wastewaters is still needed. These have resulted into deviated and stagnated judgments in the authorization process of industrial discharge. One of main reason was identified to be lack of knowledge specializing industrial wastewater matters. Thus, it was attempted that DINAMA and the JICA Study Team jointly developed the guidance for industrial wastewaters to enhance the knowledge on wastewater matters.

<Achievement>

In the Pilot Project, DINAMA and the JICA Project Team discussed what data and information should be contained in this guidance, considering actual activities of industrial wastewater management. As a result, the following items were extracted:

- Water pollution sources;
- Wastewater volume;
- Water quality parameters and their significances;
- General description of industrial wastewater treatment technologies; and
- Actual application of wastewater treatment technologies for selected industries.

First, the draft has been prepared by the JICA Project Team, collecting necessary data/information in Japan and many other countries. After the discussion between DINAMA and the JICA Project Team, both English and Spanish version comprised of about 250 pages have been completed in the Pilot Project, including additional data and information available in Uruguay.

This guidance is titled “Guidance of Industrial Wastewater Treatment Technologies” as shown in **Project Supplementary Document (2.5)**. This technical guidance will be used for staffs involved to share the common fundamental knowledge necessary for the management. Together, this will be used for the technology transfer from EnCD to the municipalities which aims at the collaboration on IWWM, also.

(3) Establishment of Collaboration System on IWWM (Output 2.3)

(a) Consensus and agreement for collaboration on IWWM between DINAMA and Municipalities (Action 1 and 2)

<Planned Action>

DINAMA has the overall competence for industrial wastewater management in Uruguay according to the Decree 253/79. Meanwhile, municipalities are in a position to supervise the wastewater discharge in their territories. It has been confirmed through the interview that the municipalities harbor strong expectations for some coordinated activities with DINAMA regarding industrial wastewater management. In light of such situation, the JICA Project Team suggested that a coordination mechanism between DINAMA and the municipalities be furnished under the Joint Work Agreement to reinforce IWWM in Uruguay.

<Achievement>

In the Pilot Project, the draft of the Joint Work Agreement, as shown in **Annex (1)**, has been prepared. This has been already discussed and largely approved by the Steering Committee. The Joint Work Agreement includes the following actions:

- MVOTMA (the upper ministry of DINAMA) provides the municipalities with technology transfer with industrial wastewater management;
- MVOTMA discloses administrative and technical data/information related with the authorization of industrial discharge to the municipalities;
- MVOTMA and the municipalities mutually share data/information of the inspection results; and
- Close cooperation is made between MVOTMA and the municipalities in carrying out industrial user inspections.

Among the municipalities, IMM has already taken collaborative actions with DINAMA with the mutual consent on the IWWM. Through the discussions in the Steering Committee, other Municipalities have strongly requested the necessity of the collaboration.

Now, EnCD is discussing the implementation schedule for the collaboration and the Agreement between DINAMA and Municipalities. As the first case, This Action is supposed to start with the workshop for discussing collaborative IWWM in IMF, in September 2006.

(b) Sharing of authorization-related data/information (Action 3)

<Planned Action>

Until now, data/information associated with the authorization of industrial discharge has not been opened from DINAMA to Municipalities, except for the special case with IMM. This has made it difficult for Municipalities to

appropriately inspect industries. To make the inspection of Municipalities easier and effective, the sharing of authorization-related data/information was suggested.

<Achievement>

In the Pilot Project, DINAMA started to open data/information associated with SADI and engineering data of industries to Municipalities, based on the request.

(c) IWWM and compliance inspections coordinated by DINAMA and Municipalities (Action 4)

<Planned Action>

DINAMA (EnCD) should play the leading role as stipulated in the Decree 253/79. The collaboration with Municipalities, however, is important to support the work of DINAMA and to raise the ownership of the Municipalities for the management of hygiene environment in their area. For the collaboration, Municipalities are considered to conduct works as the liaison or site office as shown below.

- Collaborate to compliance inspection work to be conducted by DINAMA including assistance to sampling and clarifying the status;
- Conduct simplified and supplementary compliance inspection apart from the DINAMA's inspection; and
- Follow up of compliance inspection to be conducted by DINAMA.

In order to realize efficient collaboration between DINAMA and Municipalities, the following should be conducted:

- DINAMA provides Municipalities with the information of registration of industrial wastewater discharge;
- DINAMA provides Municipalities with the record of inspection: and
- DINAMA conducts technology transfer to Municipalities in terms of laws and regulations regarding wastewater discharge and basic knowledge for wastewater treatment.

Actual collaboration plan for each Municipality should be studied and prepared individually for each Municipality, since the conditions, e.g. number of subject enterprises, staff numbers and their capacities are largely different by Municipalities.

Among others, Municipality of Montevideo (IMM) already established compliance inspection system, and thus it is proposed that IMM conducts the compliance inspection and the collaboration with DINAMA is further reinforced through appropriate exchange of information. In Municipality of Canelones (IMC), because more than 100 numbers of factories are situated, it is thus proposed to establish a system like IMM to conduct the compliance inspection by IMC in the future in view of reducing the load to DINAMA.

To study the collaborative system to be established, it was planned that DINAMA started the discussion with municipalities.

<Achievement>

The actual modality of the collaboration will be decided in the course of the discussion of the workshop which is started in IMF in September 2006. After that, the collaborative work of IWWM and inspections will begin.

(d) Mutual exchange of inspection results between DINAMA and Municipalities (Action 5)

<Planned Action>

As a result of collaborative IWWM and industrial inspections between DINAMA and Municipalities, it is proposed that every data/information thereof be exchanged mutually. The inspection results will be used for the respective purposes of DINAMA and Municipalities.

<Achievement>

This Action will be taken in the actual collaborative work after the completion of the JICA Project.

4.5 Required Actions toward 2013

4.5.1 Issues toward 2013

In the reinforcement of IWWM, main results generated in the period of JICA Project are i) improvement of individual capabilities of EnCD and related units, and ii) increase of intellectual assets by the development of procedural/management manuals and technical guidance.

In the period of JICA Project, further progress after the results mentioned above has been not realized, mainly due to the lack of human resources of EnCD involved in this Project.

Major issues to be tackled by DINAMA and concerned units after the completion of the JICA Project are:

- To complete procedural and management manuals that have been not finished yet, and to utilize them usefully ; and
- To establish the collaborative IWWM and industrial inspections between DINAMA and Municipalities concerned, by concluding the Agreement.

Required actions for that purpose are described specifically, hereunder.

4.5.2 Required Actions

(1) Strengthening of Individual Capacity of Staffs of DINAMA and Relevant Units (Output 2.5)

(a) Technology transfer to Municipalities' staff (Action 3)

The municipalities (IMC, IML, IMF and IMSJ) except for IMM need the strengthening of their capacity to enforce the collaborative operation in IWWM. The capacity required for the strengthening may include the individual ability and equipment/materials necessary for industrial wastewater inspection, though depending on the respective situations of each Municipality.

EnCD will take the leading role of this technology transfer. The procedural/management manuals and the technical guidance which were developed in the Action 1 and 2 of the Output 2.4 will be used in the technology transfer. The respective needs of Municipalities should be assessed prior to implementing the technology transfer.

(2) Completion of Industrial Wastewater Related Manuals (Output 2.4)

(a) Procedural and management manuals (Action 1)

Development of a total of seven (7) procedural and management manuals was aimed during the JICA Project Period. Of them, five (5) manuals have been not completed yet. As shown in **Table 4.5.1**, the present statuses of them are different. It was confirmed in the discussion with the Director of EnCD that the manuals were essential for DINAMA, considering a unified management in IWWM and the utilization for the technology transfer for Municipalities. Thus, EnCD shall continue this work to complete them in the subsequent stage.

Meanwhile, the completed manuals continuously need to modify due to possible changes in the inspection practices and others. EnCD will make necessary modifications, in such occasions.

Table 4.5.1 Present Status of Procedural and Management Manuals

Item No.	Titles	Present Status as of the Phase IV
1	Industrial User Inspection Manual	After the draft completion in the PLP, EnCD reviewed and modified partly. Now the legal adviser is checking it, aiming to complete it until the end of September 2006.
2	Industrial Wastewater Sampling Manual	The draft version was already completed in the PLP. Now, EnCD is reviewing it, aiming to complete until the end of March, 2007.
3	Registration Manual of Competent Professional	Not yet started. EnCD is now formulating it, aiming to complete until the end of October, 2006.
4	Self-Monitoring Report Manual	Not yet started. EnCD is now formulating it, aiming to complete until the end of December, 2006.
5	Authorization Manual of Industrial Wastewater Discharge	Not yet started. EnCD is now formulating it, aiming to complete until the end of December, 2007.

(3) Establishment of Collaboration between DINAMA and Municipalities (Output 2.3)

(a) Agreement for collaboration on IWWM, coordinated inspection and exchange of inspection results (Action 2, 4 and 5)

Under the planned coordination system, it is envisaged that DINAMA stays at the position of the authorization unit as it is, and the municipalities work as so-called a "Liaison Office" which can be mobilized rapidly in contacting industrial users (Action 4). The results of inspections of industries under a well-coordinated joint work will be used by Municipalities as well as DINAMA (Action 5). Actual modality of collaborative works will be precisely elaborated by municipalities and will be prescribed in the Joint Work Agreement (Action 2), taking account of respective situations.

Before and after concluding of the Joint Work Agreement, other related actions should be taken. Therefore, the Joint Work Agreement needs to be contracted in conjunction with other related actions, as shown in **Figure 4.5.1**. As the result of the municipalities' capacity, the implementation regime of IWWM in Uruguay will be strengthened.

EnCD is supposed to open the workshop for discussing the collaborative IWWM in IMF, in September 2006, as the first attempt. According to the plan of EnCD, the Agreement will be concluded with three (3) municipalities in 2007, and then all the municipalities until 2013.

(b) Sharing of authorization-related data/information (Action 3)

As already mentioned, the sharing of authorization-related data/information with Municipalities has started in the Pilot Project. This is conducted through mainly by a hand-over of hard copies. The method of the sharing should be improved to easier way through the internet, in the future.

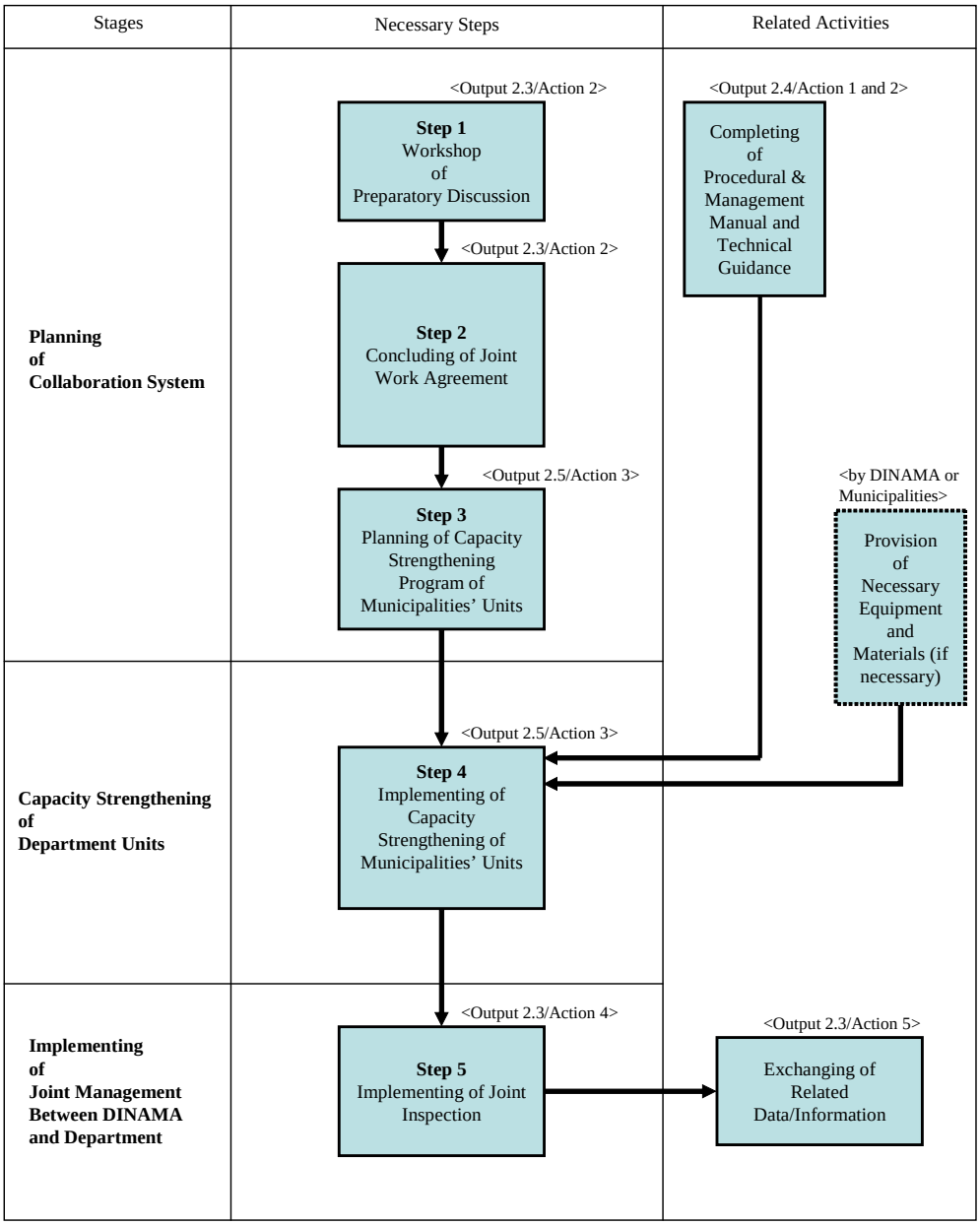

Figure 4.5.1 Road Map for Collaborative Industrial Wastewater Management

5. PROPOSED PLAN OF INTEGRATED POLLUTION SOURCE MANAGEMENT

5.1 Background

The Decree 257/97 delegates wide responsibilities to DINAMA in connection with the conservation and improvement of water quality. To be specifically, DINAMA is requested to plan, implement, supervise and evaluate preventive measures for negative impacts by human activities and projects, public and personal activities to generate environmental loads. The construction of good coordination mechanism among concerned parties is also one of DINAMA's tasks under this Decree.

The baseline survey of the Project has clarified that the task conducted by DINAMA concentrates predominantly on industrial wastewater management, for the time being. However, DINAMA has the legal responsibility to conduct integrated management of pollution sources dealing with not only industrial wastewater but also various pollution sources, like domestic wastewater, wastewater generated from solid waste, etc. Water pollution caused from non-point sources (like agricultural field, urban areas, etc.) is also the subject to integrated pollution source management (IPSM).

Although IPSM should be one of dispensable tasks of DINAMA, this has little been tackled at present. In the Santa Lucía River Basin encompassing several reservoirs for drinking water of the Metropolitan Area, it has been recognized based on monitoring data in the past and in the Pilot Project that significant water pollution, especially the eutrophication caused by nitrogen and phosphorus is a fairly possible concern. As such, it is called for that DINAMA initiate an integrated approach to control/regulate various pollution sources in IPSM.

Major problems in current practices of DINAMA in this respect are summarized hereunder:

- No organizational commitment of DINAMA for implementing IPSM, thereby resulting into no assigned staffs and a management tool;
- Lack of data/information collection necessary for assessing pollution sources; and
- Lack of collaboration between DINAMA and related units for collecting necessary data/information and policy-discussing.

To address problems mentioned above, the strengthening of IPSM is proposed in the Project, hereunder.

5.2 Needs of Capacity Development

The problems in IPSM were thoroughly analyzed from various aspects, comparing with the envisioned water quality management ultimately to be attained in Uruguay. As a result, it has been clarified that DINAMA itself as the leading agency in IPSM needs strongly to address the deprived human resource (especially numbers of staffs concerned) which is a common underlying problem.

Based on the result of the problem analysis, the needs of capacity development to strengthen IPSM were identified as follows:

- Allocation of staffs in EnCD and EQED engaged in IPSM;
- Furnishing of data/information necessary for IPSM;
- Development of a policy tool comprising database and water quality simulation model linked with GIS; and
- Establishment of collaboration between DINAMA and related units.

5.3 Proposed Strategies of Capacity Development

The approaches of the capacity development were thoroughly discussed and studied employing PCM method. Based on this, the plan of the capacity development for IPSM was designed.

The JICA Project Team, as detailed in the Main Report, proposes the "Outputs" and "Activities" (which signify the "Strategies" and "Actions", respectively) for the capacity development in line with the identified needs. The proposed plan encompasses the development of the capacity of individual level, organizational level and society/institutional level, aiming at the strengthening of IPSM until the year of 2013, as shown in **Table 5.3.1**.

Table 5.3.1 Proposed Strategies and Actions for strengthening of Integrated Pollution Source Management

Strategies (Outputs)	Actions (Activities)
Strengthening of individual capacity of relevant units on pollution sources management (Output 2.2)	1. JICA provides with the group training course in Japan for pollution source management. 2. DINAMA holds a workshop to share the output of the training in Japan with related units.
Maintaining of collaboration among relevant agencies on pollution source management (Output 2.1)	1. Various discussions on pollution sources are made among related units. 2. Periodical meetings take place to exchange information on pollution source management; attended by DINAMA, OSE, RENARE, Municipalities and other relevant organization ("Steering Committee" shall be utilized). 3. DINAMA collects data/information on sewerage development. 4. DINAMA collects data/information on solid waste management. 5. DINAMA collects data/information on non-point source pollution management.
Establishment of integrated information system for pollution sources (Output 2.6)	1. DINAMA collects (and continues/updates) data/information on pollution sources. 2. DINAMA constructs an integrated information system with GIS database on pollution sources. 3. DINAMA inputs data of various pollution sources to the integrated information system.
Establishment of water quantity observation system (Output 2.8)	1. DNH establishes a water quantity observation system for the Santa Lucía Basin necessary for water quality simulation.
Assessing of Influence of pollution sources to river	1. DINAMA allocates proper staff assigned to the task of water quality assessment.

Strategies (Outputs)	Actions (Activities)
water quality (Output 2.7)	2. DINAMA makes preliminary survey on the pollution loads from various wastewaters. 3. DINAMA develops a simulation model for predicting water quality for the Santa Lucía River Basin. 4. DINAMA continuously assesses the influence of various pollution sources.

5.4 Required Actions toward 2013

5.4.1 Achievement in JICA Project Period

In the Integrated Master Plan, it has been proposed that almost all the actual actions for IPSM will be started and taken after the completion of the JICA Project. This is because the present modest human resources of DINAMA (mainly EnCD) involved in the project have been taken into account.

The actions undertaken during the JICA Project Period was only limited to the technical training in Japan and the discussions on the necessity of IPSM in the Steering Committee. The present status and problems of pollution source management were discussed several times in the Steering Committee. As a result, it has been confirmed that IPSM is indispensable for the Santa Lucía River Basin and needs to be initiated in the near future.

As such, the proposed plan for IPSM will be started and tackled almost from the scratch, after the completion of the JICA Project.

5.4.2 Required Actions

(1) Strengthening of Individual Capacity on Pollution Source Management (Output 2.2)

(a) Technical training in Japan on pollution source management and sharing of the output (Action 1 and 2)

For the purpose of the strengthening of individual capability on pollution source management, two (2) staffs participated in the group training in Japan during the JICA Project Period, and they shared their results in the workshop. This is described in detail in **Sector F**.

Further technical training on pollution source management is called for strengthening individual capability engaged in IPSM in the subsequent phase in an appropriate scheme. The result of the technical training in Japan should be shared with relevant staffs to expand their technical knowledge.

(2) Collaboration among Relevant Agencies (Output 2.1)

(a) Periodical meetings and discussions among related units on pollution source management (Action 1 and 2)

Up to now, the discussions on pollution source management were made several times in the Steering Committee among involved units (DINAMA, OSE, DNH, RENARE and Municipalities). In these discussion, it was confirmed the necessity of the introduction of IPSM in the Santa Lucía River Basin.

In the subsequent phase, more practical and specific discussion among relevant units will be made to initiate and operate IPSM. IPSM involves numbers of central government agencies and local governments, while DINAMA is placed at the leading position. Therefore, the Agreement for Joint Work on IPSM should be discussed and made, if necessary.

(b) Collection of general and basic data/information associated with pollution source management (Action 3, 4 and 5)

IPSM requires many data/information on every pollution sources to be analyzed. Therefore, the collection of such data/information should be a routine work of DINAMA.

General and basic data/information covers industrial wastewater, sewerage system, solid waste disposal, non-point sources (like agriculture field, livestock yards, etc.) and basic data/information (like other socio-economic conditions, hydrologic data, meteorological data, etc.). At present, DINAMA partly collects necessary data/information. However, they are not properly filed that it is difficult for everyone to access them. DINAMA will develop an appropriate and systematic filing to store data/information on IPSM.

(3) Establishment of Integrated Information System for Pollution Sources (Output 2.6)

(a) Collection of actual data/information associated with pollution source management (Action 1)

The actual data/information are the ones to be resulted from classifying and analyzing at a certain level the general and basic data mentioned in the section 4.4.2-(2)-(b). This task is required to facilitate the data input work to the data base system to be developed.

(b) Development of an integrated information system with GIS, and data input (Action 2 and 3)

Integrated pollution source management (IPSM) is to make and enforce the policy for conserving and improving water quality against various pollution sources. This policy-making becomes realized through collecting

data/information for pollution sources and predicting water quality resulted from data processing and calculation.

The water quality prediction is a complicated calculation and, for that purpose, massive data/information are required. Thus, it is proposed that a computerized system with employing GIS (geographic information system), as shown in **Figure 5.4.1**, be developed.

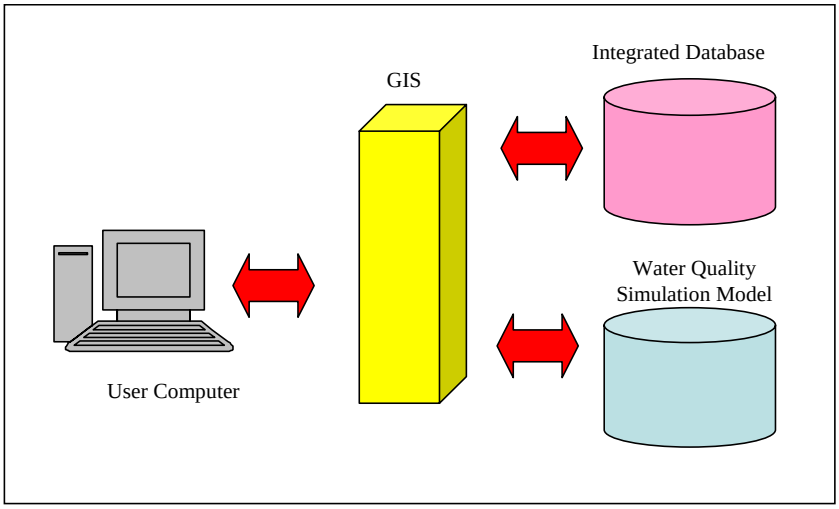

Figure 5.4.1 Conception of Information and Simulation System for Integrated Pollution Source Management

The Action 2 and 3 will be taken in the following ways:

- A technical committee comprised of the relevant units will be organized to discuss the requirement and specification of a GIS database system;
- EnCD under the collaboration with EQED will study and propose required system of the GIS database; and
- EnCD will create a GIS database system for various pollution sources.

(4) Establishment of Water Quantity Observation System (Output 2.8)

(a) Establishment of Water Quantity Observation System for Santa Lucía River Basin (Action 1)

Water quantity (river flow) data of the Santa Lucía River are required for simulating water quality. This Action is to establish appropriate system for observing river flow of the Santa Lucía River. Because DNH has the responsibility of water quantity management in Uruguay, this Action is undertaken by DNH under close collaboration with DINAMA.

In this Action, firstly, DNH identifies necessary work including equipment for the establishment of appropriate system for water quantity observation, consulting DINAMA and other related units. Based on this result, the identified plan is implemented to establish and operate necessary water quantity observation system.

Water quantity data collected from the observation system will be used for the information and simulation system for IPSM, thereby making a policy for pollution source management.

(5) Assessment of Pollution Sources' Influences (Output 2.7)

(a) Allocation of assigned staff to be engaged (Action 1)

The development and operation of the information and simulation system for IPSM requires personnel acquiring the appropriate knowledge and experience on water quality matters and system engineering. Thus, DINAMA is requested to allocate and assign proper numbers of staff for implementing IPSM. Preferably the unit specializing in IPSM should be created under EQED in the collaboration with EnCD.

(b) Preliminary survey of pollution loads from various pollution sources (Action 2)

DINAMA will make a preliminary survey on the pollution load from various pollution sources. This preliminary survey will make to clarify quantitatively and qualitatively all pollution loads generated from point sources (wastewater from industries, urban areas, solid waste disposal sites, etc.) and non-point sources (agricultural field, urban areas, natural field areas, etc.), in the following way:

- Firstly, data/information stored in the GIS database for pollution sources will be evaluated to check the data/information already obtained;
- Then, data/information necessary for water quality assessment will be enumerated, and a preliminary survey plan of pollution load will be formulated; and
- Along with the preliminary survey plan, necessary data/information to define pollution loads will be collected by the unit, and input to the database.

(c) Development of a simulation model of water quality (Action 3)

A simulation model will be created to predict water quality of the Santa Lucía River Basin. As already mentioned, there are a possible concern about eutrophication phenomena caused by phosphorus and nitrogen in the Santa Lucía River Basin. Therefore, the simulation model is requested to deal with the concentrations of nutrient (nitrogen and phosphorus) as well as usual water quality parameters (BOD, TSS, etc.).

The simulation model of water quality, which is incorporated into the information and simulation system for IPSM (shown in **Figure 5.1**), will be developed and operated by the unit engaged, in the following way:

- Appropriate simulation model of water quality is discussed and studied, taking account of characters of the Santa Lucía River Basin;
- The appropriate simulation model of water quality is developed; and
- Using the developed simulation model, the possible future change of water quality in the Santa Lucía River Basin is predicted and assessed.

(d) Assessment of various pollution sources' influences (Action 4)

By using the information and simulation system for IPSM developed in the Action 3, DINAMA assess the influence to the water environment to be caused various by pollution loads. The results obtained from the assessment will be used for a policy-making in pollution source management in the Santa Lucía River Basin.

Annex

ANNEX (1)

= DRAFT =

AGREEMENT

ON

FRAMEWORK OF JOINT WORK IN WATER QUALITY MANAGEMENT

BETWEEN

MINISTRY OF HOUSING, USE OF LAND AND ENVIRONMENT (MVOTMA)

AND

MUNICIPAL GOVERNMENT OF CANELONES (IMC)

Montevideo, July 10, 2004

Arq. Saul Irureta Saralegui	Mr. Tabaré Hackembruch
Minister	Mayor
Ministry of Housing, Use of Land	Municipal Government of Canelones
And Environment	

(Witnessed by)

Mr. Keiji Sasabe

Leader

JICA Project Team

<u>Remark</u>:

(1) This shows the sample for the Agreement between MVOTMA and IMC. The actual Agreement will be made separately for IMC, IMSJ, IMF and IML. Therefore, "IMC" and other parts peculiar to the municipality in this draft will be replaced.

(2) This Agreement is drafted, assuming that water quality monitoring and industrial wastewater management are concluded together.

The Ministry of Housing, Use of Land and Environment (hereinafter called MVOTMA) and the Municipal Government of Canelones (hereinafter called IMC) mutually agreed on the Joint Work described hereunder.

1. INTRODUCTION

MVOTMA and IMC cooperatively conduct a Joint Work in water quality management (hereinafter called the Joint Work) for the purpose of preserving and improving water quality in the water bodies.

The Joint Work is comprised of two (2) components:

(1) Water Quality Monitoring, and

(2) Industrial Wastewater Management

This document sets forth the frameworks of the Joint Work.

2. OBJECTIVES OF JOINT WORK

2.1 Water Quality Monitoring

Water quality monitoring is necessary for clarifying the status of water quality in water bodies for both MVOTMA and IMC. However, water quality monitoring is currently very modest due to the shortage of the capacity in this respect.

Considering such present situation and the underlying needs for water quality monitoring, the Joint Work is aiming to cooperate for securing sustainable water quality monitoring of water bodies, promoting the capacity improvement of IMC.

2.2 Industrial Wastewater Management

Industrial wastewater is one of the sources for water pollution in water bodies. While both MVOTMA and IMC are making efforts to regulate and control the discharge from industries, there are currently a significant number of improper operations and suspected violations.

Considering such present situations and underlying needs for proper controls of industrial wastewater management, the Joint Work is aiming to cooperate for securing sustainable industrial wastewater management, promoting the capacity improvement of IMC.

3. SCOPE OF COOPERATION

3.1 Water Quality Monitoring

MVOTMA and IMC carry out water quality monitoring including sediment analysis (sampling, transportation, laboratory analysis, etc.) of water bodies in close cooperation, as follows:

(1) IMC principally undertakes water sampling, transportation of samples and laboratory measurement for a part of water parameters, according to a monitoring schedule,

(2) MVOTMA principally undertakes laboratory measurement for water parameters all but the ones made by IMC,

(3) MVOTMA provides IMC with technology transfer for water sampling techniques, laboratory measurement, etc., and

(4) MVOTMA and IMC mutually share water quality data obtained their measurement in the Joint Work.

3.2 Industrial Wastewater Management

MVOTMA and IMC carry out industrial wastewater management in close cooperation, as follows:

(1) MVOTMA and IMC carry out inspection related with industrial wastewater management under a coordinated schedule,

(2) MVOTMA discloses administrative and technical data/information related with industrial discharge authorization to IMC upon request,

(3) MVOTMA provides IMC with technology transfer related with industrial wastewater management, and

(4) MVOTMA and IMC mutually share data/information of the inspection results.

4. OTHERS

(1) Actual execution of the Joint Work will be discussed between National Directorate of Environment (hereinafter called DINAMA) as the enforcement unit of MVOTMA and the enforcement unit of IMC within the framework of the Agreement at the later stage, based on the Preliminary Implementation Plan shown in **APPENDIX**.

(2) Expenses necessary for materials and reagents for each party's work shall be born by each party, and

(3) MVOTMA and IMC amicably consult with each other in respect of any matter that may arise from or in connection with the Joint Work.

Attached: APPENDIX 1: Preliminary Implementation Plan

(End)

APPENDIX

PRELIMINARY IMPLEMENTATION PLAN OF JOINT WORK

IN

WATER QUALITY MANAGEMENT

1. INTRODUCTION

This Preliminary Implementation Plan (hereinafter called PIP) is concerned with the Agreement on Framework of Joint Work in Water Quality Management between MVOTMA and IMC (hereinafter called the Framework Agreement). In accordance with the Section 4- (1) of the Framework Agreement, the PIP for the execution of the Joint Work is described hereunder.

It should be remarked that this basic plan would be followed by the precise and practical schedule at the actual implementation stage and be changed within the framework of the Framework Agreement.

2. UNITS IN CHARGE

DINAMA and IMC cooperate in the execution of the Joint Work, through the following units in charge:

(1) Water Quality Monitoring

- DINAMA: Environmental Quality Evaluation Division (hereinafter called EQED)
- IMC: General Directorate of Environmental Management

(2) Industrial Wastewater Management

- DINAMA: Environmental Control Division (hereinafter called EnCD)
- IMC: General Directorate of Health and Environmental Management

3. DEMARCATION OF WORK

3.1 Water Quality Monitoring

DINAMA and IMC carry out water quality monitoring including sediment analysis (sampling, transportation, laboratory measurement/analysis, etc.) of water bodies and the capacity development thereof, as follows:

(1) IMC undertakes water sampling, transportation of samples and laboratory measurement/analysis for a part of water parameters according to Table 1, Table 2 and Figure 1, starting from December 2004,

(2) DINAMA undertakes laboratory measurement/analysis for water parameters according to **Table 1** and **Figure 1** *(Attached not here but other section)*, starting from December 2004

(3) DINAMA provides IMC with technology transfer for water sampling techniques, laboratory measurement/analysis, etc., starting from September 2004, and

(4) DINAMA and IMC mutually exchange its measurement/analysis results in the Joint

Work, promptly after its work.

3.2 Industrial Wastewater Management

DINAMA and IMC carry out industrial wastewater management and the capacity development thereof, as follows:

(1) DINAMA and IMC carry out inspection for wastewater sources, wastewater treatment facilities, effluent water quality monitoring, etc.) starting form the year of 2005, under a coordinated schedule to be formulated in the mutual consultation later,

(2) DINAMA opens administrative and technical data/information related with industrial discharge authorization to IMC on its website, starting from April 2005,

(3) DINAMA provides IMC with a copy of Engineering Project upon request, starting from April 2005,

(4) DINAMA provides IMC with technology transfer related with industrial wastewater management, by holding a workshop on authorization procedure, data/information disclosure, inspection methodologies, and wastewater treatment technologies, etc. in the year of 2005, under a schedule to be formulated later, and

(5) DINAMA and IMC mutually share data/information of the inspection results.

(End)