



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 1: SUMMARY**

**JANUARY 2007**



CTI Engineering International Co., Ltd.

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The cost estimate in this study is based on the price level on March 14, 2005 and the applied foreign currency exchange rates are as stated below:

***EXCHANGE RATE***

US Dollar (US\$) 1.00 = Uruguay Pesos (\$) 25.20
Japanese Yen (¥) 1.00 = Uruguay Pesos (\$) 4.17

## **PREFACE**

In response to a request from the Government of the Oriental Republic of Uruguay, the Government of Japan decided to conduct a project on Capacity Development for Water Quality Management in Montevideo and Metropolitan Area and entrusted the study to Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Keiji Sasabe of CTI Engineering International Co., Ltd. and consists of members from CTI Engineering International Co., Ltd. to Uruguay between October 2003 and January 2007.

The team held discussions with the officials concerned of the Government of Uruguay and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Uruguay for their close cooperation extended to the team.

January 2007

Ariyuki Matsumoto  
Vice President  
Japan International Cooperation Agency

January 2007

Mr. Ariyuki Matsumoto  
Vice President  
Japan International Cooperation Agency  
Tokyo, Japan

Sir:

**LETTER OF TRANSMITTAL**

We are pleased to submit herewith the Final Report on *the Project on Capacity Development for Water Quality Management in Montevideo and Metropolitan Area in the Oriental Republic of Uruguay*.

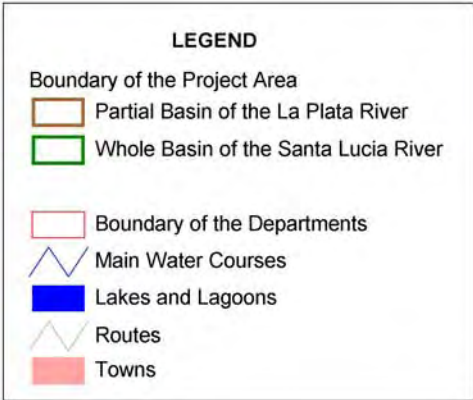
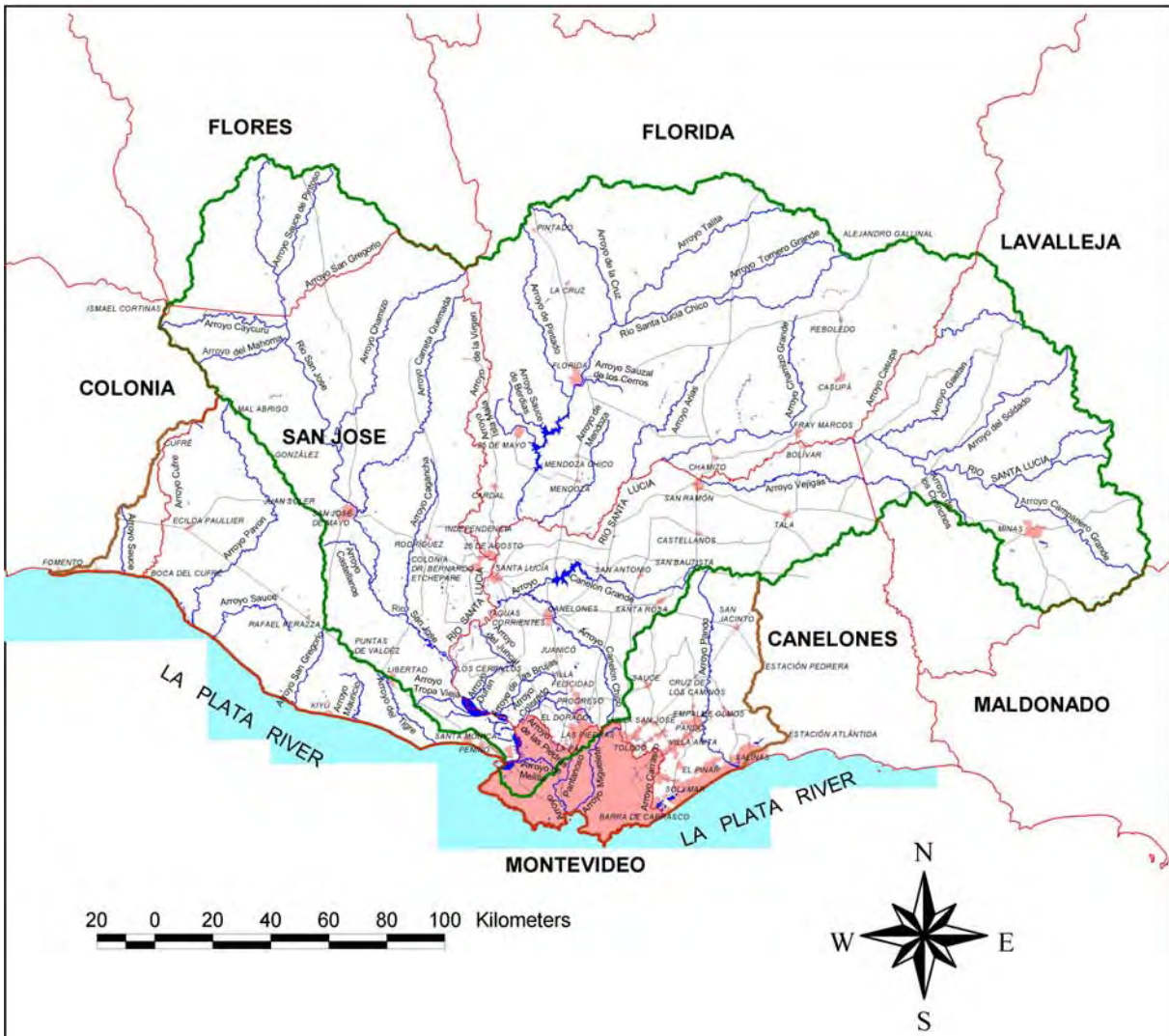
The study was conducted by CTI Engineering International Co., Ltd. under contracts with Japan International Cooperation Agency (JICA) during the period from October 2003 to January 2007. In conducting the study, we have paid much attention to formulate a realistic master plan of capacity development of water quality management in Montevideo and Metropolitan Area and to conduct effective trial implementation of the part of the master plan with due consideration to the present situation of Uruguay.

We wish to take this opportunity to express our sincere gratitude to the Government of Japan, particularly, JICA, the Ministry of Foreign Affairs, and other offices concerned. We also wish to express our deep appreciation to the National Directorate of Environment, Ministry of Housing, Use of Land and Environment and other authorities concerned of the Government of Uruguay for their close cooperation and assistance extended to the JICA study team during the study.

Finally, we hope that this report will contribute to the further promotion of capacity development for water quality management.

Very truly yours,

Keiji Sasabe  
Leader, JICA Study Team  
CTI Engineering International Co., Ltd.



**LOCATION MAP OF THE PROJECT AREA**

## **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**

## **EXECUTIVE SUMMARY**

### **Context Background and Outline of the Project**

1. The capital of the Republic of Uruguay, the city of Montevideo, and its Metropolitan Area are a part of a major area with the other departments. This area is generally associated with rural Montevideo and San José and Canelones Departments. The Santa Lucía River Basin is the river basin that comprehends the wider Metropolitan Area integrating also Florida and Lavalleja Departments. The area of the Santa Lucía River Basin represents approximately 10% of the national territory and a population of approximately two million, over 60% of that of the whole nation, concentrates in this basin.
2. The Santa Lucía River Basin with an area of 13,482 km<sup>2</sup> is one of the six main hydrographic basins of Uruguay. The basin is very important since it is the source of drinking water to the population of the south of the country. The other five major basins in the country are: Negro River basin (68,140 km<sup>2</sup>); Uruguay River basin (45,860 km<sup>2</sup>); Laguna Merin basin (28,950 km<sup>2</sup>); Plata River basin (12,780 km<sup>2</sup>) and Atlantic Ocean basin (8,480 km<sup>2</sup>). The Project Area covered the Santa Lucia River Basin and complementarily a minor coastal space of La Plata River Basin between creeks of Cufre (San José Department) and Pando (Canelones Department).
3. In the Santa Lucía River Basin, there is clean water to protect, as can be seen forward in the Executive Summary, and there are many others that are in process of deterioration. Causes of the deterioration of the aquatic environment of Metropolitan area are: increasing domestic loads, industrial discharges produced by the concentration of industries, illegal dumping of solid wastes on the urban zones, and agricultural activities with the use of fertilizers and chemicals on drinking water sources in the rural areas. Because of the changes of the conditions of the aquatic environment during the last years, the national and local governmental institutions, the companies and the civil society organizations, are beginning to do researches and contributions to the determination and implementation of measures aimed to improvement of water quality.
4. To face the highlighted environmental deterioration, the Government of Uruguay, with the support of the Government of Japan, decided to impulse a Project of Institutional Strengthening. On 2002, the Government of Uruguay together with the Japan International Cooperation Agency (hereinafter referred to as "JICA"), acknowledged the need to implement a project to strengthen the capacity for water quality management in the highlighted area, by agreeing formally to realize joint work between the Ministry of Housing, Use of Land and Environment (hereinafter "MVOTMA") and JICA, on December 5, 2002. On October 2003, the first JICA technical team came to Uruguay to support the execution of the cited project. The work executed by the joint DINAMA-JICA team (with the support of other organizations) continued until December 2006.
5. This Project targeted an overall goal as "River water quality in Montevideo and Metropolitan Area is improved; Public hygiene environment is improved; and, Future water pollution is prevented." with a Project purpose of "The capacity of water quality management of DINAMA and relevant organization in Montevideo and Metropolitan



Area is improved." Output of the Project was "An integrated master plan for strengthening water quality management of rivers in Montevideo and Metropolitan Area is formulated;" and "Capacity of DINAMA and related agencies is developed paying attention to their ownership."

6. For the follow-up of the Project, created was a steering committee chaired by the Minister of Housing, Use of Land and Environment and consisting of representatives from Ministry of Housing, Use of Land and Environment (MVOTMA) mainly from DINAMA, Office of Planning and Budget of Presidency (OPP), National Directorate of Hydrograph (DNH) of Ministry of Transport and Public Works, Administration of the Sanitation Works of the State (OSE) and five municipalities in the Santa Lucía River Basin, namely, Montevideo, Canelones, San José, Florida and Lavalleja. Also created was a technical committee consisting of relevant personnel from the above organizations and National Directorate of Natural Renewable Resources (RENARE) of Ministry of Livestock, Agriculture and Fishery in addition. DINAMA appointed counterpart personnel for the coordinated work between DINAMA and JICA Project Team and for the daily technical transfer. Activities under the Project were conducted through the coordinated work by JICA Project Team, counterpart of DINAMA and members of the Technical Committee.

7. From the beginning, the Joint Team promoted the coordination, accounting with the collaboration of the national institutions related to water, the Municipalities, the educative institutions and the civil society organizations. In general all the institutions contributed in a significant way with the development of the Project. The DINAMA-JICA joint team located mainly in Montevideo, promoted successfully several actions in the five departments of Project implementation.

8. The pilot projects that were part of the Projects focused on: the Development of the Capacity and Strengthening of the Coordination (including the Strategic Part of the Management, the Management of Pollution Sources and the Environmental Water Quality Monitoring, and the Coordination Strengthening between the relevant agencies); the Establishment of an Information System for Water Quality, the creation of a Manual for Management of Industrial Wastewater, and the Strengthening of the Coordination, the creation of a Manual for the Design of Monitoring and Sampling Networks and the Promotion of Dissemination, Education and Public Participation.

9. An Integrated Master Plan was developed that could support the process of strengthening of DINAMA and the rest of the relevant institutions related with water quality management in Montevideo and Metropolitan Area. Integrated Master Plan consisted of realistic action plans with "who" does "what", "when", "how" for the concrete activities for the water quality management. The Master Plan in the present Project is thus not a fixed one, but the one updated and renewed through the preparation of the First Draft, implementation of pilot projects, getting feedback and preparation of Second Draft. The Second Draft was implemented by the Uruguayan side through the experimental implementation and finally was elaborated the Final Plan.

### **Present Condition of Water Quality**

10. Uruguay is divided by six major river basins, namely, Río Uruguay (45,860 km<sup>2</sup>), Río de la Plata (12,780 km<sup>2</sup>), Oceano Atlantico (8,480 km<sup>2</sup>), Laguna Merin (28,950 km<sup>2</sup>),

Río Negro (68,140 km<sup>2</sup>), and Río Santa Lucía (13,482 km<sup>2</sup>). In the water environment sector, the highest concern is given to the Santa Lucía River Basin since it accommodates more than 60% of the national population in the area around 10% of the national territory.

**11.** To be noted regarding “water” in Uruguay, a plebiscite took place together with the presidential election in October 2004 asking “Should water be managed by the state or not?” The result was Yes. Article 47 of the Constitution has accordingly been reformed adding a description “*The water is a natural resource essential for the life. The access to the potable water and the access to the sanitation constitute fundamental human right...*” The Government then declared under the article No.327 in the Law No.17,930, December 19, 2005) that the "Ministry of Housing, Use of Land and Environment" shall propose to the Executive Power the formulation of national water and sanitation policies, pursuant to the provisions of Article 47 of the Constitution of the Republic. Article No.328 then declared an organization responsible for water, namely, National Directorate of Water and Sanitation, DINASA. DINASA has been established on January 17 2006 with the mandate to formulate national policies on water and sanitation. This new institution is starting to do activities, and its development is still very weak. It has not defined yet its relationship with water quality management, where DINAMA is remaining as playing a leading role in the field of water quality.

**12.** In a wider view, main courses of the Santa Lucía River and its tributaries are largely maintained well in water quality with BOD<sub>5</sub> at 5 mg/l and less except in some stretches passing through rural urban areas, thus the water of regional rivers in the Santa Lucía Basin is not affected so much in terms of general organic pollutants. Attention should, however, be paid that although the upstream stretches in Minas and Chamizo are still maintained with lower nitrogen, the middle stream and down, however, the nitrogen concentration increases in places. This is mainly because tributaries such as the Santa Lucía Chico, La Virgen, Canelon Grande and Canelon Chico are polluted by high-level nitrogen. The status of nitrogen in the river water implies the possibility of the eutrophication phenomena in reservoirs in these areas. Remarkable eutrophication phenomena have not been reported as of today, it is, however, a possible threat for raw water sources predominantly used for the potable water of the metropolitan area.

**13.** In the La Plata Basin, however, most rivers appear significantly influenced by artificial activities, namely, wastewater discharged from industries, urban areas and agricultural lands showing the BOD value, in Pando and Sauce rivers, for example, beyond the one specified in the environmental standard.

**14.** The Pantanoso, Miguelete and Carrasco rivers are typical urban rivers, flowing the center area of Montevideo and pouring into the Montevideo Bay or the La Plata River. They are heavily polluted by domestic wastewater, industrial wastewater and other pollution sources. This is due to heavily concentrated population and industrial activities, and insufficient mitigation against pollution effluent. Regarding organic pollution, BOD<sub>5</sub> exceeds by far the allowable standard at 15 mg/l for the Class 4 in almost all sections, deteriorating the urban amenity in the capital city. Nevertheless, the “Environmental Report” issued by the Municipal Government states that current situation is the indication of being improved year by year as a result of recent interventions. On the other hand, incompletely treated wastewater discharged from tanneries has been identified as the cause of heavy metal (mainly chromium) pollution. The water quality survey conducted by the Municipal Government of Montevideo indicates the fact that the total chromium

concentration is beyond the standard (0.05 mg/l) at nearly half of monitoring stations. Likewise, lead concentration exceeds the standard (0.03 mg/l) at many measurement points, too.

**15.** Beaches along the coast of the La Plata River are popular for citizens and tourists for recreation and tourism, especially in the summer season. In general, the coastal water of the beaches far from the center zone of Montevideo is in good condition. There are few beaches that suffer (on a low frequency basis) pollution episodes, which can happen because of the relative increase of fecal coliform caused by sewage discharge from Montevideo of domestic wastewater that usually are discharged at a prudential distance on the open sea. Coastal water shows the sign of pollution in the zones that are located in the estuaries of the Pantanoso and Miguelete (in Montevideo Bay) and Carrasco (in La Plata River) rivers, indicating that total coliform is sometimes above the level established by the environmental water quality standard.

**16.** Despite the fact that production, import and usage of chlorate insecticides (except dodecachlor and endosulfan) were prohibited by Ministry Resolution in 1997, concerns about the pesticides pollution of water resources are voiced in Uruguay. The lack of accumulation of data of pesticide concentration in water bodies, however, enables any evaluation.

#### **Condition of Water Quality Management as of the Year 2004**

**17.** Some of the recent advances in Uruguayan environmental legislation include the establishment of General Law on Protection of the Environment (Law No.17283). In the Article 6, general principles of the environmental policy are given including; Uruguay is characterized as "Natural Country", considering the sustainable development that integrates economical, cultural, and social aspects; the prevention and prevision are the criteria with the highest priority against any others in the environmental management; and integration and coordination of the various public and private sectors concerned are required.

**18.** Uruguay has established a series of laws and regulations to protect and improve the water environment and it is deemed sufficient so far. Components of the water quality management, namely, establishment of policy and strategies; classification of water bodies; control of pollution sources including industrial/domestic wastewater, discharge from solid waste disposal, wastewater from non-point sources; ambient water quality monitoring; and, prescription for diffusion, education and public participation related with water quality are declared in some part of the existing laws and decrees.

**19.** The environmental standard of water quality has already been established in the Decree 253/79 and amendments, dividing into five classes applicable for the water utilization in rivers. From February 2005 through a Ministry Resolution No. 99/005, all the water courses without classification are classified under 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 are 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."

**20.** The regulation for industrial wastewater in Uruguay is basically complied with the principle of “Command and Control”. The Decree No. 253/79 states numbers of legal requirements for the qualities of wastewater discharged from industries. The effluent standard of wastewater is specified depending on the discharge destinations: sewerage, rivers and ground (Article 11). DINAMA as a directorate responsible for the environment is vested numbers of responsibilities in the regulation of industrial wastewater by the Decree No. 253/79. Major legal instruments for enforcing its competence are: authorization of wastewater discharge; registering and processing of qualified expert and report of operation; order of improvement; compliance inspection; imposition of fines against non-compliance.

**21.** DINAMA, one of the directorates of MVOTMA created in 1990 by the Law No. 16,112, is a key organization for enforcing water quality management in Uruguay, with a series of the wide competence. The Decree No. 257/979 defines 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.

**22.** DINAMA 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 2004 including the national director and division directors. Environmental Quality Evaluation Division and Environmental Control Division are directly involved in water quality management. DINAMA had a unit for the environmental education in the past, there, however, was no specific unit to work for dissemination and education on water quality management as of April 2004.

**23.** Environmental Quality Evaluation Division covers duties; 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. Environment Laboratory is under this Division and measures and analyzes water samples and industrial effluent samples except for pesticide.

**24.** Environmental Control Division covers duties; 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.

**25.** 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 Municipality of Montevideo, municipal governments implements water and sanitation development in rural area.

**26.** The Santa Lucía River Basin is covered by the municipalities of Montevideo, Canelones, San José, Florida and Lavalleja. Of these, the Municipality of Montevideo is rich in the staff numbers, and conducts enough activities of water quality management, namely, establishment of policy, pollution source management, ambient water quality monitoring and dissemination and education. Of the remaining four municipalities, Canelones follows Montevideo, but not much involvement to the water quality management has been realized as in the other three municipalities of San José, Florida and Lavalleja.

**27.** Relevant organizations of the central government related to water quality management include; DNH under MTOP dealing water quantity; OSE responsible for rendering water supply and sewerage service in the whole of country except for the sewerage service in Montevideo; RENARE under MGAP approving the water and soil use plan as an indispensable requirement for obtaining water use permission; and, DINASA under MVOTMA newly created in January 2006 but the participation to water quality management is not yet identified.

**28.** DINAMA is engaged in activities for industrial wastewater management in the whole Uruguay. All industries discharging wastewater must be authorized and registered by DINAMA. After submitting the SADI (*Solicitud de Autorización de Desague Industrial*, Application for Authorization of Industrial Discharge), entities must obtain DINAMA's permit and then can start the construction work. Industries must accordingly submit IPO (*Informe de Puesta en Operación*, Report of Operation) prior to the operation and finally can attain ADI (*Autorización 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. Management or intervention by DINAMA for the other pollution sources, namely, domestic wastewater (OSE and IMM are directly in charge), solid waste (municipalities) and non-point pollution (RENARE) is almost not conducted.

**29.** DINAMA has been conducting water sampling and quality analysis in specific period and for specific points under so-called campaign, thus periodical ambient water quality monitoring for river basins has not been conducted in Uruguay. Municipality of Montevideo has been conducting periodical ambient water quality monitoring since 1999 in rivers and a bay. Other municipalities in the Santa Lucía River Basin have different situation by municipality, and it can be said that periodical ambient water quality monitoring is less implemented.

**30.** DINAMA has developed a bimonthly magazine the "Ambiente Uruguay" and the website. Some articles in these media have focused on groundwater, the evaluation of industrial wastewater toxicity and industrial water pollution control. The page related to water quality evaluation is presently under construction without disseminating related data and information. While one of DINAMA's functions is to operate the Environmental Information System (including the Annual Environmental Report) related to air, water, soils and biota, the annual report has not been published in recent years. OSE and IMM are conducting various education programs on environment, but there are no outstanding activities by DINAMA on education related to water quality.

31. On complains from the public, the website of the Government of Uruguay navigates how and where to convey environmental complaints and, there, DINAMA is designated as the window in this respect. Meanwhile, the Government of Montevideo has set the phone numbers that receives complaints and questions on environmental issues. The Government of Montevideo created GAM (Montevideo Environmental Group) to basically define the Montevideo Environmental Agenda. There are less practices of public participation to water quality management in Uruguay.

### **First Draft Integrated M/P on Capacity Development for the Water Quality Management**

32. Principles of water quality management are proposed consisting of three pillars, namely, “Water Quality Management for River Basins”, “Systematic Water Quality Management”, and “Integrated Water Quality Management”. A cycle of four modules, namely: establishment of policies and strategy, pollution source management, ambient water quality monitoring, and dissemination, education and public participation promotion has been considered in the systematic water quality management. “Establishment of Policies and Strategies” in the cycle of the water quality management is in the most upstream part and DINAMA is exclusively responsible for it.

33. Administrative management on environment for pollution source management firstly is the “analysis and evaluation of pollutants” that analyzes and evaluates the impact of pollutants to the water environment in order to identify the basic direction of the measures to minimize the negative impact to water environment. Secondly is the “control of wastewater” that directly manages pollution sources so as to conduct necessary measures.

34. Basic direction of ambient water quality monitoring is; implementation of strategic ambient water quality measurement; ambient water quality measurement considering organizational framework; and maintenance and effective use of ambient water quality data (including the establishment of water quality information system, and the publication of annual environment report).

35. The basic direction of the dissemination, education and public participation is proposed as follows: The dissemination and education is to be conducted to raise the awareness of the local citizens on environmental water quality, and to motivate for the water quality conservation. Other purposes are; formulation of a basis for the wider understanding for the establishment of the policy for water quality management; promotion of the participation of the local citizens for the implementation of policies on the water quality management, and to promote the integration of the stakeholders for the effective implementation of the activities, and realize reduction in the load to the governmental organization through the spontaneous cooperation of the people; and, motivation of the relevant government agencies for the effective implementation of water quality management policy through the watching of the government by the residents.

36. Expected output by the implementation of capacity development in Module No.1 Strengthening of Strategic Part of the water quality management is determined as follows:

- Water quality management strategies and specific action plans of respective water quality approaches are established
- Decree No.253/79 and relatives are amended
- Water bodies' specific use is declared based on the "Decree No.253/79 and Amendments"
- Present river water quality is evaluated.
- Necessity of council for water quality management in the Santa Lucía River Basin is discussed

**37.** Expected output by the implementation of capacity development in Module No.2 Strengthening of Pollution Source Management of the water quality management is determined as follows:

- Collaboration system among relevant agencies on pollution source management is maintained
- Capacity of relevant organization on pollution source management is strengthened
- Industrial wastewater management is conducted under the collaboration of DINAMA and Municipalities
- Industrial wastewater related manuals are prepared
- Capacity of DINAMA and relevant agencies on industrial wastewater management is developed
- River water quantity observation system is established
- An integrated information system on pollution sources is established
- Influence of pollution sources to river water is grasped

**38.** Expected output by the implementation of capacity development in Module No.3 Strengthening of Ambient Water Quality Monitoring of the water quality management is determined as follows:

- Manuals related to monitoring are prepared
- Ambient water quality monitoring plan for the Santa Lucía River Basin is established
- Collaborated implementation system for sampling, analysis and evaluation is established
- Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened
- Water quality information system is established
- Water quality data are properly evaluated
- Water Quality Annual Report is publicized

**39.** Expected output by the implementation of capacity development in Module No.4 Promotion of Education and Public Participation of the water quality management is determined as follows:

- Awareness of stakeholders for water quality is raised
- A system for the formulation of agreement on water quality management is created and public participation is promoted.
- Awareness for water quality management in the relevant organizations is raised.

40. First Draft Integrated M/P on the Capacity Development for Water Quality Management has been formulated by identifying necessary activities for the achievement of the output in each module as discussed above in the three period, namely, the period for the implementation of the pilot projects (fiscal year 2004), mid-term period (until 2008) and long-term period (until 2013). Various schemes, e.g., activities in the Project, training in Japan and horizontal training, were considered for the activities.

41. The following pilot projects were implemented.

- **PLP 1:** Capacity Development and Strengthening of Coordination
  - **PLP 1a:** Development of Capacity for Strategic Part of Water Quality Management
  - **PLP 1b:** Development of Capacity for Pollution Source Management
  - **PLP 1c:** Development of Capacity for Ambient Water Quality Monitoring and Strengthening of Coordination between Relevant Agencies
- **PLP 2:** Establishment of Water Quality Information System
- **PLP 3:** Establishment of Industrial Wastewater Management Manual and Strengthening of Coordination
- **PLP 4:** Establishment of Manual for Monitoring Network Designing and Sampling
- **PLP 5:** Promotion of Dissemination and Education
- **PLP 6:** Promotion of Public Participation

42. In PLP 1a: Development of Capacity for Strategic Part of Water Quality Management, implemented are: establishment of coordinated work system in DINAMA; establishment of a system for the implementation of water quality management for a river basin as a unit; dissemination of principles of water quality management consisting of three pillars, etc. Established Water Quality Management Committee for the coordinated work in DINAMA is not maintained, directors' meeting, however, is sporadically held giving the same function of WQMC and it is judged effective. Although the Basin Council has not been set up, the Steering Committee of the present Project consisting of the representatives from the relevant agencies for water quality management in the Santa Lucía River Basin is developing such function, and it is considered effective that various discussions on water quality management were held in the Committee.

43. PLP 1b: Development of Capacity for Pollution Source Management has been implemented through the training in Japan and on-the-job training. Although the outcome is difficult for evaluation, effectiveness of the implementation of combined schemes was confirmed in a case that participant to the training in Japan joined to the work of PLP 3.

44. PLP 1c: Development of Capacity for Ambient Water Quality Monitoring and Strengthening of Coordination with Relevant Agencies targeted the capacity development of personnel and organization and the establishment of coordinated work system. It is a significant achievement that the periodical water quality monitoring has been actually commenced in Uruguay as a result of these capacity development activities. In the subsequent stage, namely after 2005, the most important thing is to continue this monitoring activity by maintaining the established collaboration system under the Joint Work Agreement. In the meantime, it is extremely important for the municipal laboratories to develop their capacity with proper budget allocation.



45. PLP 2: Establishment of Water Quality Information System has been implemented for the **Module No.3: Strengthening of Ambient Water Quality Monitoring**, and establishment of a basic system for water quality data storage and effective utilization have been targeted. The named SISICA DINAMA has almost been completed and presented in the Seminar on December 1, 2004. The condition before the start of the Project was that DINAMA's historical water quality data was stored personally and no other people could use them. The establishment of SISICA DINAMA provides a significant change in the system of ambient water quality management. A good system has been developed. From now on, namely after 2005, promotion of the effective use of SISICA DINAMA is the important work. The Water Quality Report scheduled for completion in the pilot project should be the product as one of components of a comprehensive environmental report to be publicized by DINAMA and early publication after 2005 is requested. It is expected that DINAMA start other parts of the comprehensive environmental report, such as air quality, solid waste, natural environment, etc, in earliest stage.

46. PLP 3: Establishment of Industrial Wastewater Management Manual and Strengthening of Coordination was implemented for the **Module No.2: Strengthening of Pollution Source Management**, and establishment of manuals and strengthening of coordination have been targeted. The completion of a series of manuals and guidelines is a significant outcome, considering the conventional and previous situation that many practices were depending on mainly individual knowledge of staff. It is important that these documents be practically used through actual jobs and utilized as useful tools of the technology transfer in DINAMA and the municipalities. Although, the activities in the pilot projects for pollution source management were generally not active when compared to the other modules, thus boosting is needed in this module in the future.

47. PLP 4: Establishment of Manual for Monitoring Network Designing and Sampling has been implemented for the **Module No.3: Strengthening of Ambient Water Quality Monitoring**, and establishment of manuals has been targeted. It is a significant outcome that the water quality monitoring plan has been established through a series of site surveys and the mutual agreement between DINAMA and the municipalities. It is important that this plan be continuously reviewed and updated, reflecting lessons learned from actual implementation and the monitoring network to be extended in the future.

48. PLP 5/6: Promotion of Dissemination, Education and Public Participation has been implemented for the **Module No.4: Promotion of Education and Public Participation**, and various activities were proposed. Regarding the material for dissemination and education, newsletters, posters, pamphlets, stickers, video for general public, video for children, Kamishibai (illustrated story) for children, etc. have been developed through the joint work by DINAMA, Municipality of Florida, education related authorities and personnel, and JICA Team. Such joint activities were deemed efficient besides the actual materials themselves. Dissemination and educations sessions included Santa Lucía Chico river cleaning campaign, flora observation campaign in 25 de Mayo City, education sessions and events in primary and secondary schools, various workshops, etc. and they were effective. All these activities were reported in medias and gave impact.

49. As a system for the public participation to the water quality management, Florida Water Quality Forum (FWQF) has been established in the Municipality of Florida. Florida Water Quality Forum acted as a main player in the dissemination and education

activities as mentioned above. More than 70 people joined FWQF and discussed the water quality issues. A unit for dissemination and education has been created in DINAMA and conducting various activities.

### **Second Draft Integrated M/P on Capacity Development for the Water Quality Management**

**50.** First Draft Integrated Master Plan has been formulated and the pilot projects composing the initial activities of the Master Plan were implemented by 2004. The Second Draft Integrated Master Plan has been formulated for the period of 2005-2008 getting feedback of the results of the pilot project implementation. The Second Draft Integrated Master Plan was executed as the trial implementation by only the Uruguayan side in the Phase III of the Project in the fiscal year 2005 and the results were considered for feedback to the Final Integrated Master Plan.

### **Trial Implementation of Second Draft Integrated M/P and Evaluation**

**51.** Trial implementation of the Second Draft Integrated Master Plan has been conducted in Phase III of the Project in the fiscal year 2005 by the Uruguayan side in order to confirm the adequacy of the plan for the sustainable implementation.

**52.** Module No.1: It is judged good that the strategy for the water quality management, namely, with three pillars of water quality management for river basins, systematic water quality management, and integrated water quality management, is acknowledged by DINAMA and relevant organizations in the country. Important is to monitor in Phase IV (2006) the situation of the organizational strengthening of Water Quality Department of DINAMA for the necessary work related to the declaration of water bodies' specific use under the Decree No. 253/79 and Amendments.

**53.** Output No.1.1 (Water quality management strategies and specific action plans of respective water quality approach are established): The strategy for the water quality management is confirmed in the every Steering Committee meeting and it is acknowledged inside DINAMA. It could be judged that the strategy is already of Uruguay itself. DINASA (National Directorate of Water and Sanitation) has been established in 2006, and it was confirmed that its strategy is in the same direction with the strategy of the present project and thus there expects no adverse impacts on the strategy of water quality management in Uruguay.

**54.** Output No.1.2 (Decree No.253/79 is amended): For this output, JICA Project provided DINAMA with technical information.

**55.** Output No.1.3 (Water bodies' specific use is declared based on the Decree No.253/79 and Amendments.): The Ministerial Order dated on 28th of February 2005 describes that all the rivers with the catchment area of 10 km<sup>2</sup> of more fall in Class 3 of the Decree No.253/79. Decree No.253/79 and Amendments is going to clarify water body's specific use, but not yet finished.

**56.** Module No.2: Preparation of manuals scheduled in Phase III has been implemented and it could be judged good. Important point for the finalization of

Integrated M/P is whether the Environmental Control Division would be strengthened with necessary personnel.

**57.** Output No.2.1 (Collaboration system among relevant agencies on pollution source management is maintained.): It is generally not active and boosting of the activities is needed in the future.

**58.** Output No.2.4 (Industrial wastewater related manuals are prepared.) Of the seven scheduled manuals, four manuals, namely, "Guidance for industrial wastewater flow measurement", "Guidance for sampling, preservation and transportation of groundwater", "Registration Manual of Competent Professional", and "Authorization Manual of Industrial Wastewater Discharge" have been completed and published by web.

**59.** Module No.3 is generally very active and it could be evaluated that this module achieved the best output among the four modules.

**60.** Output No.3.1 (Manuals related to monitoring are prepared.) Final version of the contents has been prepared and in actual use.

**61.** Output No.3.2 (Ambient water quality monitoring plan for the Santa Lucía River Basin is established.) It has been implemented as scheduled. Monitoring sites of the monitoring plan prepared by the pilot project in Phase II has been amended by DINAMA at the beginning of Phase III and it is evaluated that the monitoring plan is prepared and used by Uruguay side itself.

**62.** Output No.3.3 (Collaborated implementation system for sampling, analysis and evaluation is established.) Periodical technical committees took place; inter-laboratory calibration was proposed by Uruguay side and implemented; collaborated monitoring system has been established thus the output is well realized.

**63.** Output No.3.4 (Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened.) Capacity development for pesticide analysis has been conducted through collaboration with JCPP (Japan Chile Partnership Program), etc.

**64.** Output No.3.5 (Water quality information system is established.) Campaigns for the effective use of SISICA took place in each municipality, OSE, DNH and RENARE. DINAMA made a request to JICA Project Team that JICA Project Team includes a specialist of laboratory management in order to raise the function of SISILAB in the 7th Field Work in 2006.

**65.** Output No.3.7: (Water quality annual report is publicized.) This output has not been realized. There are requests for the capacity development on water quality evaluation.

**66.** For Module No.4, Generally, certain output has been achieved including establishment of Florida Water Quality Forum, activities with Florida Water Quality Forum as the core, establishment of Lavalleja Water Quality Forum, and preparation of education materials. Important point for the finalization of Integrated Master Plan is the establishment of the system and the action plan for the sustainable implementation of the activities, since there are some unsuccessful cases including the stagnation of the activities of Florida Water Quality Forum.

**67.** Output No.4.1 (Awareness of stakeholders for water quality is raised): Issue of Newsletter in September 2005 has not been realized and it was scheduled in March 2006. Due to the capacity of the publishing group of DINAMA, quarterly issue is deemed difficult. JICA web page has been completed and under operation. Activities for the dissemination, education and public participation with the Florida Water Quality Forum established in Phase II as the core were stagnated.

**68.** Output No.4.2 (A system for the formulation of agreement on water quality management is created and public participation is promoted.): Activities of Florida Water Quality Forum is stagnated. Establishment of Lavalleja Water Quality Forum has been created earlier than the original schedule with the assistance of DINAMA and Florida Water Quality Forum.

**69.** Output No.4.3 (Awareness for water quality management in the relevant organizations is raised.): Strengthening of education and public participation in DINAMA has been realized as the establishment of an ad hoc unit. Awareness for water quality management in the relevant organization is realized through the abovementioned unit in DINAMA

### **Final Integrated Master Plan on Capacity Development for the Water Quality Management**

**70.** The Final Integrated Master Plan has been prepared for the period from 2004 to 2013. It includes all the activities conducted up to the present time including those of the pilot projects and those implemented in Phase III, the stage for the trial implementation by Uruguayan side.

**71.** Overall evaluation and key issues for the future activities in the Final Integrated Master Plan in Module No.1 Strengthening of Strategic Part are identified as follows:

- Water quality management for the Santa Lucía River Basin has been introduced and is being implemented as the first case of the water quality management for a river basin as a unit in Uruguay, thus the necessity of the water quality management for river basins has become well recognized in the country.
- Systematic water quality management with a cycle of the modules is also well recognized by DINAMA and relevant agencies. Establishment of the strategies of the water quality management by Uruguay itself should be conducted through the implementation of the Integrated Master Plan by reviewing the strategy proposed by JICA.
- Decree No.253/79 and Amendments should be implemented by efforts of the Uruguay government as was conducted up to the present time. It should be boosted otherwise the work for the water bodies specific use could not be started.
- Setup of Basin Council for the implementation of the integrated water quality management should be studied and promoted in the future. Follow-up Committee for the Implementation of the Master Plan DINAMA/JICA in the Basins of Santa Lucía River and Sub-basins of Carrasco and Pando Streams should be setup in the earliest stage to give the function that the Steering Committee provided during the implementation of JICA Project.

**72.** Overall evaluation and key issues for the future activities in the Final Integrated Master Plan in Module No.2 Strengthening of Pollution Source Management are identified as follows:

- Input for the capacity development in Module No.2 in the JICA Project focused on the promotion of collaboration between the agencies and elaboration of manuals. Of these, certain output has been achieved for the elaboration of manuals, collaboration between DINAMA and relevant agencies, however, has not progressed except with IMM that already maintains some collaboration with DINAMA. The status of the collaboration is improving after entering to the Phase IV with the efforts of EnCD, DINAMA for the joint work for industrial wastewater management. The sustainable efforts are deemed necessary.
- Module No.2 is far behind the required status compared to the modules No.3 and No.4, and it could not be recovered by the capacity development by the Uruguay itself. Input of technical assistance from countries with much experience should be implemented for the development of the capacity. Establishment of an integrated pollution source information system and a simulation model to grasp the influence of the pollution sources to the river water quality should be given higher priority.

**73.** Overall evaluation and key issues for the future activities in the Final Integrated Master Plan in Module No.3 Strengthening of Ambient Water Quality Monitoring are identified as follows:

- Through the JICA Project, monitoring manuals have been elaborated, an ambient water quality monitoring plan for the Santa Lucía River Basin has been established, a collaborated implementing system for the sampling, analysis and evaluation has been established, a water quality information system has been established, and the periodical ambient water quality monitoring in the Santa Lucía River Basin is being implemented. It is highly evaluated as an output of the Project.
- Capacity development of both personnel and equipment for sampling, analysis and evaluation should be implemented in a sustainable manner with an input by Uruguay itself.
- Annual report of water quality has been published as a result of the water quality monitoring in the pilot project. Sustainable publication of the annual report of water quality is indispensable for the maintenance of the established ambient water quality monitoring system.
- SISICA, a water quality information system, should be evolved to the Integrated SISICA that targets information sharing with the relevant agencies.
- In the field of analysis and evaluation in laboratory, SISILAB, an information system in laboratory, should be evolved so as to raise the efficiency and quality of the laboratory work.

**74.** Overall evaluation and key issues for the future activities in the Final Integrated Master Plan in Module No.4 Promotion of Dissemination, Education and Public Participation are identified as follows:

- Activities on dissemination and education were implemented as the elaboration and effective use of education materials (videos, illustrated story, etc.) and implementation of various campaigns. JICA Project implemented such activities mainly in the municipalities of Florida and Lavalleja, but effective utilization of the

education materials was promoted in all the relevant five municipalities. Such activities should be continued in a sustainable manner.

- As a system for the formulation of agreement on water quality management, Water Quality Forum was set up in the municipalities of Florida and Lavalleja. These Water Quality Forums should be managed in a sustainable manner in the future. Water Quality Forums in the other three municipalities should be established by the effort of the municipalities with the help of already established Forums and DINAMA.
- Federation of Water Quality Forums for the Santa Lucía River Basin should be established by the effort of Uruguay.



## **Location Map**

### **Summary**

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## **ABBREVIATIONS**

### **Organization, Programs and Projects**

Abbreviation : English / Spanish or Other Language

ANONG	:	<i>Asociación Nacional de ONGs Orientadas al Desarrollo</i> (National Association of NGO oriented to the Development)
APRAC	:	<i>Asociación Pro Recuperación del Arroyo Carrasco</i> (Association for Carrasco Creeck Recovery)
CARU	:	<i>Comisión Administradora del Río Uruguay</i> (Administrative Commission of Uruguay River)
CIID Canada	:	<i>Centro Internacionnal de Investigacion para el desarrollo,</i> <i>Canada</i> (International Center of Investigation for the development, Canada)
COTAMA	:	<i>Comisión Técnica Asesora del Medio Ambiente</i> (Technical Advisory Commission on Environment)
DGRNR	:	<i>Dirección General de Recursos Naturales Renovables,</i> <i>Ministerio de Ganadería, Agricultura y Pesca</i> (Directorate General of Renewal Natural Resources, Ministry of Livestock, Agriculture and Fishing)
DGSA	:	<i>Dirección General de Servicios Agrícolas</i> (General Directorate of Agricultural Services)
DINAMA	:	<i>Dirección Nacional de Medio Ambiente</i> (National Directorate of Environment)
DINAMIGE	:	<i>Dirección Nacional de Mineralogía y Geología, Ministerio de</i> <i>Industria, Energía y Minas</i> (National Directorate of Mining and Geology, Ministry of Industry, Energy and Mining)
DINASA	:	<i>Dirección Nacional de Agua y Saniamiento</i> (National Directorate of Water and Sanitation)
DNH	:	<i>Dirección Nacional de Hidrografía, Ministerio de Transporte y</i> <i>Obras Públicas</i> (National Directorate of Hydrograph, Ministry of Transport and Public Works)
DNM	:	<i>Dirección Nacional de Meteorología, Ministerio de Defensa</i> <i>Nacional</i> (National Directorate of Meteorology, Ministry of National Defense)
DNTN	:	<i>Dirección Nacional de Tecnología Nuclear</i> (National Directorate of Nuclear Technology)
ECOPLATA	:	<i>Apoyo a la Gestión Integrada de la Zona Costera Uruguaya del</i> <i>Río de la Plata</i> (Support to the Integrated Management of Coastal Zone of Uruguay along La Plata River)
EmCD	:	Emission Control Department, Environmental Control Division, DINAMA
EnCD	:	Environmental Control Division, DINAMA

EQED	:	Environmental Quality Evaluation Division, DINAMA
EU	:	European Union ( <i>Unidad Europea</i> )
FAO	:	United Nations Food and Agriculture Organization ( <i>Organización de las Naciones Unidas para la Alimentación y Agricultura</i> )
FREPLATA	:	<i>Protección Ambiental del Rio de la Plata y su frente marítimo</i> (Environmental Protection of Plata River and its front to the sea)
GAM	:	<i>Grupo Ambiental de Montevideo</i> (Environmental Group of Montevideo)
GTZ	:	<i>Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)</i> <i>GmbH</i> (Technical Cooperation of the Republic of Germany)
IDB	:	Inter-American Development Bank ( <i>Banco Interamericano de Desarrollo</i> )
IFAD	:	International Fund for Agricultural Development ( <i>Fondo Internacional para Desarrollo Agrícola</i> )
IMC	:	<i>Intendencia Municipal de Canelones</i> (Municipality of Canelones)
IMF	:	<i>Intendencia Municipal de Florida</i> (Municipality of Florida)
IML	:	<i>Intendencia Municipal de Lavalleja</i> (Municipality of Lavalleja)
IMM	:	<i>Intendencia Municipal de Montevideo</i> (Municipality of Montevideo)
IMSJ	:	<i>Intendencia Municipal de San José</i> (Municipality of San José)
INAPE	:	<i>Instituto Nacional de Pesca</i> (National Fishing Institute)
JICA	:	Japan International Cooperation Agency ( <i>Agencia de Cooperacion Internacional del Japón</i> )
JUNAGRA	:	<i>Junta Nacional de la Granja</i> (National Council of Farming)
LATU	:	<i>Laboratorio Tecnológico del Uruguay</i> (Technological Laboratory of Uruguay)
MDN	:	<i>Ministerio de Defensa Nacional</i> (Ministry of National Defense)
MGAP	:	<i>Ministerio de Ganadería, Agricultura y Pesca</i> (Ministry of Livestock, Agriculture and Fishery)
MRREE	:	<i>Ministerio de Relaciones Exteriores</i> (Ministry of Foreign Affairs)
MTOP	:	<i>Ministerio de Transporte y Obras Públicas</i> (Ministry of Transport and Public Works)
MVOTMA	:	<i>Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente</i> (Ministry of Housing, Use of Land and Environment)
OPP	:	<i>Oficina de Planeamiento y Presupuesto, Presidencia de la República</i> (Office of Planning and Budget of Presidency)

OSE	:	<i>Administración de Las Obras Sanitarias del Estado (Administration of Sanitarian Works of the State)</i>
PNUMA	:	<i>Programa de Naciones Unidas para el Medio Ambiente (United Nations Environmental Program)</i>
PRENADER	:	<i>Programa Recursos Naturales y Desarrollo del Riego (Program on Natural Resources and Irrigation Development)</i>
PROCON	:	<i>Programa de Control de Contaminación (Pollution Control Program)</i>
RENARE	:	<i>Dirección Nacional de Recursos Naturales Renovables, Ministerio de Ganadería, Agricultura y Pesca (National Directorate of Natural Renewable Resources, Ministry of Livestock, Agriculture and Fishery)</i>
RETEMA	:	<i>Red Temática Medio Ambiente (Network on Environmental Subjects)</i>
SOHMA	:	<i>Servicio de Oceanografía, Hidrografía y Meteorología de la Armada (Service of Oceanography, Hydrography and Meteorology of the Army)</i>
UDELAR	:	<i>Universidad de la República (University of Republic)</i>
UNDP	:	<i>United Nations Development Program (Programa de Desarrollo de las Naciones Unidas)</i>
UNESCO	:	<i>United Nations Educational, Scientific and Cultural Organization (Organización Educativa, Científica y Cultural de las Naciones Unidas)</i>
WB	:	<i>The World Bank (Banco Mundial)</i>
WQD	:	<i>Water Quality Department, Environmental Quality Evaluation Division, DINAMA</i>
WWF	:	<i>World Wildlife Fund (Fondo Mundial de Fauna Silvestre)</i>

### **Others**

BHC	:	<i>Benzene Hexachloride (Hexacloruro de benceno)</i>
BOD	:	<i>Biochemical Oxygen Demand (Demanda Bioquímica de Oxígeno)</i>
COD	:	<i>Chemical Oxygen Demand (Demanda Química de Oxígeno)</i>
DDT	:	<i>Dichloro-Diphenyl-Trichloro-ethane (Dicloro-Difenil-Tricloro-etano)</i>
DO	:	<i>Dissolved Oxygen (Oxígeno Disuelto)</i>
EIA	:	<i>Environmental Impact Assessment (Evaluación de Impacto Ambiental)</i>
FY	:	<i>Fiscal Year (Año Fiscal)</i>



GC	:	Gas Chromatography ( <i>Gas Cromatográfico</i> )
GDP	:	Gross Domestic Product ( <i>Producto Interno Bruto</i> )
GIS	:	Geographic Information System ( <i>Sistema de Información Geografica</i> )
GNI	:	Gross National Income ( <i>Ingreso Nacional Bruto</i> )
GRDP	:	Gross Regional Domestic Product ( <i>Producto Interno Regional Bruto</i> )
ICA	:	<i>Indice de Calidad de Agua</i> (Water Quality Index)
ISCA	:	<i>Indice Simplificado de Calidad de Agua</i> (Simplified Water Quality Index)
MIS	:	Management Information System ( <i>Sistema de Gestión de la Información</i> )
NGO	:	Non-Governmental Organization ( <i>Organización No Gubernamental</i> )
O&M	:	Operation and Maintenance ( <i>Operación y Mantenimiento</i> )
PCM	:	Public Consultation Meeting ( <i>Reunión de Consulta Pública</i> )
PCM	:	Project Cycle Management ( <i>Manejo del Ciclo del Proyecto</i> )
Peso	:	<i>Pesos Uruguayos</i> (Uruguayan Pesos)
USD	:	United States Dollar ( <i>Dolar Estadounidense</i> )

### MEASUREMENT UNITS

(Length)		(Time)	
mm	:	mm	:
cm	:	s, sec	:
m	:	min	:
km	:	h, hr	:
		d, dy	:
		y, yr	:
(Area)		(Volume)	
mm <sup>2</sup>	:	mm <sup>3</sup>	:
cm <sup>2</sup>	:	cm <sup>3</sup>	:
m <sup>2</sup>	:	m <sup>3</sup>	:
km <sup>2</sup>	:	l, ltr	:
ha	:	mcm	:
(Weight)		(Speed/Velocity)	
g, gr	:	cm/s	:
kg	:	m/s	:
ton	:	km/h	:

## **CHAPTER 1. INTRODUCTION**

### **1.1 Background of the Project**

The capital of the Republic of Uruguay, the city of Montevideo, and its Metropolitan Area are a part of a major area with the other departments. This area is generally associated with rural Montevideo and San José and Canelones Departments. The Santa Lucía River Basin is the river basin that comprehends the wider Metropolitan Area integrating also Florida and Lavalleja Departments. The area of the Santa Lucía River Basin represents approximately 10% of the national territory and a population of approximately two million, over 60% of that of the whole nation, concentrates in this basin.

The Santa Lucía River Basin with an area of 13,482 km<sup>2</sup> is one of the six main hydrographic basins of Uruguay. The basin is very important since it is the source of drinking water to the population of the south of the country. The other five major basins in the country are: Negro River basin (68,140 km<sup>2</sup>); Uruguay River basin (45,860 km<sup>2</sup>); Laguna Merin basin (28,950 km<sup>2</sup>); Plata River basin (12,780 km<sup>2</sup>) and Atlantic Ocean basin (8,480 km<sup>2</sup>). The Project Area covered the Santa Lucia River Basin and complementarily a minor coastal space of La Plata River Basin between creeks of Cufre (San José Department) and Pando (Canelones Department).

In the Santa Lucía River Basin, there is clean water to protect, as can be seen forward in the Executive Summary, and there are many others that are in process of deterioration. Causes of the deterioration of the aquatic environment of Metropolitan area are: increasing domestic loads, industrial discharges produced by the concentration of industries, illegal dumping of solid wastes on the urban zones, and agricultural activities with the use of fertilizers and chemicals on drinking water sources in the rural areas. Because of the changes of the conditions of the aquatic environment during the last years, the national and local governmental institutions, the companies and the civil society organizations, are beginning to do researches and contributions to the determination and implementation of measures aimed to improvement of water quality.

To face the highlighted environmental deterioration, the Government of Uruguay, with the support of the Government of Japan, decided to impulse a Project of Institutional Strengthening. On 2002, the Government of Uruguay together with the Japan International Cooperation Agency (hereinafter referred to as "JICA"), acknowledged the need to implement a project to strengthen the capacity for water quality management in the highlighted area, by agreeing formally to realize joint work between the Ministry of Housing, Use of Land and Environment (hereinafter "MVOTMA") and JICA, on December 5, 2002. Finally, JICA selected a consulting firm, CTI Engineering International Co., Ltd. On October 2003, the first JICA technical team came to Uruguay to support the execution of the cited project. The work executed by the joint DINAMA-JICA team (with the support of other organizations) continued until December 2006.

## **1.2 Objectives of the Project**

### **1.2.1 Overall Goal**

River water quality in Montevideo and Metropolitan Area is improved; Public hygiene environment is improved; and, Future water pollution is prevented.

### **1.2.2 Project Purpose**

The capacity of water quality management of DINAMA and relevant organization in Montevideo and Metropolitan Area is improved.

### **1.2.3 Outputs of the Project**

- An integrated master plan for strengthening water quality management of rivers in Montevideo and Metropolitan Area is formulated;
- Technology transfer to DINAMA is conducted for the implementation of activities necessary for improvement of river water quality improvement in close collaboration with related organizations; and,
- Capacity of DINAMA and related agencies is developed paying attention to their ownership.

## **1.3 Subject Area of the Project**

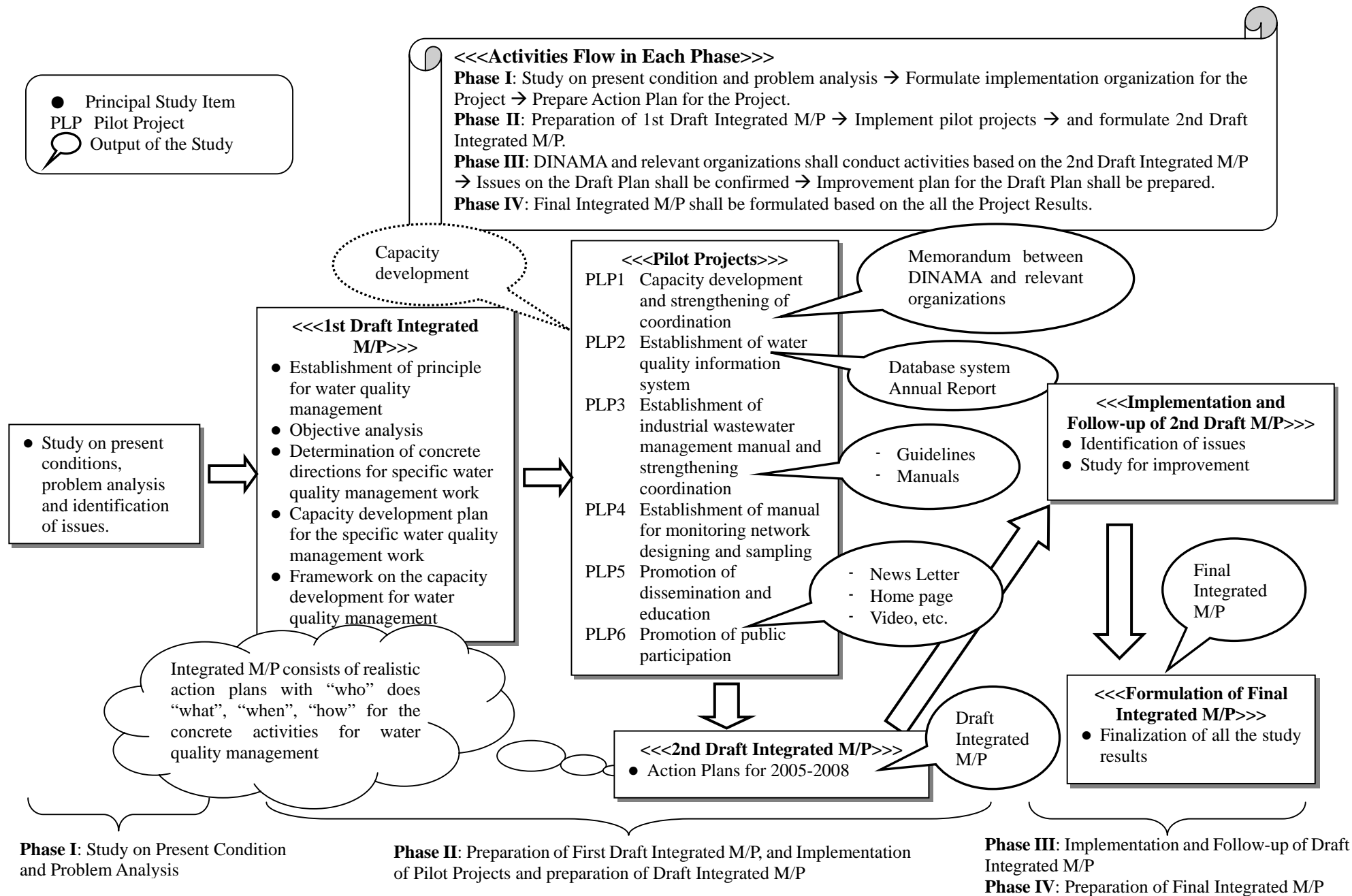
The Project Area covers the river basins located in Montevideo and Metropolitan Area consisting of the Santa Lucía River Basin and the La Plata River Basin between Arroyo Cufre and Pando.

## **1.4 Concept of the Integrated Master Plan on the Capacity Development for the Water Quality Management**

The Integrated Master Plan targets coordinated, systematic and overall water quality management system under the collaboration of all the related organizations. Integrated Master Plan consists of realistic action plans with “who” does “what”, “when”, “how” for the concrete activities for water quality management.

The Master Plan in the present Project is not a fixed and sole one, but the one updated and renewed thorough the implementation of pilot projects and trial implementation by the Uruguayan side.

The concept of the Integrated Master Plan is as illustrate in **Figure 1.4.1**.



**Figure 1.4.1 Concept of the Integrated Master Plan on Capacity Development for Water Quality Management**

## 1.5 Implemented Schedule and Input

The implemented overall project schedule is given in Figure 1.5.1.

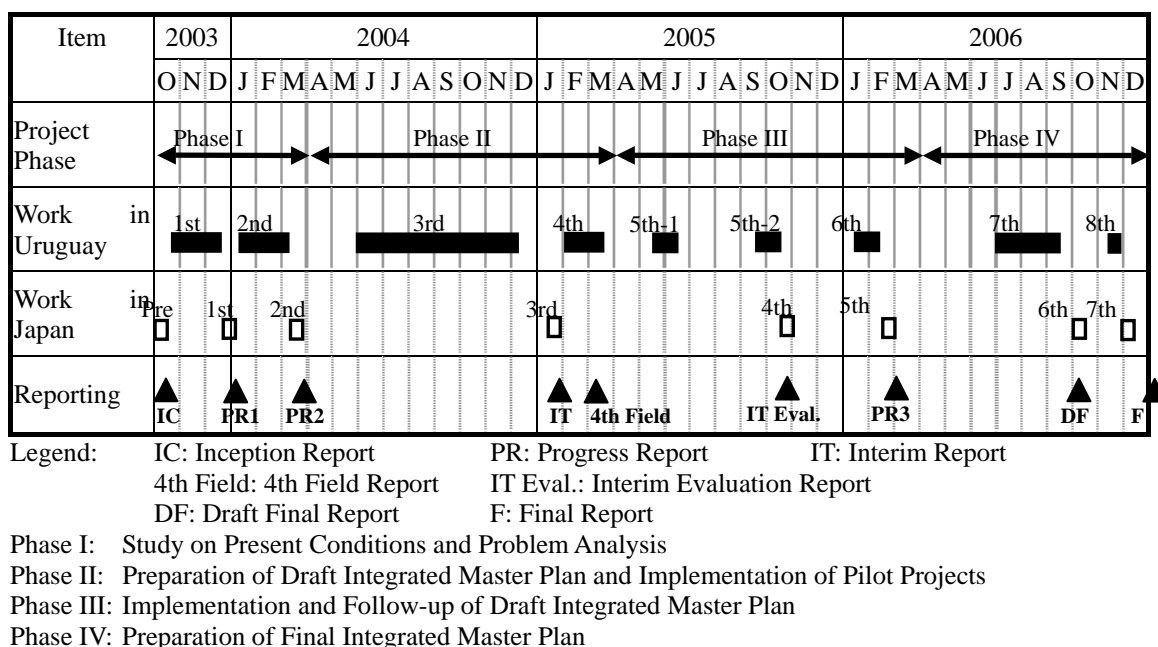


Figure 1.5.1 Implemented Schedule of Overall Project

## 1.6 Project Implementation Organization

The Government of Uruguay formulated a steering committee chaired by the Minister of Housing, Use of Land and Environment and consisting of representatives from Ministry of Housing, Use of Land and Environment (MVOTMA) mainly from DINAMA, Office of Planning and Budget of Presidency (OPP), National Directorate of Hydrograph (DNH) of Ministry of Transport and Public Works, Administration of the Sanitation Works of the State (OSE) and five municipalities in the Santa Lucía River Basin, namely, Montevideo, Canelones, San José, Florida and Lavalleja. Also formulated is a technical committee consisting of relevant personnel from the above organization and National Directorate of Natural Renewable Resources (RENARE) of Ministry of Livestock, Agriculture and Fishery). DINAMA appointed counterpart personnel for the coordinated work between DINAMA and JICA Project Team and for the daily technology transfer.

The Project Team discussed strategic matters and important issues for project implementation with the Steering Committee. With the Technical Committee, the Project Team exchanged technical information and technical transfer has been taken place in every aspect of the Project.

## **CHAPTER 2. GENERAL CONDITION OF THE PROJECT AREA AND PRESENT CONDITION OF WATER QUALITY**

### **2.1 National Government Administration and Economy**

#### **2.1.1 Land, River Basins and Population**

The Oriental Republic of Uruguay is located on the left bank of the La Plata River in South America bordering on Argentine and Brazil. It has a land area of 176,215 km<sup>2</sup> and is located between 30°06'-34°58'24" South latitudes and between 53°11'-58°26'18" West longitudes. The whole area of the country consists of hilly terrains with an average elevation from the sea level at 116.7 m and the highest peak is at Catedral Hill in the Municipality of Maldonado with an elevation at 513.66 m. National population as of the year 2004 is 3.43 million and of these, 1.4 million people live in the Municipality of Montevideo, the capital of the nation. Low birth rate and rapid aging is a characteristic of the country.

Uruguay is divided by six major river basins, namely, Río Uruguay (45,860 km<sup>2</sup>), Río de la Plata (12,780 km<sup>2</sup>), Oceano Atlantico (8,480 km<sup>2</sup>), Laguna Merin (28,950 km<sup>2</sup>), Río Negro (68,140 km<sup>2</sup>), and Río Santa Lucía (13,482 km<sup>2</sup>). In the water environment sector, the highest concern is given to the Santa Lucía River Basin since it accommodates more than 60% of the national population in the area around 10% of the national territory.

#### **2.1.2 Government**

Uruguay is a nation of democratic republican system declared independence in 1825. The country is governed by the three separate powers, the Executive Power, the Legislative Power, and the Juridical Power. The President of the Republic exercises the Executive Power conjointly with the respective Ministers, currently thirteen. The Legislative Power is represented by the General Assembly composed of two chambers. The country is divided into 19 local Municipalities. A Municipal Mayor and the Municipal Council govern each Municipality.

The Frente Amplio – Encuentro Progresista – Nueva Mayoría coalition won the presidential election on October 31, 2004 and marked the first time in more than 170 years that the executive power is not from either of the two traditional parties, namely, Partido Colorado and Partido Nacional. The coalition also occupied majority in both upper and lower chambers. They extended their power during the local election in May 2005 realizing mayors of the EP-FA group in eight municipalities.

#### **2.1.3 Economy**

Major industries are export-oriented agriculture and livestock, food processing, leather, and textile. Major trading countries are Brazil, Argentine and U.S.A., though the orders are different in export and import. Gross National Income (GNI) in 2004 was 13.4 billion US dollar and GDI per capita was USD 3,950. The economy has been debilitated by the four years of recession, especially affected by the recession in Argentine from 2001-2002, lower demand from Brazil and the apparition of the cow disease in 2001.

GDP of the Municipality of Montevideo shares more than half of that of the whole nation. The contribution of the metropolitan area to the national economy is high and thus the higher priority in the environmental sector should also be given.

#### 2.1.4 Manifesto

The former government started in March 2000 puts principal issue as: decrease in government expenditure; strengthening of agriculture and livestock industry; stabilization and vitalization of the economy through expansion of export; development of MERCOSUR; administrative reform; deregulation; social development. After the economic decline in 2001, the Government emphasized priority for the promotion of national reform (including financial diminution).

The new Government started in March 2005 has embraced an agenda for change, though has also signaled continuity in many of the policies. It has given the highest priority to the measures for the socially weak group, creating Ministry for Social Development and established Social Emergency Plan (Law No.17869, May 12, 2005: Plan for Attention for Social Emergency and Program for Citizen Income). The Government puts emphasis on reforms, e.g., administrative reform (reformation of government agencies), improvement of taxation system (equalization of income distribution), improvement in legal system (simplification of procedures), and decentralization and others.

Regarding “water”, a plebiscite took place together with the presidential election in October 2004 asking “Should water be managed by the state or not?” The result was Yes. Article 47 of the Constitution, “The protection of the environment is of general interest. The persons must abstain of any act that causes predation, destruction or serious pollution to the environment...” has accordingly been reformed adding a description “*The water is a natural resource essential for the life. The access to the potable water and the access to the sanitation constitute fundamental human right...*”

The Government then declared under the article No.327 in the Law No.17,930, December 19 2005) that the "Ministry of Housing, Use of the Land and the Environment" shall propose to the Executive Power the formulation of national water and sanitation policies, pursuant to the provisions of Article 47 of the Constitution of the Republic. Article No.328 then declared an organization responsible for water, namely, National Directorate of Water and Sanitation, DINASA. DINASA has been established on January 17 2006 with the mandate to formulate national policies on water and sanitation. This new institution is starting to do activities, and its development is still very weak. It has not defined yet its relationship with water quality management, where DINAMA is remaining as playing a leading role in the field of water quality.

#### 2.1.5 Management and Development Plans in Environment Sector

Relevant plans for management, development, and institutional improvement related to water quality are summarized as follows: **Program to strengthen the environmental management capacity of DINAMA** was implemented from 1993 with a fund Inter-American Development Bank (IDB). The major objective is the institutional development and targeted to identify specific improvement projects, though it was finished without significant output. Those related to water quality monitoring include the following: **Water Quality Goal Project 2000** has been conducted with the purpose to

examine the water quality goals for major rivers in the country but finished without achieving the goal. **PROCON (Program for Contamination Control)** is underway by **CARU** since 1987 and four campaigns have been performed a year except in some exceptions. **ECOPLATA** is a program to coordinate activities for “Integrated Management of Coastal Zone of Uruguay along La Plata River”. **FREPLATA (Frente del Rio de la Plata)** commenced in 2001 to conduct proper management of common water area of Rio de la Plata.

Environmental management related projects of DINAMA and relevant agencies are: “**Indicadores**” **DINAMA/EMS- SEMA/IDRC-CRDI Program** is for the definition of environmental indicators supported by CIID Canada. **National Implementation Plan (NIP-Uruguay)** is funded by UNEP/GEF and addresses the chemical products management in the framework of Stockholm Convention on Persistent Organic Pollutants (POP). Other than of DINAMA, **Project on Institutional Framework Strengthening for Pesticide Management in Uruguay** is implemented with the agreement between MGAP and the Research and Productivity Council of New Brunswick (RPC) from Canada. In the sector of groundwater, **Integrated Management of Groundwater Resources** is a study to improve the groundwater management for the Raigon aquifer jointly undertaken by relevant government agencies.

As an activity led by NGOs, activities by APRAC (Asociacion Pro-Recuperacion del Arroyo Carrasco) are the major ones in the Project Area. **OSE Modernization and Systems Rehabilitation Program Project** was fund by WB and **National Portable Water and Sewerage Program (Stage I)** formulated a master plan for the Santa Lucía River Basin with the target year 2035.

There are programs and projects for Municipalities. **Municipal Development and Management Program** was fund by IDB to improve the fiscal situation of the municipal governments outside of the metropolitan Montevideo area, upgrade the quality of municipal services and make their delivery more efficient. The similar program is **Municipality of Montevideo Modernization Program** fund by IDB and **Municipal Development Program III** is fund by IDB. The development of sewerage system in Montevideo is fund by IDB and presently Stage IV is ongoing. **Montevideo and Metropolitan Area Solid Waste Management Project** is funded by IDB and completed.

## **2.2 Outline of the Project Area**

### **2.2.1 Land Area and Population**

The land area and population by Municipality and those in the Project Area are tabulated in **Table 2.2.1** below:



**Table 2.2.1 Land Area and Population in the Project Area**

Municipality	Area (km <sup>2</sup> )		Population (person except otherwise shown)				
	Area	Project Area	1996	2002	Annual Increase Rate (%)	Density (person/km <sup>2</sup> )	2002 Project Area <sup>1/</sup>
Montevideo	530	530	1,344,839	1,382,149	0.46	2,607.8	1,382,149
Canelones	4,536	3,266	443,053	513,279	2.48	113.2	490,000
San José	4,992	4,992	96,664	105,786	1.51	21.2	105,786
Florida	10,417	4,688	66,503	68,627	0.53	6.6	55,000
Lavalleja	10,016	2,168	61,085	62,493	0.38	6.2	44,000
Others		1,061					
Total	30,491	16,705	2,012,144	2,132,334	0.97	69.9	2,077,000
Nation	176,215 <sup>2/</sup>		3,163,763	3,360,868	1.01	19.1	---

Note: <sup>1/</sup> is estimated value by the Project. <sup>2/</sup> from 2003 National Statistics.

## 2.2.2 River Basins, Meteorology, Hydrology and Water Use

### River Basins

The Project Area is the Santa Lucía River Basin and the La Plata River Basin between the creeks of Cufre and Pando with a total area of 16,705 km<sup>2</sup>. Geologically, the Project Area is mainly founded by Pre-Cambrian rocks with Mesozoic to Cenozoic rock cover in the southern part. Large-scale sedimentation is not observed due to topography without steep-sloped mountains and to geology without faults and volcanoes. Soil in Uruguay is classified into five groups according to the predominant types, and the Project Area is mostly covered by a group that is rather deep, heavy textured with low and medium permeability and high to medium fertility.

### Meteorology and Hydrology

Of the total 24 stations managed by National Directorate of Meteorology (DNM) in the nation, there are six meteorological stations in the Project Area, namely, San José, Libertad, Prado, Florida, Carrasco, and Minas. Hydrological observation for surface water is managed solely by National Directorate of Hydrograph (DNH), and in the Project Area, there are 28 and 8 water level/discharge gaging stations, respectively in the Santa Lucía River Basin and in the La Plata River Basin. Daily average temperature at Prado varies from 11°C in June to 24°C in January, no much variation in monthly rainfall distribution in every stations with an annual average rainfall at less than 1,200 mm. The mean flow of the Santa Lucía River at Paso Pache Station (catchment area of 4,900 km<sup>2</sup>) is estimated at 61.24 m<sup>3</sup>/s for 14 years (1980-93) with an annual runoff height at 390 mm.

### River and Water Use

All water drawings and uses have been managed and controlled by DNH according to "Water Code" (Codigo de Aguas, Ley No.14859/978) and all water uses shall be reported and registered every year to DNH through the consultation by "Integrated Commission" composed of DNH, DGRNR of MGAP, and User's Representatives, as compiled into "National Inventory of Surface Water Exploitation". In the Project Area, the volume of intake-water is estimated at 8.77 m<sup>3</sup>/s, 7.99 m<sup>3</sup>/s from the Santa Lucía River and 0.78 m<sup>3</sup>/s in the La Plata River Basin. The water intake for domestic water is the largest

at 6.733 m<sup>3</sup>/s (76.8%), followed by irrigation at 1.755 m<sup>3</sup>/s (20.0%), industry at 0.226 m<sup>3</sup>/s (2.6%), and others at 0.057 m<sup>3</sup>/s (0.6%).

Potable water supply is managed and operated by the State Sanitary Works Administration (OSE). In the Project Area, there are two and six intake sites in the La Plata River Basin and Santa Lucía River Basin, respectively, with a total intake volume at 6.733 m<sup>3</sup>/s. DNH gives authority for extraction and use of irrigation water to those who developed, through the consultation by Integrated Commission. In the Project Area, irrigation water is supplied to maize, fruit and vegetable. Industrial water supply is not dominant to the surface water intake in the Project Area and most of the industries in the area acquire the groundwater for their uses. Recently, over-quarrying and resulting erosion of river banks have become a problem. The groundwater of Raigon aquifer with a total area of 2,271 km<sup>2</sup> having the maximum potential in Libertad has been used for domestic, industrial and agricultural purposes, though the water is vulnerable for salinity and soil alkalinity. The management of Raigon aquifer is conducted through the collaboration of the various agencies including DNH and DINAMA.

### **2.2.3 Land Use, Vegetation, Flora and Fauna**

In terms of land cover, grasslands dominate the whole Uruguay. Most of the Project Area is of Grassland (winter type), except in the northern part that is of Grassland (winter/summer type) and in the eastern part of Grassland (summer type). The well-known flora in the country is represented by something less than 2,500 species, distributed in 811 genres (Marchesi, 1992). The prairies constitute atmospheres with the highest wealth in species; there are almost two thousands species of the total. The number of shrubs and trees is smaller. In Uruguay, 224 species of wood plants have been registered, of which something more than one hundred are trees and the rest shrubs (Lombardo, 1964).

Related to the fauna, listed are around 930 species of vertebrates, distributed in the following groups: Fish 350, Amphibians 34, Reptiles 56, Birds 426, and 90 mammals. At present, it is considered that approximately 26 Uruguayan species of superior vertebrates have some degree of threat. The wetland area in the west of the Municipality of Montevideo constitutes a unique ecosystem in the south of the country, when being associated to a unique native scrubland that is important to preserve. Lands next to the Santiago Vázquez village on the mouth of the San Gregorio Creek, Peral Creek and Turtle Creek are of municipal property having a land near 1,000 hectares. In June 1999 this area was designated as Municipal Natural Park. There is a forest-ranger team in charge of taking ahead the plan of handling the protected wild area.

## **2.3 Present Water Quality Condition in the Project Area**

Present status of water quality in the Project Area is the precondition of the water quality management to be implemented in the future. This section describes current status of water quality of river and coast in the Project Area, followed by the general status for the pesticide pollution and groundwater pollution.

### 2.3.1 River Water Quality

Rivers in the Project Area are largely divided into regional rivers flowing through local areas in the Municipalities of Canelones, Lavalleja, Florida and San José and urban rivers in the urban areas of the Municipality of Montevideo. The former ones are represented by the Santa Lucía River and its tributaries and rivers belong to the La Plata River Basin, and the latter ones are the Pantanoso, Miguelete, Carrasco, Pando rivers, etc.

#### (1) Regional Rivers in the Santa Lucía River Basin

##### General Organic Pollution

Based on the water quality data measured by OSE in 1999, it is assessed that main courses of the Santa Lucía River and its tributaries are largely maintained well with BOD at 5 mg/l and less. These water qualities are almost correspondent to the value of the Class 1 specified in the environmental standard of water quality in Uruguay, which is applicable for the raw water of potable water. Therefore, the water of regional rivers in the Santa Lucía Basin is not affected significantly in terms of general organic pollutants.

In the La Plata Basin, however, most rivers appear significantly influenced by artificial activities, namely, wastewater discharged from industries, urban areas and agricultural lands. The Pando and Sauce rivers, for example, show the BOD value beyond the one specified in Class 1 of the environmental standard. Apart from main courses of regional rivers, sections of rivers passing through local urban centers, like capitals of Municipalities, show a polluting tendency. Such pollution is caused by wastewater generated in urban and industrial activities, though the degree of pollution varies depending on the locations.

##### Eutrophication

The upstream stretches of the Santa Lucía River in Minas and Chamizo are still maintained with lower nitrogen. The middle stream and down, however, the nitrogen concentration is increased in places. This is mainly because tributaries such as the Santa Lucía Chico, La Virgen, Canelon Grande and Canelon Chico are polluted by high-level nitrogen. The status of nitrogen in the river water implies the possibility of the eutrophication phenomena in reservoirs in these areas.

Although the causes for this higher nitrogen concentration have not been verified, it is almost certain that major sources of nitrogen are wastewater from urban area, industrial activities and agricultural lands. Fortunately, remarkable eutrophication phenomena have not been reported as of today, it is, however, a possible threat for raw water sources predominantly used for the potable water of the metropolitan area.

OSE measured precisely the nitrogen concentrations of the Santa Lucía Chico, at the downstream stretch from Florida City. The measurement results over the time in **Table 2.3.2** show that the increase in nitrogen concentration is distinct for the past ten years, and currently exceeding by far the values set in the environmental standard of Japan in both nitrogen and phosphorus.

**Table 2.3.1 Historical Change in Nutrient Concentration in Paso Severino Reservoir**

Locations Nutrients	Inlet of Reservoir		Inside of Reservoir		Outlet of Reservoir		Environmental Standard of Japan for lakes
	1989	1997	1989	1997	1988	1996	
Total Nitrogen (mg/l)	0.85	5.49	1.44	2.14	1.27	1.90	0.1 to 1.0
Total Phosphorus (mg/l)	0.17	0.38	0.13	0.31	0.13	0.21	0.01 to 0.1

Source: "Master Plan of Water Supply in Montevideo", OSE, 1999.

## (2) Urban Rivers

### Water Quality

The Pantanoso, Miguelete and Carrasco rivers are typical urban rivers, flowing the center area of Montevideo and pouring into the Montevideo Bay or the La Plata River. All urban rivers flowing in the Municipality of Montevideo are heavily influenced by domestic wastewater, industrial wastewater and other pollution sources. This is due to heavily concentrated population and industrial activities, and insufficient mitigation against pollution effluent.

Regarding organic pollution, BOD<sub>5</sub> exceeds by far the allowable standard 15 mg/l for the Class 4 in almost all sections, deteriorating the urban amenity in the capital city. Nevertheless, the "Environmental Report" issued by the Municipal Government states that current situation is the indication of being improved year by year as the result of recent interventions.

On the other hand, incompletely treated wastewater discharged from tanneries has been identified as the cause of heavy metal (mainly chromium) pollution. The water quality survey conducted by the Municipal Government of Montevideo indicates the fact that the total chromium concentration is beyond the standard (0.05 mg/l) at nearly half of monitoring stations. Likewise, lead concentration exceeds the standard (0.03 mg/l) at many measurement points, too.

### Sediment Quality

Although particular quality standards for evaluating sediment quality are not available in Uruguay or other countries, these results are expediently compared with the standard of Japan applied for soil pollution. According to this, the level of accumulated lead appears rather high. There is no explanation besides the industrial discharge containing heavy metals over a long period.

## 2.3.2 Coastal Water Quality

### (1) Tendency of Coastal Water Quality

Beaches along the coast of the La Plata River are popular for citizens and tourists for recreation and tourism, especially in the summer season. These beaches become improper conditions with the increase of fecal coliform caused by sewage discharge from Montevideo, depending on various conditions.

Coastal water maintains suitable conditions for bathing at beaches located away from the center zone of Montevideo. However, coastal water shows the sign of pollution in the zones that are located in the estuaries of the Pantanoso, Miguelete and Carrasco rivers, indicating that total coliform is sometimes near to the environmental water quality standard.

Meanwhile, the total coliform of coastal water becomes extremely high, after raining. This is partly because sewerage system of Montevideo is largely of the “combined type” that collects domestic wastewater and rainwater together with same pipes and, therefore, domestic wastewater may reach the watercourses due to the overflows from spillways especially in the event of heavy precipitation. Uncollected domestic wastewater directly flowing into rivers is also another reason for this pollution.

## **(2) Possible Influence of Direct Sewage Discharge**

Most of sewage generated in the center of Montevideo is discharged into the bottom of the La Plata River through the 2.2 km long pipe from the treatment plant (only the removal of coarse substances and greases) at Punta Carretas. According to the survey of the Municipal Government of Montevideo, there is no possibility that discharged sewage returns and pollutes beaches. Considering the additional installation plan of sewage discharge pipes in the future, the Government is now conducting the computer model simulation on the water quality of the La Plata River.

The La Plata River where fresh and seawater mix has received the occurrence of “green tide” and “red tide” recently, causing a hindrance to bathing several times a year. Though the pollution discharge might be responsible for, this phenomena is calling for a scientific research cooperated over the regions and countries benefited from the La Plata River.

### **2.3.3 Pesticide Pollution**

The contamination of pesticides in the water environment has little been surveyed and clarified up to now. The survey result on the La Plata River<sup>1</sup>, which is only available information now, indicates that the amounts of pesticides such as aldrin, dieldrin and DDT exceed established limit to aquatic life but all the values are lower for human health criterion.

Despite the production, import and usage of chlorate insecticides except dodecachlor and endosulfan were prohibited by Ministry Resolution in 1997, concerns about the pesticides pollution of water resources are voiced in Uruguay. Because the measurement and analysis require sophisticated equipment and technology, only LATU and a few other institutions are capable of this task at present. Given that the environmental standard of water quality in Uruguay lists numbers of pesticides, necessary monitoring becomes the issue from now on.

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<sup>1</sup> : “Presence of organochlorates pesticides in exterior Rio de La Plata”, Maritime Front, 11, 1987.

### **2.3.4 Groundwater Pollution**

The Raigon aquifer stretching in the southern zone of the country is the most extensive and promising groundwater source in Metropolitan Area. While the possibility of saline intrusion in a certain degree is in existence, this aquifer is used widely for irrigation water, industrial water and, also, potable water in the areas where the OSE's piped water service is not reached in the municipal area of San José. In other areas of the Project Area, groundwater is often used for various purposes. There are many cases that low-income people living in the periphery of urban centers tend to take living water from shallow wells. A main concern about groundwater is the possibility of pollution to be caused by the intrusion of wastewater discharged from industries and solid waste dumping but little information is available on this matter.

## **2.4 Implemented Mitigation Measures for Pollution Source**

### **2.4.1 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, of these, 331 entities (about 60 %) are located in the Project Area. Of the 331 industries in the Project Area, Montevideo accounts for almost 50 % and Canelones accounts for 33%.

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. 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.

#### **(2) Discharge of Industrial Wastewater**

Total industrial wastewater of about 100,000 m<sup>3</sup>/day in volume and about 50,000 kg-BOD/day of pollution load is generated in the Project Area<sup>2</sup>. In terms of wastewater volume (m<sup>3</sup>/day) generated in industries, domestic wastewater is the largest one sharing 23.1% followed by fuel oil at 19.4%, meat at 18.9% leather at 9.2% and others at 29.3%. Meanwhile, in terms of generated BOD (before treatment, kg/day), meat shares 31.4% followed by leather at 24.9%, milk at 10.0%, domestic at 9.6% and others at 24.1%.

With regard to the discharge receiving body, a total of 45 % industries discharges 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 noted that ground infiltration, in which the likelihood of

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<sup>2</sup> : The Project Team calculated pollution load derived from industries using unit rates, based on the data of SADI.

groundwater pollution is possible, is still permitted in Uruguay. Also to be reminded is 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 has no treatment plant.

### **(3) Actual Status of Industrial Wastewater Treatment**

According to the inspection data, of the BOD of wastewater from industries, more than half at 63 % fail to satisfy 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. It is conceivable that there are so many cases of water quality violations in the whole of Uruguay.

#### **2.4.2 Domestic Wastewater**

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.

##### **(1) Sewerage in Montevideo**

At present, the sewerage in Montevideo 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 are discharged into the bottom of the La Plata River through the 2.3 km long discharge pipe 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.

##### **(2) Other Municipalities**

Coverage rate of sewerage in the local municipalities with the population of over 10,000 and 5,000 are 42 % and 38 %, respectively as of 1998. Almost all the collection methods of the sewerage by 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).

##### **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. 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.

### **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. 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 cover 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: de-nitrogen and nitrification tanks.

## **2.4.3 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. From the standpoint of water pollution, solid waste disposal exerts two issues. One is leachate coming out dumping sites. 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.

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<sup>3</sup> 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.

## **2.5 Pollution Load Assessment for the Subject Five Municipalities**

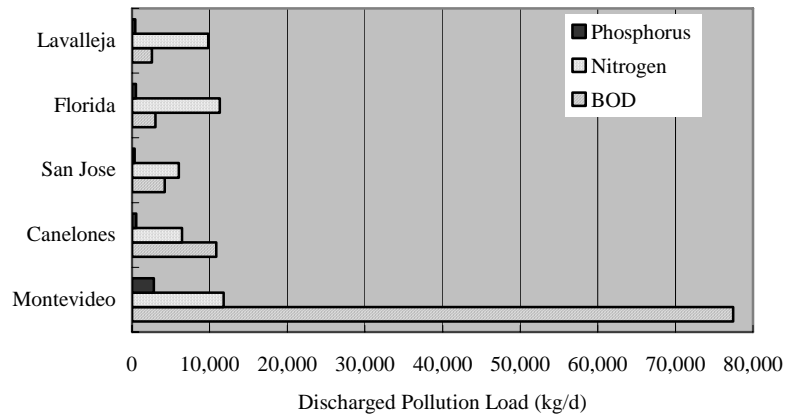
Various kinds of pollution sources exist in the Study Area. Among them, domestic wastewater, industrial wastewater and wastewater originated from solid waste are enumerated as major point sources, as described before. Besides, farmlands for stockbreeding, which occupy as high as around 75 % of the total land area of the Study

<sup>3</sup> : “Work shop of Water Resources 2002”, the Municipal Government of Montevideo, 2002.



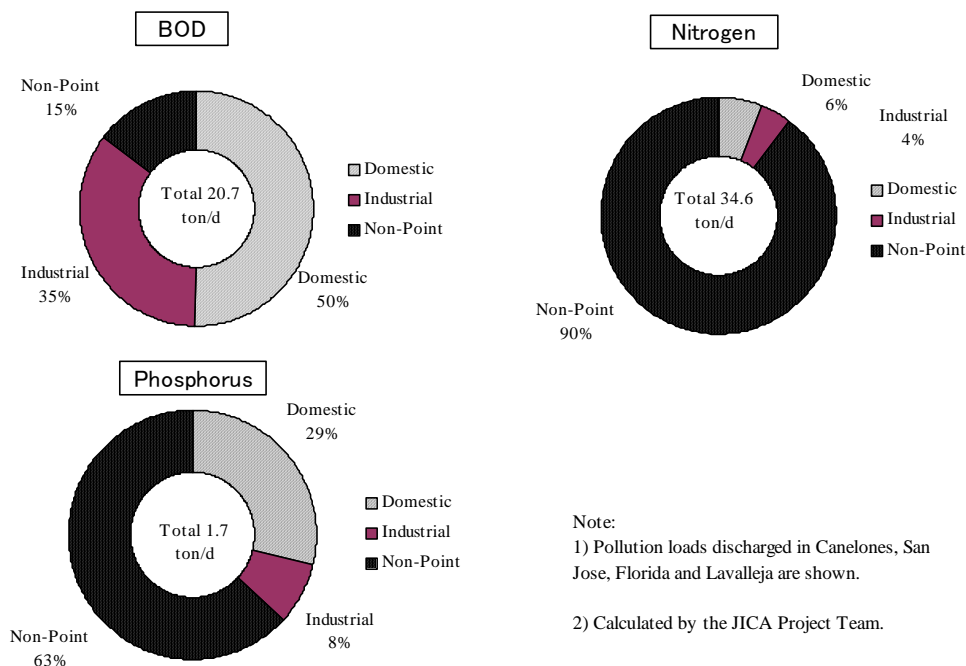
Area, are another major pollution sources as non-point source. They discharge nitrogen and phosphorus which may cause eutrophication in the water.

Generated and discharged pollution load has been estimated to discuss the basic direction of water quality management in the future. **Figure 2.5.1** shows pollution load discharged into the water environment from the municipalities in the Project Area.



**Figure 2.5.1** Projected Pollution Load Discharged into Water Environment

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 2.5.2**, in this rough calculation, 90 % of nitrogen is derived and 63 % of phosphorus from non-point sources.



**Figure 2.5.2** Sources of Discharge Pollution Load

## **CHAPTER 3. PRESENT CONDITION OF WATER QUALITY MANAGEMENT AS OF THE YEAR 2004**

### **3.1 Establishment of Policies and Strategies on Water Quality Management**

#### **3.1.1 Government Policies**

The Government maintains the policies on water quality management according to the environmental 5-year plan for DINAMA.

In the environmental plan, DINAMA aimed mainly: To formulate strong consciousness to the environment; To conserve the environment in a sustainable manner; 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. More specific policies directly governing the management in terms of water quality are not available for the time being.

#### **3.1.2 General Principles of the Environmental Policy**

Some of the recent advances in Uruguayan environmental legislation were the establishment of General Law on Protection of the Environment (Law No.17283). In the Article 6, general principles of the environmental policy are given including; Uruguay is characterized as "Natural Country", considering the sustainable development that integrates economical, cultural, and social aspects; The prevention and prevision are the criteria with the highest priority against any others in the environmental management; Integration and coordination of the various public and private sectors concerned are required.

#### **3.1.3 Specific Action Plans**

There exist no specific action plans indicating specific measures against problems in water quality nor kinds of action plans for implementing respective approaches of water quality management.

#### **3.1.4 Classification of Water Bodies**

The environmental standard of water quality has already been established in the Decree 253/79, dividing into five classes applicable for the water utilization in rivers. From February 2005 through a Ministry Resolution No. 99/005, all the water courses without classification are classified under 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 are 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."

## 3.2 Laws and Regulations

### 3.2.1 Legal Structure for the Water Quality Management

Uruguay has established a series of laws and regulations to protect and improve the water environment, as shown in **Table 3.2.1**. Of these, the ones directly governing related with water quality are the Law No.17283 (General Environment Protection Law), the Decree-Law No. 14859 (Water Code), the Decree No. 253/79 (Water Quality Control Regulation and Standards) and the Decree No. 257/997 (by this Decree the DINAMA was re-structured).

The current activities and various dispositions prescribed in the Decree No. 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).
- Prescription for diffusion, education and public participation related with water quality (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.

**Table 3.2.1 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.

### 3.2.2 Organizations Concerned on the 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.

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 (MTOPE), OSE, and RENARE (MGAP) are among them.

Meanwhile, Law No. 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 No. 253/79 states that DINAMA may order relevant measures 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.

### 3.2.3 Environmental Standards on Water Quality

In Uruguay, the environmental standard of water quality has been established in the Decree No. 253/79. The watercourses are classified into Class 1 to 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.

The Decree No. 253/79 exerts many and important regulations for water quality management as well as the environmental standards. Decree No. 253/79 is thus regarded

as a crucial administrative pillar in every aspect of water quality management. Examination for amendment of this Decree is ongoing in COTAMA.

### **3.2.4 Effluent Standards for Industrial Wastewater and Discharge Control**

The regulation for industrial wastewater in Uruguay is basically complied with the principle of “Command and Control”. The Decree No. 253/79 states numbers of legal requirements for the qualities of wastewater discharged from industries. The effluent standard of wastewater is specified depending on the discharge destinations: Sewerage, rivers and ground (Article 11).

DINAMA as a directorate responsible for the environment in MVOTMA is vested numbers of responsibilities in the regulation of industrial wastewater by the Decree No. 253/79. Major legal instruments for enforcing its competence are: Authorization of wastewater discharge; Registering and processing of qualified expert and report of operation; Order of improvement; Compliance inspection; Imposition of fines against violation.

## **3.3 Organizations and Resources**

Information on organizations and resources described hereafter is that of April 2006.

### **3.3.1 National Directorate of Environment (DINAMA)**

#### **(1) General**

The Water Code (Decree-Law No. 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 the 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 No. 257/979 defines 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.

#### **(3) Technical Advisory Commission on Environment (COTAMA)**

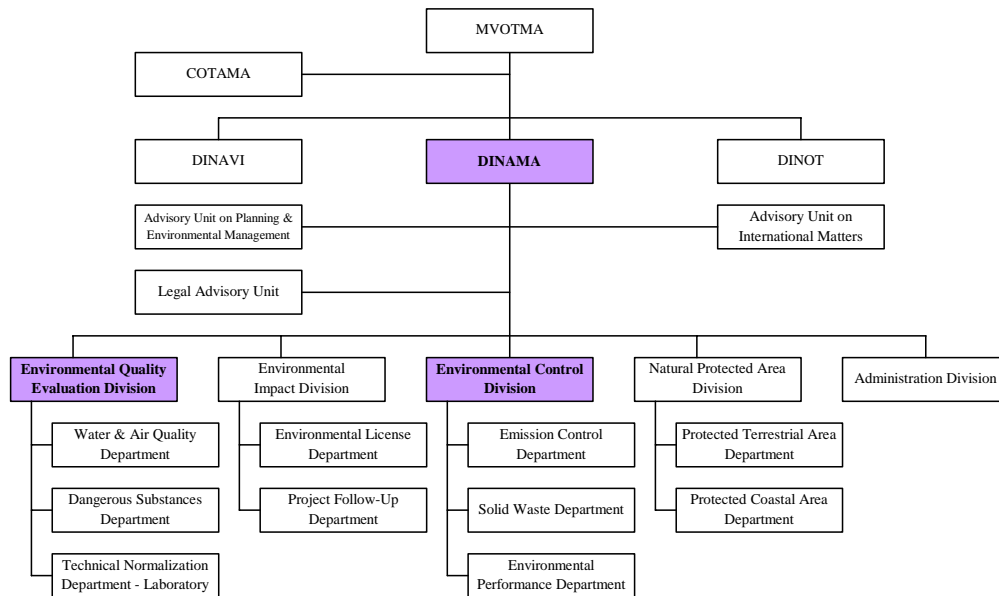
COTAMA is an inter-institutional organization of MVOTMA that involves different sectors, for the advice and coordination in policy and environmental management matters, as stated in the Ministry Creation Law (Law No. 16,112).

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.

#### (4) Organizational Structure and Personnel

DINAMA, as shown in **Figure 3.3.1**, 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 2004 including the national director and division directors.



**Figure 3.3.1 Organization 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 of these divisions are summarized as follow:

#### Division of Environmental Quality Evaluation

- 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.

As of May 2004, human resources allocated to both divisions are 31 in total. 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 currently allocated numbers are very limited, especially in water quality monitoring and evaluation, when their vast duties in water quality management are considered.

DINAMA had a unit for the environmental education in the past, there, however, was no specific unit to work for dissemination and education on water quality management as of April 2004.

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

#### **(5) Water Quality Laboratory**

DINAMA has a laboratory (Technical Normalization Department) with a total of 8 employees (3 graduated and 5 assistants). Major tasks for the water quality management 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 laboratory has a floor area of about 200 m<sup>2</sup> and is well equipped for analyzing water, air, soil as well as materials contained in the wastewater. Major items of equipment are as follows:

- Manual Analysis: Drying equipment, incubator (for BOD), 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 for practical purposes so that GC has never been used for over 6 months and therefore, the limit of detection was unknown.

### **Quality Assurance**

Inter-calibration was conducted a few years ago with the laboratory of IMM to make a crosscheck of the analysis data. Inter-calibration with the other laboratory is conducted periodically. The methods of sample preservation and analysis are in compliance with standards of US Environmental Protection Agency (EPA) and American Public Health Organization (APHA).

### **Certificate**

The laboratory obtained accreditation ISO9001: 2000 so that all routine work is carried out according to this system and procedures.

## **(6) Procedural Manuals and Standards**

Manuals for analysis and measurement of water quality are elaborated for the laboratory. The basic methods applied comply the standards of US-EPA and APHA.

Environmental Control Division has elaborated 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 work in industrial wastewater management, water quality monitoring, etc. is taking place depending on knowledge and experience of individual staff.

## **(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 by 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 coordinately filed.

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**

The Division of Environmental Control has established "SADI" System for the industrial wastewater management. The system maintains data and information for the entities registered by DINAMA (currently 513 in numbers) over the whole Uruguay. In terms of water quality data monitored in the past, a database has not

been developed, and measured data are just kept in the form of spreadsheet. Relevant information like sampling locations is not properly filed. Therefore, these water quality data are not practically accessible for third parties.

### **Website**

DINAMA has a LAN system. DINAMA maintains a webpage and publicize its policy, activities and other environmental information. In terms of water quality management, the webpage 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 webpage.

## **3.3.2 Local Governments in the Project Area**

### **(1) Participation of the Local Governments to the Water Quality Management**

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 Municipality of Montevideo, municipal governments implements water and sanitation development in rural area.

### **(2) Municipality of Montevideo**

#### **Organization**

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

#### **Human Resources**

The Government of Montevideo is rich in the staff numbers. Of a total staff of about 8,700, about 1,800 including contract-base belong to the Environment Development Department. 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.

Individual capacity of staff in water quality management appears to be well relevant to respective tasks, with sufficient opportunities of experience.

#### **Laboratory**

The Government of Montevideo has a well-equipped laboratory at Punta Carretas for manual and instrumental analyses, with a total of 20 employees. 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, since 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 a LAN system in the Government office and has also established the website, publicizing much information on water-matters. It issues 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. For public participation, the Government has formed GAM (Montevideo Environmental Group) with a very wide participation and has a working group on water resources.

#### **(3) Municipality of 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 to water quality management.

The Government of Canelones has a total staff of about 4,800. Of these, 550 are engaged in water quality-related work, and majority of them are charged in physical labor work. 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 on water quality issues, the Government of Canelones has neither specific department nor staff. 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.

#### **(4) Municipality of San José**

In the Municipal Government of San José, the Department of Hygiene, the Office of Land Use and Environment Office are related to water quality management. The Government of San José has a total staff of 715. Of these, a total of about 70 is engaged in water quality-related work but majority of them are charged in physical labor work. 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.

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

**(5) Municipality of Florida**

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

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.

**(6) Municipality of Lavalleja**

In the Municipal Government of Lavalleja, the General Directorate of Hygiene, Environment and Lifestyle is related to water quality management. The total staff of the Municipal Government of Lavalleja is 1,288. Of these, a total of 29 is 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.

**3.3.3 Related Organizations in Central Government**

**(1) National Directorate of Hydrograph, Ministry of Transport and Public Works**

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 viewpoint of quantity. According to the Law No.16,858, 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.

DNH and DINAMA must be connected in the following aspects so as to implement 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.

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

OSE was created by the Law No. 11,907 in 1952 as a decentralized organization of MTOP. OSE, however, came 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 Municipality of Montevideo.

According to relevant laws, OSE is originally obligated duties on water-related matters: 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. 14,859) has been 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 kinds of 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 has water quality laboratories; one at headquarters and another one at Aguas Corrientes where an intake and purification plant for water supply to the Metropolitan Area is located. EPA and APHA are commonly used in the laboratory of OSE. The laboratory at headquarters covers manual analysis, heavy metals, microbiology and pesticides (GC-MS). Inter-calibration has been carried out with DINAMA.

OSE and DINAMA are deeply related in the following aspects so as to do their respective duties: the collaboration between OSE and DINAMA is crucial for the preservation of 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.

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

## (3) General Directorate of Renewable Natural Resources (RENARE), Ministry of Livestock, Agriculture and Forestry

RENARE under the jurisdiction of MGAP exerts specific roles in legal procedures related to water use for agricultural/livestock purposes. The Decree-Law No. 15,239 governs water and soil conservation, and irrigation for agriculture/livestock use, establishing necessary norms. The Law No. 16,858 gives the competence to RENARE for the approval of the water and soil use plan as an indispensable requirement for obtaining water use permission.

Laboratory equipment of MGAP, which can be utilized by RENARE, is well prepared for handling manual analysis, heavy metals, bacteria and pesticides/herbicides. About 13 temporary employees with university degree are mobilized for an irregular basis. They work for dissemination and education on soil and water issues in workshops and seminars.

#### **(4) National Directorate of Water and Sanitation (DINASA)**

National Directorate of Water and Sanitation (DINASA) was established on January 17th, 2006 based on the Law No. 17,930 dated December 19th, 2005. Article 327 of the Law No. 17,930 establishes that the Ministry of Housing, Use of Land and Environment shall propose to the Executive Power the formulation of national water and sanitation policies, according to what is stated under article 47 of the Constitution of the Republic. Article 328 establishes that in order to fulfill the assignments stated on article 327, the “National Directorate of Water and Sanitation” should be created under Ministry of Housing, Use of Land and Environment.

DINASA is a newly created organization and it is presently studying and planning what will be their future function. Concrete participation to the water quality management by DINASA is still not known. Considering the background of the creation of DINASA, it should strongly participate to the water quality management in the country.

#### **3.3.4 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. They include, LATU (Uruguayan Technological Laboratory), DINAMIGUE (Directorate of Mining and Geology), DGSA (General Direction of Agricultural Services), DNM (National Directorate of Meteorology), IMFIA (Faculty of Engineering, Republic University of Uruguay), APRAC (Association of Carrasco River Water Rehabilitation).

### **3.4 Pollution Source Management**

#### **3.4.1 Industrial Wastewater Management**

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

#### **Management by DINAMA**

All industries discharging wastewater must be authorized and registered by DINAMA. After submitting the SADI (*Solicitud de Autorización de Desague Industrial*, Application for Authorization of Industrial Discharge), entities must obtain DINAMA’s permit and then can start the construction work. Industries must accordingly submit IPO (*Informe de Puesta en Operación*, Report of Operation) prior to the operation and finally can attain ADI (*Autorización 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.

### **Management by Municipal Governments**

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. In the other municipalities, intervention to the industrial wastewater management is rather less.

#### **3.4.2 Intervention in Domestic Wastewater Management**

At present, activities being made by DINAMA as the intervention in domestic wastewater management is limited to the supervision of the construction work 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.

#### **3.4.3 Intervention in Solid Waste Management**

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. 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.

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.

#### **3.4.4 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 the fact of 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.

### **3.5 Ambient Water Quality Monitoring**

#### **3.5.1 Monitoring by DINAMA**

DINAMA had implemented ambient water quality monitoring under various projects or programs since its creation in 1990, but its activities have been very constrained recently mainly for the financial reason. Ambient water quality monitoring is originally to be conducted continuously at certain frequencies and at specified points of watercourses. In DINAMA, however, water sampling and quality analysis had been carried out in specific period, so-called campaign, but not periodically.

Apart from the status above, weekly-based monitoring of coastal water quality is undertaken by DINAMA, only in summer season, in order to provide holidaymakers with information on suitability for bathing as a result of bacteriological analysis.

Programs and project that DINAMA participated so far include: "Water Quality Goal Project 2000", APRAC (Recovery Association of Carrasco River), ECOPLATA, FREPLATA, etc.

#### **3.5.2 Monitoring by Municipal Governments**

##### **(1) Municipality of Montevideo**

The water quality monitoring program carried out by the Government of Montevideo, one of the components of the Urban Sanitation Plan, was commenced early in 1999 by the consortium of consultants. The program continues from the summer 2002 under the responsibility of the Government of Montevideo. It consists of 6 campaigns a year (3 in summer and 3 in winter). In addition, river discharges are measured in the campaign of summer and winter respectively. During the period 1999-2001, sampling has been conducted at 33 monitoring stations in the four selected rivers (Pantanos, Miguelete, Carrasco, and Las Piedras) and in Montevideo Bay. The Government added one more station in the Carrasco River Basin in 2002 to evaluate impact on water quality by industrial wastewater. All analysis work is carried out in the laboratory of the Government located at Punta Carretas.

##### **(2) Other Municipal Governments**

The Government of Canelones takes 15 water samples every week from the beach of the La Plata River. The river coast is divided into three blocks and samples are taken from five selected beaches at each block, and sampling points are scheduled to change every week according to a five-week rotation plan. Collected samples are analyzed in the laboratory of the Government for such parameters as pH, DO, BOD and coliform. With respect to the creek, the estuaries of the Carrasco, Pando, Solis Chico and Solis Grande River are the focus of the water quality monitoring.

The other municipal governments of San José, Lavalleja and Florida are expressing interest in water quality. However, due to the small capacity of their own laboratory,



parameters are limited only to pH and coliform, which may be useful for the people's health care about bathing in the creek.

### **3.5.3 Water Quality Measurement by OSE**

OSE has around 10 monitoring stations in the Santa Lucía River Basin. These are located within 50 km upstream from the water intake weir of Aguas Corrientes. Monitoring is conducted every week for the analysis of 11 parameters. Water quality at the intake is analyzed at 6 times a day for 6 physical and chemical parameters in the laboratory at the treatment plant. For the first time of sample of the day taken at 7 a.m., the analysis of 36 parameters is defined. In addition, OSE is currently undertaking nationwide campaign to secure the quality of drinking water, so that sampling and analysis work are now underway in the laboratory of OSE headquarters.

### **3.5.4 Water Quality Monitoring Status by Water Quality Parameter**

In order to grasp the present status of the water quality monitoring by relevant organizations, water quality parameters monitored by each program or campaign are checked as shown in **Table 3.5.3**.



## **3.6 Dissemination, Education and Public Participation**

### **3.6.1 Overview for the Country**

#### **Environmental Conflicts and Solution Practice**

“The research of Santandreu and Gudynas” says that the environmental conflicts in Uruguay related to water quality reflects the general concept; the most of the conflicts with relation to water would be diluted along the time without any solution. For example, MVOTMA formed a commission with the basin management features for the Carrasco River’s management under wide-range participation, but it has functioned no more since 2001. Nevertheless, there were so many formulations of communities seeking participatory approaches.

#### **National Policies and DINAMA’s Task**

At present, there is no national policy on environmental education, as a programmatic proposal of environmental education promotion in all sectors of society that establish responsibilities and duties. A national policy on environmental education should give an institutional framework of environmental education, establishes their principles and be the basis for public policies.

Although DINAMA has produced some public campaigns on environmental issues, they are in a very limited extent for the elaboration and production of public campaigns on water quality problems. Also it has not been involved so much in the prevention of conflicts related to water quality problems.

### **3.6.2 Dissemination Activities on Environment**

DINAMA has developed a bimonthly magazine the “Ambiente Uruguay” and the website. Some articles in these media have focused on underground water, the evaluation of industrial wastewater toxicity and industrial water pollution control. The page related to water quality evaluation is presently under construction without disseminating related data and information.

While one of DINAMA’s functions is to operate the Environmental Information System (including the Annual Environmental Report) related to air, water, soils and biota, the annual report has not been published in recent years.

OSE basically directs their information dissemination mainly to drinking water protection and appropriate use, not to water resource protection and recover. GEA directs the information dissemination mainly focusing on water contamination and watercourses monitoring and protection.

### **3.6.3 Activities on Environmental Education**

OSE uses its website as a platform for an educative campaign directed to schoolchildren. Government of Montevideo is carrying own educative programs, but DINAMA is not involved in these programs.

At primary education level some kind of educative work on water issues exist through MECAEP (Improvement of Quality of Primary Education) program with elaboration and distribution of educative materials, development of capacity building activities for teachers, an electronic bulletin, and promotion of projects on health and environment (PME). DINAMA is not involved in these programs, also.

#### **3.6.4 Current Status of Public Participation in Water Quality Matters**

On complains from the public, the website of the Government of Uruguay navigates how and where to convey environmental complaints and, there, DINAMA is designated as the window in this respect.

Meanwhile, the Government of Montevideo has set the phone numbers that receives complaints and questions on environmental issues (COMMAC: Montevideo Citizen Environmental Monitoring Commission).

The Government of Montevideo created GAM (Montevideo Environmental Group) to basically define the Montevideo Environmental Agenda (Montevideo Agenda 21).

## **CHAPTER 4. FIRST DRAFT INTEGRATED MASTER PLAN ON THE CAPACITY DEVELOPMENT FOR THE WATER QUALITY MANAGEMENT**

### **4.1 Principles for Water Quality Management in Uruguay**

#### **4.1.1 Principles for Water Quality Management**

Principles of water quality management in Uruguay have been envisaged considering the present status of the country as well as the worldwide trend. Principles are proposed as: i) Water Quality Management for River Basins, ii) Systematic Water Quality Management considering a cycle of establishment of policy and strategies, pollution source management, ambient water quality monitoring, and dissemination, education and public participation), and, iii) Integrated Water Quality Management as follows.

#### **4.1.2 Specific Approaches for Systematic Water Quality Management**

##### **(1) Establishment of Policy and Strategies**

“Establishment of Policies and Strategies” in the cycle of the water quality management is in the most upstream part. Principles of water quality management, namely, “Water Quality Management for River Basins”, “Systematic Water Quality Management”, and “Integrated Water Quality Management” should always be kept in mind in the activities under this component of the management cycle. DINAMA is exclusively responsible for these approaches.

The approach includes initiation and amendment (when necessary) of laws, regulations, degrees, codes, regulatory standards like environment standards of water quality and effluent standards, etc. necessary for the enforcement of water quality management. Also included is the establishment of a system for integrated management. Classification of water bodies is included in this approach to classify and set up particular quality targets for respective water bodies, applying graded quality classes.

##### **(2) Pollution Source Management**

“Pollution Source Management” approach in the cycle of systematic water quality management covers various kinds of pollution sources, namely, industrial wastewater, domestic wastewater, solid waste, and non-point sources.

##### **Industrial Wastewater Management**

Industrial wastewater treatment facilities are constructed and operated by correspondent entities. The approach of industrial wastewater management is to regulate wastewater discharged from industrial entities through the authorization of discharge, inspection, effluent monitoring, etc. by means of the principle of “command and control”.

In addition, this approach is to analyze and assess the influence of industrial wastewater for the water environment, aiming to establish integrated strategies for the conservation and improvement of the water environment over a long term.

### **Intervention in Domestic Wastewater Management**

The approach of the intervention in domestic wastewater management is to coordinate and supervise the development projects of sewerage system. In addition, this approach is to analyze and assess the influence of sewage for water environment.

### **Intervention in Solid Waste Management**

The approach of the intervention is to coordinate and supervise the development projects of solid waste disposal projects. Another objective is to analyze and assess the influence of water pollution.

### **Intervention in Non-Point Source Pollution Management**

Actual measures in non-point source pollution management are implemented mainly by MGAP, since typical pollutants are generated from agricultural lands. The intervention by DINAMA is to coordinate and assist the actual measures taken by MGAP. In addition, this approach is to analyze the pollution.

## **(3) Ambient Water Quality Monitoring**

DINAMA has the responsibilities for carrying out ambient water quality monitoring to scientifically clarify and assess the status of the water quality, concerning all water quality parameters specified in the environmental standard of water quality. This approach consists of a series of component works: design of monitoring networks, sampling and analysis of water, accumulation of data in a database, processing and interpreting of data, and providing information for decision-making and dissemination.

## **(4) Dissemination, Education and Public Participation**

Approaches of dissemination, education and public participation in water quality management are aiming: to raise the awareness of community to the water environment through rendering the knowledge on water quality-related matters by means of dissemination and environmental education, and, to reflect stakeholders' opinions to the strengthening of water quality management through the participation of public.

## **4.2 Participation in Water Quality Management by Organization**

Based on the discussion for each organization, characteristic issues are summarized by each approach of water quality management cycle as follows:

### **(1) Establishment of Policy and Strategies**

- Decree 257/997 defines 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.

## **(2) Pollution Source Management**

- DINAMA is the leading agency for the pollution source management in Uruguay. Of the management by pollution sources, industrial wastewater management is conducted through DINAMA's leadership. Among others, industrial wastewater management is in a relatively advanced level in DINAMA. The industrial wastewater management is conducted through, application and approval (SADI), issuance of wastewater discharge license (ADI), compliance inspection including wastewater quality monitoring, etc.
- Emission Control Department with eight staff under Environmental Control Division is in charge of approval of industrial wastewater discharge in DINAMA. Staff of the Emission Control Department generally has enough technical level for industrial wastewater management. Due to the absence of procedural manuals and technical guidance, however, management work depends on the personal experience and knowledge. Compliance inspection and monitoring of wastewater are conducted approximately once a year to about the half of the registered enterprises (a total of 516 in the whole country).
- Each Municipality also is authorized for compliance inspection for industrial wastewater management. Municipality of Montevideo implement compliance inspection in an organized manner. The other four Municipalities in the Santa Lucía River Basin have not conducted systematic industrial wastewater management.
- Collaboration between DINAMA and relevant agencies for pollution source management is less. There is some collaboration for industrial wastewater management, almost no collaboration has, however, been conducted for domestic wastewater management, solid waste management, and non-point pollution source management.

## **(3) Ambient Water Quality Monitoring**

- DINAMA is the leading agency for the ambient water quality monitoring in Uruguay, while Municipalities participate in this from the viewpoint of conservation of environmental hygiene condition in their territory.
- In the Santa Lucía River Basin and the basins of the La Plata River from Cufre to Pando, no periodical ambient water quality monitoring has been conducted except in the Municipality of Montevideo.
- The capacity (leadership, proposing ability, implementing capability, etc.) of the monitoring group of DINAMA is not sufficient.
- DINAMA laboratory, on the other hand, generally has higher organizational and personal capacity. The workload to the laboratory is full of capacity in some parts.
- Awareness of the participation to ambient water quality monitoring of Municipalities is generally low.
- The capacity of laboratory in the four Municipalities other than Montevideo is generally low although it is different by Municipality. There is a lack in basic capacity for grasping river water environment.

- Water quality data of DINAMA is not systematically utilized, and they are stored personally. Water quality data in the relevant agencies are stored, maintained and used in the individual organization.

**(4) Dissemination, Education and Public Participation**

- DINAMA periodically issues information through quarterly booklets “Ambient Uruguay” and through web pages, there, however, are no systematic activities for dissemination, education and public participation related to water quality management.
- Municipality of Montevideo established GAM (Montevideo Environmental Group) and conducting public participation programs. OSE also publicize information thorough web pages.

**4.2.2 Participation in Water Quality Management by Organization**

Present status of participation by organization to the water quality management is summarized in a matrix as shown in **Table 4.2.1**.



**Table 4.2.1 Matrix for Present Status of Participation to Water Quality Management by Organization**

	DINAMA	RENARE/MGAP	DNH	OSE	IMM	IMC	IMSJ	IMF	IML	NGO, Residents
<b>Establishment of Policy and Strategies</b>										
Establishment of policy and action plans	- Decree 257 declares that Dinama should establish water quality management policy, though it has not been done.									
Water quality standards	- Decree 253 declares water quality and wastewater quality standards. Amendment of Decree 253 is in progress (COTAMA).									
Classification of rivers	- Classification of rivers is declared in Decree 253, though it has not been done.	-	-	-	-					
Water quality management for river basins	- Necessity of basin wide water quality management is less recognized.	-	-	-	-					
<b>Pollution Source Management</b>										
Water quality simulation for the basin	- Prediction of water quality change in the future is requested, though it has not been done.		-							
Industrial wastewater management	- Conducts approval for wastewater discharge. Registration information is provided to IMM upon request. - Controls wastewater discharge. - Carries out compliance inspection.			- Nothing conducted specially.	- Controls wastewater discharge. - Conducts compliance inspection	- No systematic or scheduled activities for wastewater control are conducted. Ad hoc compliance monitoring is conducted basically upon complaint from residents.				- Residents complain.
Domestic wastewater management	- Almost nothing is conducted for domestic wastewater management.			- Formulates sewerage development plan. - Implements sewerage development projects.	- Implements sewerage development projects	- Collaboration is conducted for sewerage development implemented by OSE.				- Residents give complaint.
Solid waste management	- Almost nothing is conducted for wastewater from solid waste and solid waste pollution.				- Conducts solid waste management. - Construction and operation of final dumping sites.					- Residents complain.
Non-point source pollution management	- Almost nothing is conducted for non-point pollution source management.	- Should manage non-point source pollution, though activities are inactive.								- Residents complain.
<b>Ambient Water Quality Management</b>										
Monitoring network design	- Water quality monitoring for specific purpose, area and periods is conducted through campaigns. - Monitoring network designing for river basins has not been conducted.	- Water quality analysis is conducted for their purpose.		- Conducts monitoring for water source.	- Conducts periodical ambient water quality monitoring for rivers and a bay.	- 5 rivers are monitored in summer. - La Plata Beach is monitored fecal coliform in summer.	- 3 rivers are monitored 3-4 times a year. - La Plata Beach is monitored fecal coliform in summer.	- Rivers are monitored fecal coliform in summer.	- Rivers are monitored fecal coliform in summer.	- There is a concern of water quality in residents.
Water and sediment sampling	- Water and Air Quality Department conducts sampling of water and sediments. - Capacity of the monitoring group is low due to lack of staff and other reasons.			- Conducts water sampling - Do not sample sediments.	- Conducts water and sediment sampling.	- Conducts water sampling, but sediment not.	- Conducts water sampling, but sediment not.	- Conducts water sampling, but sediment not.	- Conducts water sampling, but sediment not.	
Analysis	- Technical Normalization Department - Laboratory conducts analysis of water and sediments.			- Labo in HQ covers almost all parameters. - Parameters covered by intakes and local office is limited.	- Almost all parameter including a part of pesticide is covered.	- pH, Salinity, DO, BOD. Coliform are covered.	- pH, Nitrite, BOD (simple), Ammonia, Coliform are covered.	- pH, Coliform are covered. - COD cannot be analyzed due to lack of accessory.	- pH, Coliform are covered. - Solid cannot be analyzed (out-of-order of a scale)	-
Accumulation of water quality data and evaluation and analysis	- Water quality data are maintained personally and not effectively utilized.	- Water quality data is stored in Access database and used internally.		- Data is stored at each unit by Excel. - No effective use outside of each unit.	- Data is stored in Excel file. - Evaluates data every year for annual report.	- Data are stored in Excel file. - Historical change, etc. are evaluated.	- Data are stored in Excel file.	- Data are stored in Excel file.	- Data are stored in Excel file.	- Information to be checked by residents.
Publication of water quality data	- Water quality information is not publicized. - Environmental Annual Report is not published.	- No water quality data is publicized.	- Sells river flow data.	- Water quality data is not publicized.	- River water quality and wastewater related information is publicized by Environmental Annual Report.	- Water quality data are not publicized.	- Water quality data are not publicized.	- Water quality data are not publicized.	- Water quality data are not publicized.	
<b>Dissemination, Education and Public Participation</b>										
Dissemination and education	- Quarterly magazine "Ambient Uruguay" is published for dissemination			- Environmental education for drinking water is conducted.	- GAM conducts environmental education.	- Nothing specially conducted.				- Residents have concern
Public participation	- No activities.	-	-	-	-	- Nothing specially conducted.				- Have willingness to participate.

### **4.3 Identification of Issues by Water Quality Parameter**

In this section, identification of issues by water quality parameter is conducted to confirm the present condition from the different point of view. From the **Table 3.5.1**, the following characteristics and issues in the water quality management in Uruguay have been extracted.

- Fecal Coliform is widely monitored water quality parameter in Uruguay. Every Municipality can analyze fecal coliform. This is considered to be the result of higher concern on water quality for bathing in rivers and children' playing in rivers.
- The pH that is a basic parameter of water quality and measurement is easy also is commonly monitored and every Municipality is capable of this.
- Some Municipalities do not cover BOD<sub>5</sub> that is commonly used in the world for the evaluation of river water quality.
- Total Chromium and lead are the representative parameters for heavy metals.
- Monitoring of pesticide is limited to campaigns of ECOPLATA and FREPLATA. Present condition of pesticide pollution cannot be evaluated due to the lack of data.
- Amendment of Decree No.253/79 proposes new inclusion of Chloride, Hexavalent Chromium, etc. Excluded from the present Decree No. 253/79 is only Boron. Other heavy metals and pesticides are presently under study for the amendment. Amendment of wastewater discharge standards is presently under study.
- With regard to the ambient water quality monitoring by Municipality, the Municipality of Montevideo is quite different from the other Municipalities in implementing status and in monitoring capacity. Planning of the future monitoring should consider this status.
- The laboratory that belongs to DGSA (General Directorate of Agricultural Services), MGAP, does not conduct regular water quality analysis, and only conducts residual pesticide for agricultural crops. It accepts analysis upon request with approximately US\$55 per sample.
- LATU is an organization that conducts analysis upon request. Tariff for 8-kind of heavy metals is US\$170/sample and that for chloric pesticides is US\$77/sample.
- Regarding number of sampling locations and frequency of sampling by each Municipality, the Municipality of Montevideo conducts sufficient periodical ambient water quality monitoring. Municipality of Canelones follows this with monitoring of relatively long period of river water quality including BOD<sub>5</sub>. San José follows this with periodical river water quality monitoring and summer campaign for beaches. Municipalities of Florida and Lavalleja only conduct summer campaign analyzing fecal coliform.
- With regard to industrial wastewater monitoring, DINAMA conducts better monitoring when compared to river water quality monitoring. Of the Municipalities, the Municipality of Montevideo conducts better industrial wastewater monitoring rather than DINAMA. Industrial wastewater monitoring by other Municipalities is almost not conducted and also they do not have capacity for this.

## 4.4 Problem Analysis

Problem analyses on water quality management for the present project have been conducted at various occasions as follows:

- PCM Session 1 (stakeholder analysis) and PCM Session 2 (problem analysis and objective analysis)
- Simplified problem analysis and objective analysis in local workshop in each Municipality (IMM, IMC, IMSJ, IMF, IML).
- Summarization study by the project team based on the above analysis.

Problem Tree is not attached, but please refer to the Objective Tree as discussed later.

## 4.5 Objectives Analysis

### 4.5.1 Objective Tree

On the basis of the problem tree as developed in the Section **4.4 Problem Analysis**, objectives analysis has been conducted in this section. The proposed direction for water quality management as discussed in the previous section is the input for conducting the objectives analysis.

As discussed in **Chapter 1 Introduction**, overall goal and project purpose of the present Project are as follows:

#### **Overall Goal**

- River water quality in Montevideo and Metropolitan Area is improved
- Public hygiene environment is improved
- Future water pollution is prevented

#### **Project Purpose**

- The capacity of water quality management of DINAMA and related organization in Montevideo and Metropolitan Area is improved

The established objectives tree is as presented in **Figure 4.5.1**.

### 4.5.2 Confirmation of Module of Water Quality Management

It has been confirmed that the proposed four modules in the systematic water quality management, one of the principles of the water quality management in Uruguay, appear as the four pillars of approaches in the objective tree in **Figure 4.5.1**.

- Strengthening of Strategic Part
- Strengthening of Pollution Source Control
- Strengthening of Ambient Water Quality Monitoring
- Promotion of Dissemination, Education and Public Participation

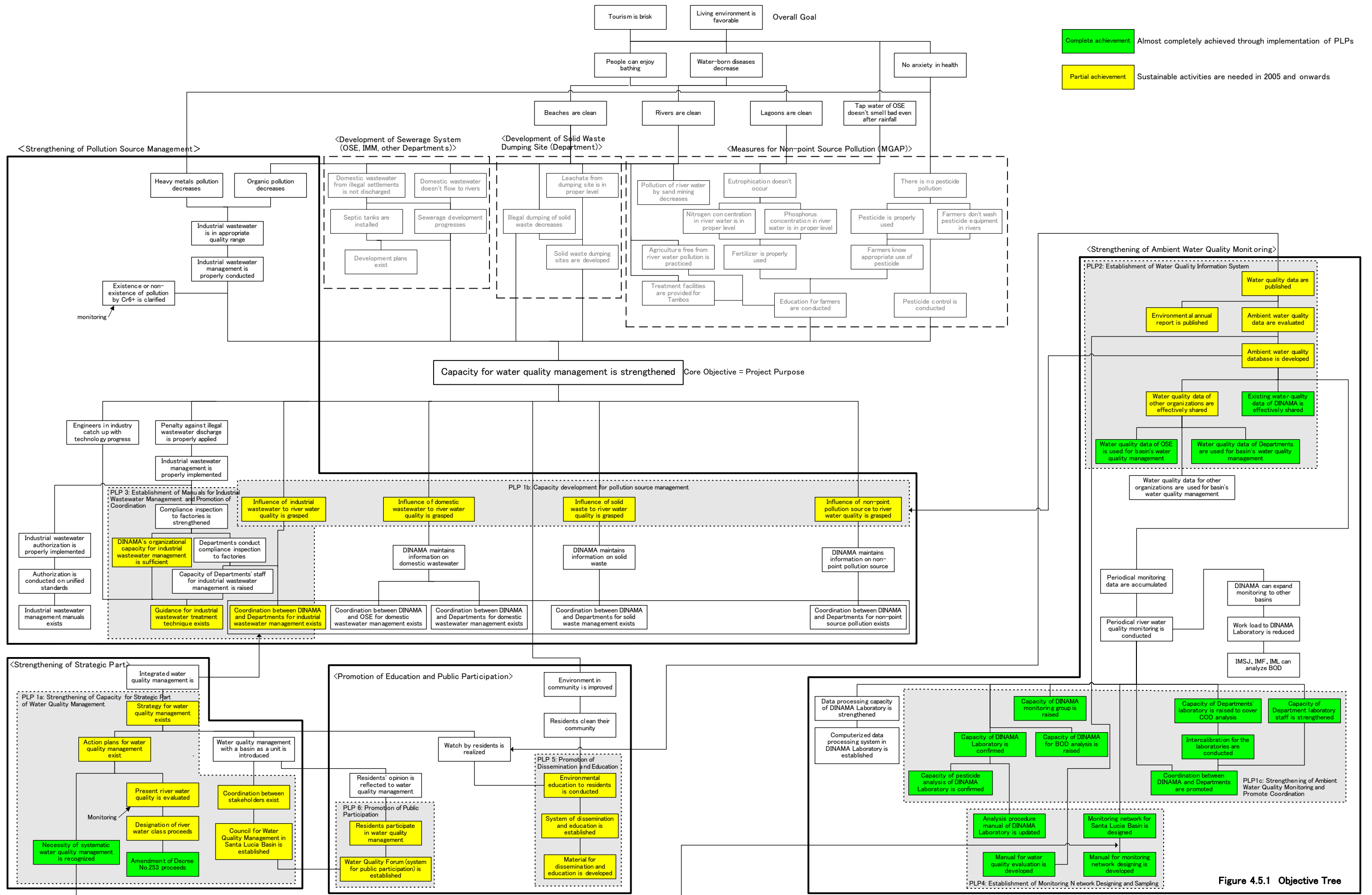


Figure 4.5.1 Objective Tree

## **4.6 Concrete Directions by Module of Water Quality Management**

### **4.6.1 Establishment of Policies and Strategies**

As discussed in **Section 4.1**, the basic policy for water quality management in Uruguay is proposed to consist of the following three principles:

- Water Quality Management for River Basins
- Systematic Water Quality Management
- Integrated Water Quality Management

### **4.6.2 Pollution Source Management**

Administrative management on environment for pollution source management can be broadly divided into two. The first one is the “analysis and evaluation of pollutants” that analyzes and evaluates the impact of pollutants to the water environment in order to identify the basic direction of the measures to minimize the negative impact to water environment. The second one is the “control of wastewater” that directly manages pollution sources so as to conduct necessary measures.

### **4.6.3 Ambient Water Quality Monitoring**

Basic direction of ambient water quality monitoring is; implementation of strategic ambient water quality measurement; ambient water quality measurement considering organizational framework; maintenance and effective use of ambient water quality data (establishment of water quality information system, publication of annual environment report).

### **4.6.4 Dissemination, Education and Public Participation**

The basic direction of the dissemination, education and public participation is proposed as follows: The dissemination and education is to be conducted to raise the awareness of the local citizens on environmental water quality, and to motivate for the water quality conservation. Formulate a basis for the wider understanding for the establishment of the policy for water quality management. Promote the participation of the local citizens for the implementation of policies on the water quality management, and to promote the integration of the stakeholders for the effective implementation of the activities, and realize reduction in the load to the governmental organization through the spontaneous cooperation of the people. Motivate the relevant government agencies for the effective implementation of water quality management policy through the watching of the government by the residents.

### **4.6.5 Proposed Participation by Organization to the Water Quality Management**

On the basis of the concrete directions for the modules of the water quality management, proposed participation of the relevant organization to the water quality management has been summarized in a matrix as shown in **Table 4.6.1**. This matrix has been developed based on the matrix for the present participation to the water quality management by organization.



**Table 4.6.1 Matrix for Proposed Participation to Water Quality Management by Organization**

	DINAMA	DINASA	RENARE/MGAP	DNH	OSE	IMM	IMC	IMSJ	IMF	IML	NGO, Residents	
<b>Establishment of Policy and Strategies</b>												
Establishment of policy and action plans	- Establish policy and action plans making use of Council for Water Quality Management in the Santa Lucia River Basin	- Coordination										
Water quality standards	- Amend Decree 253 (COTAMA)											
Classification of rivers	- Designate "Water Bodies for Specific Use"		- Coordination for designation of water bodies for specific use	- Coordination for designation of water bodies for specific use	- Coordination for designation of water bodies for specific use	- Coordination for designation of water bodies for specific use						
Water quality management for river basins	- Preside Council for Water Quality Management for Santa Lucia River Basin	- Coordination	- Participate to the Council	- Participate to the Council	- Participate to the Council	- Participate to the Council						
<b>Pollution Source Management</b>												
Water quality simulation for the basin	- Prediction of water quality change in the future based on information of present water quality, present pollution sources, and future prediction of pollution sources.			- Provision of river flow data								
Industrial wastewater management	- Conducts approval for wastewater discharge - Provision of registration information to Departments and OSE - Controls wastewater discharge - Preparation of compliance inspection plan - Provision of compliance inspection data to Departments and OSE - Accumulation, evaluation and analysis of various basic information on industrial wastewater				- Control of wastewater discharge to sewer	- Controls wastewater discharge - Preparation of compliance inspection plan - Provision of compliance inspection data to Dinama	- Work as liaison office for industrial wastewater management (-Receive complaints from residents, -Collaborate to compliance inspection work to be conducted by Dinama including assistance to sampling and grasping the status, -Conduct simple compliance inspection apart from Dinama's inspection, -Follow up of compliance inspection to be conducted by Dinama.				- Issue opinion	
Domestic wastewater management	- Collaborated management of sewerage development - Accumulation, evaluation and analysis of various basic information on domestic wastewater				- Collaborated management of sewerage development - Development of sewerage	- Collaborated management of sewerage development - Development of sewerage	- Collaborated management of sewerage development - Collaboration to sewerage management to be conducted by OSE				- Issue opinion	
Solid waste management	- Collaborated management of water pollution by solid waste - Accumulation, evaluation and analysis of various basic information on solid waste originated wastewater					- Solid waste management - Provision of information on solid waste originated wastewater to Dinama					- Issue opinion	
Non-point source pollution management	- Collaborated management of water pollution by non-point source pollution - Accumulation, evaluation and analysis of various basic information on non-point source pollution	-	- Implementation of measures against non-point source pollution								- Issue opinion	
<b>Ambient Water Quality Management</b>												
Monitoring network design	- Design monitoring network	-	- Collaboration to monitoring network design	- Collaboration to monitoring network design	- Collaboration to monitoring network design	- Collaboration to monitoring network design	- Collaboration to monitoring network design					
Water and sediment sampling	- Sampling by boat at the estuary of the Santa Lucia River - Sediment sampling				- Water sampling, site test, and sample transport	- Water and sediment sampling, site test, and sample transport	- Water sampling, site test, and sample transport					
Analysis	- Water quality analysis that is not covered by Departments and OSE - Analysis for sediments				- Analysis of water	- Analysis of water and sediment	- Analysis of basic parameter (Temperature, pH, EC, DO, BOD, COD, Fecal Coli, Total Coli)				- Participation of NGO and residents	
Accumulation of water quality data and evaluation and analysis	- Establishment of water quality information system in Dinama - Establishment of integrated water quality information system - Promotion of utilization of water quality information system	-	- Establishment of water quality information in RENARE - Promotion of utilization of water quality information system	- Promotion of utilization of water quality information system	- Establishment of water quality information in OSE - Promotion of utilization of water quality information system	- Establishment of water quality information in IMM - Promotion of utilization of water quality information system	- Establishment of water quality information in IMC - Promotion of utilization of w.q. information system	- Establishment of water quality information in IMSJ - Promotion of utilization of w.q. information system	- Establishment of water quality information in IMF - Promotion of utilization of w.q. information system	- Establishment of water quality information in IML - Promotion of utilization of w.q. information system	- Check of water quality information	
Publication of water quality data	- Issue of Environmental Annual Report (incl. water quality)											
<b>Dissemination, Education and Public Participation</b>												
Dissemination and education	- Preparation of education material - Planning for environmental education - Implementation of environmental education				- Planning of environmental education on domestic water - Implementation of environmental education on domestic water	- Planning of Departmental environmental education - Implementation of Departmental environmental education	- Planning of Departmental environmental education - Implementation of Departmental environmental education	- Planning of Departmental environmental education - Implementation of Departmental environmental education	- Planning of Departmental environmental education - Implementation of Departmental environmental education	- Planning of Departmental environmental education - Implementation of Departmental environmental education	- Planning of Departmental environmental education - Implementation of Departmental environmental education	- Participation of NGO and residents to environmental education
Public participation	- Support for establishment of water quality forum in each Department	-	- Support for establishment of water quality forum in each Department	- Support for establishment of water quality forum in each Department	- Support for establishment of water quality forum in each Department	- Establishment of Departmental water quality forum - Operation of forum	- Establishment of Dep. water quality forum - Operation of forum	- Establishment of Dep. water quality forum - Operation of forum	- Establishment of Dep. water quality forum - Operation of forum	- Establishment of Dep. water quality forum - Operation of forum	- Establishment of Dep. water quality forum - Operation of forum	- Participation of NGO and residents to water quality forum

#### **4.7 Capacity Development Plan by Module for the Water Quality Management**

On the basis of the analysis from the various kinds of viewpoints and the proposed principles of water quality management in Uruguay, capacity development plan, the theme of the present Project, has been identified in this section of the report. The capacity development plan has been discussed by module for the water quality management. Output expected for the implementation of capacity development in each module has been summarized in **Table 4.7.1**.



**Table 4.7.1 Output by Module of Capacity Development**

<b>Item</b>	<b>Overall Project</b>	<b>Module No.1: Strengthening of Strategic Part</b>	<b>Module No.2: Strengthening of Pollution Source Management</b>	<b>Module No.3: Strengthening of Ambient Water Quality Monitoring</b>	<b>Module No.4: Promotion of Education and Public Participation</b>
<b>Objectives/ Purpose</b>	<p><u>Overall Goal</u></p> <p>- River water quality in Montevideo and Metropolitan area is improved; public hygiene is improved; and, future water pollution is prevented.</p> <p><u>Project Purpose</u></p> <p>- The capacity of water quality management of DINAMA and related organization in Montevideo and Metropolitan Area is improved.</p>	<p><u>Purpose</u></p> <ol style="list-style-type: none"> <li>1. Water quality management for river basins is introduced</li> <li>2. Systematic water quality management is implemented</li> <li>3. Integrated water quality management is implemented</li> </ol>	<p><u>Purpose</u></p> <ol style="list-style-type: none"> <li>1. Pollution source management is properly implemented</li> </ol>	<p><u>Purpose</u></p> <ol style="list-style-type: none"> <li>1. Periodical ambient water quality monitoring in the Santa Lucía River Basin is implemented</li> <li>2. Water quality data of the whole nation is stored, evaluated, utilized, and publicized</li> </ol>	<p><u>Purpose</u></p> <ol style="list-style-type: none"> <li>1. Dissemination, education and public participation is promoted in the Santa Lucía River Basin</li> <li>2. People's opinion is reflected to water quality management in the Santa Lucía River Basin</li> </ol>
<b>Output</b>	<ol style="list-style-type: none"> <li>1. An integrated master plan for strengthening of water quality management of rivers in Montevideo and Metropolitan Area is formulated.</li> <li>2. Capacity of DINAMA and related agencies is developed paying attention to their ownership</li> </ol>	<ol style="list-style-type: none"> <li>1.1 Water quality management strategies and specific action plans of respective water quality approaches are established</li> <li>1.2 Decree No.253/79 is amended</li> <li>1.3 Water bodies' specific use is declared based on the "Decree No.253/79 and Amendments"</li> <li>1.4 Present river water quality is evaluated.</li> <li>1.5 Necessity of council for water quality management in the Santa Lucía River Basin is discussed</li> </ol>	<ol style="list-style-type: none"> <li>2.1 Collaboration system among relevant agencies on pollution source management is maintained</li> <li>2.2 Capacity of relevant organization on pollution source management is strengthened</li> <li>2.3 Industrial wastewater management is conducted under the collaboration of DINAMA and Municipalities</li> <li>2.4 Industrial wastewater related manuals are prepared</li> <li>2.5 Capacity of DINAMA and relevant agencies on industrial wastewater management is developed</li> <li>2.6 River water quantity observation system is established</li> <li>2.7 An integrated information system on pollution sources is established</li> <li>2.8</li> </ol>	<ol style="list-style-type: none"> <li>3.1 Manuals related to monitoring are prepared</li> <li>3.2 Ambient water quality monitoring plan for the Santa Lucía River Basin is established</li> <li>3.3 Collaborated implementation system for sampling, analysis and evaluation is established</li> <li>3.4 Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened</li> <li>3.5 Water quality information system is established</li> <li>3.6 Water quality data are properly evaluated</li> <li>3.7 Water Quality Annual Report is publicized</li> </ol>	<ol style="list-style-type: none"> <li>4.1 Awareness of stakeholders for water quality is raised</li> <li>4.2 A system for the formulation of agreement on water quality management is created and public participation is promoted.</li> <li>4.3 Awareness for water quality management in the relevant organizations is raised.</li> </ol>

## **4.8 First Draft Integrated Master Plan on the Capacity Development for Water Quality Management**

### **4.8.1 Identification of Activities by Module**

In the previous section, capacity development plan by module for the water quality management has been identified establishing outputs to be achieved in each module. In this section, concrete activities to attain the output have been proposed. For each “output” as discussed in **Section 4.7**, activities have been identified by implementation phase as shown in **Table 4.8.1**.

For the implementation phase, the following three phases have been considered; namely, the period for pilot projects implementation (April 2004 to March 2005); the period from April 2005 until 2008 (mid-term: five years from the start of the Project); and the period until 2013 (long-term: ten years from the start of the Project) have been considered.

### **4.8.2 Identification of Pilot Projects**

Implementation of the pilot projects was considered in the present project for the following purposes.

- To discuss between DINAMA, relevant organizations and JICA Project Team through the implementation of various pilot projects, and confirm the basic policy and the proposed direction for water quality management as proposed in this report;
- To conduct technical transfer for items basically needed for the implementation of each module;
- To establish the basic system, mechanism, structure, etc. and to produce basic material necessary for the implementation of each Module;
- To conduct capacity development through the implementation of the pilot projects;
- To carry out activities that shall be the reference to those to be conducted by DINAMA and relevant organizations in the middle and long term; and,
- To carry out activities in a sample area for the reference of implementation in the overall area.

Composition of pilot projects is proposed considering the above purposes, and the five key aspects of capacity development, namely, capacity of organization and personnel; coordination between organizations; effective use of information; establishment of manuals; and, promotion of dissemination and public participation as follows:

Although **Table 4.8.1** is a proposal of the activities to be conducted from now on, the results of the pilot projects implementation have been reflected in the same table for convenience in the column under “activities and outputs of pilot projects”. Detailed discussion on the implementation of the pilot projects is discussed in the next chapter.

**Table 4.8.1 First Draft Integrated Master Plan on Capacity Development for Water Quality Management**

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
<b>Module No.1: Strengthening of Strategic Part</b>			
<p><b>1.1:</b> Water quality management strategies and specific action plans of respective water quality approaches are established.</p>	<ul style="list-style-type: none"> <li>DINAMA establishes proper committee for the coordination for water quality management inside DINAMA. → Established.</li> <li>JICA provides necessary technical transfer through the technical training in Japan. → Technical transfer was implemented through Group Training Course “Environmental Management of Regional Drainage Basin II”, Individual Training Course “Strengthening of Water Quality Management System (1)”, and Individual Training Course “Strengthening of Water Quality Management System (2)”.</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA reviews the strategy of water quality management and the action plan established in the course of the Project, and modifies them (if necessary).</li> <li>DINAMA sets the Work Plan for respective development modules, based on the action plan mentioned above.</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA continues annually to review strategies and specific action plans of respective water quality approaches.</li> </ul>
<p><b>1.2:</b> Decree No.253/79 is amended.</p>	<ul style="list-style-type: none"> <li>GESTA Agua (Grupo de Estandares Agua = Group for Water Standards), COTAMA prepares a technical draft for “the Decree No.253/79 and Amendments” (not included in the work of Pilot Projects) → Technical draft is being prepared, but not yet completed.</li> <li>JICA Project Team provides technical advice on the “the Decree No.253/79 and Amendments” upon confirmation of the basic direction of the amendment. → Provided.</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA plays the leadership in the GESTA Water of COTAMA in making “Decree No.253/79 and Amendments” from the technical aspect.</li> <li>Legal procedure for the “Decree No.253/79 and Amendments” proceeds.</li> </ul>	
<p><b>1.3:</b> Water bodies’ specific use is declared based on the “Decree No.253/79 and Amendments”. (All the activities depend</p>		<ul style="list-style-type: none"> <li>DINAMA designates proper unit for the task of declaration of water bodies’ specific use.</li> <li>DINAMA coordinates with Council for Water Quality Management in River Basins (with the Steering Committee during the period of the</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA coordinates with Council for Water Quality Management in River Basins for the declaration of water bodies’ specific use.</li> <li>DINAMA coordinates with relevant organizations for the declaration of “water</li> </ul>

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
upon the contents of the “Decree No. 253/79 and Amendments”)		<p>JICA Project) for the declaration of water bodies’ specific use.</p> <ul style="list-style-type: none"> <li>• DINAMA coordinates with relevant organizations for the declaration of “water bodies of high quality”, and issues declaration.</li> <li>• DINAMA coordinates with OSE, Municipalities, MGAP, INAPE, MSP, and relevant organizations for the declaration of “water bodies for specific use”, and issues declaration.</li> <li>• DINAMA coordinates with relevant organizations for the declaration of “water bodies under recovery”, and issues declaration.</li> <li>• DINAMA continues to review the declaration of water bodies’ specific use.</li> </ul>	<p>bodies of high quality”, and issues declaration.</p> <ul style="list-style-type: none"> <li>• DINAMA coordinates with OSE, Municipalities, MGAP, INAPE, MSP, and relevant organizations for the declaration of “water bodies for specific use”, and issues declaration.</li> <li>• DINAMA coordinates with relevant organizations for the declaration of “water bodies under recovery”, and issues declaration.</li> <li>• DINAMA continues to review the declaration of water bodies’ specific use.</li> </ul>
<b>1.4:</b> Present river water quality is evaluated		<ul style="list-style-type: none"> <li>• DINAMA evaluates present river water quality utilizing SISICA referring to the water bodies’ specific use.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA evaluates present river water quality utilizing SISICA referring to the water bodies’ specific use.</li> </ul>
<b>1.5:</b> Necessity of Council for Water Quality Management in the Santa Lucía River Basin is discussed.	<ul style="list-style-type: none"> <li>• Ad Hoc Council for the Water Quality Management in the Santa Lucía River Basin is established. → The Steering Committee conducts the role during the period of the JICA Project.</li> </ul>	<ul style="list-style-type: none"> <li>• Necessity of the establishment of Council for the Water Quality Management in River Basins is discussed in the meeting of Steering Committee under the new government organization.</li> <li>• DINAMA conducts necessary procedure for the legalization of the Council when the new government decides to establish the Council.</li> <li>• Council for the Water Quality Management in the Santa Lucía River Basin is established when the new government decides to establish</li> </ul>	

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
		the Council.	
<b>Module No.2: Strengthening of Pollution Source Management</b>			
2.1: Collaboration system among relevant agencies on pollution source management is maintained.	<ul style="list-style-type: none"> <li>• Various discussions are held for the pollution source management attended by relevant organizations. → Took place only in Steering Committee meetings</li> </ul>	<ul style="list-style-type: none"> <li>• Periodical meetings take place to exchange information and opinion on pollution source management; attended by DINAMA, OSE, RENARE, Municipalities and other relevant organization (“Steering Committee” shall be utilized).</li> <li>• DINAMA should collect the information on sewerage development and vacuum vehicle domestic wastewater system in a sustainable manner.</li> <li>• DINAMA should collect the information on solid waste management.</li> <li>• DINAMA should collect the information on non-point source pollution management.</li> </ul>	<ul style="list-style-type: none"> <li>• Periodical meetings take place to exchange information and opinion on pollution source management; attended by DINAMA, OSE, RENARE, Municipalities and other relevant organization (“Steering Committee” shall be utilized).</li> <li>• DINAMA collects the information on sewerage development in a sustainable manner.</li> <li>• DINAMA collects the information on solid waste management.</li> <li>• DINAMA collects the information on non-point source pollution management.</li> </ul>
2.2: Capacity of relevant organization on pollution source management is maintained	<ul style="list-style-type: none"> <li>• JICA provides necessary technical transfer through the technical training in Japan. → Technical level has been raised through Group Training Course “Industrial Wastewater Treatment Technique II” and Group Training Course “Domestic Wastewater Treatment Technique”.</li> <li>• DINAMA holds a workshop to share the output of training in Japan by the relevant personnel. → To be conducted in March 2005.</li> </ul>	<ul style="list-style-type: none"> <li>• JICA provides necessary technical transfer through the technical training in Japan.</li> </ul>	
2.3: Industrial wastewater management is conducted under the collaboration of DINAMA and	<ul style="list-style-type: none"> <li>• The consensus between DINAMA and Municipalities for sharing a certain part of the industrial wastewater management is reached, and agreements are exchanged. → Basic</li> </ul>	<ul style="list-style-type: none"> <li>• Agreement between DINAMA and Municipalities for the collaboration on industrial wastewater management is concluded.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA plays a leading role in the industrial wastewater management.</li> <li>• Municipalities work as so-called “Liaison Office” in the industrial wastewater</li> </ul>

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
Municipalities	direction has been agreed but agreement has not been exchanged.	<ul style="list-style-type: none"> <li>• DINAMA continues providing Municipalities with information of SADI and engineering data of industry.</li> <li>• DINAMA and Municipalities coordinate for the compliance inspection.</li> <li>• DINAMA and Municipalities mutually exchange the inspection results of industrial wastewater facilities in a sustainable manner.</li> </ul>	<p>management.</p> <ul style="list-style-type: none"> <li>• DINAMA provides Municipalities with information of SADI and engineering data of industry.</li> <li>• DINAMA maintains to keep the sharing of the inspection of industrial wastewater facilities in a sustainable manner.</li> </ul>
2.4: Industrial wastewater related manuals are prepared	<ul style="list-style-type: none"> <li>• DINAMA and JICA Project Team jointly prepare procedural manuals of industrial wastewater management. → The following manuals are almost ready. <ul style="list-style-type: none"> <li>▪ Industrial User Inspection Manual</li> <li>▪ Industrial Wastewater Sampling Manual</li> <li>▪ Guidance for Industrial Wastewater Flow Rate Measurement</li> <li>▪ Guidance for Sampling, Preservation and Transportation of Underground Water</li> </ul> </li> <li>• DINAMA and JICA Project Team jointly prepare technical guidance for industrial wastewater management. → Technical Guidance for Industrial Wastewater Treatment Technologies has been prepared.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA develops procedural and management manuals for industrial wastewater.</li> <li>• DINAMA amends established manuals, when necessary.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA review and modify the manuals of industrial waste management, if necessary.</li> </ul>
2.5: Capacity of DINAMA and relevant agencies on industrial wastewater management is developed	<ul style="list-style-type: none"> <li>• JICA Project Team provides technical transfer of industrial wastewater management to DINAMA's staff, using Manuals to be established in &lt;Output 2.4&gt;. → Implement collaborated work for the preparation of the manual and conduct explanation of manuals in March 2005.</li> <li>• JICA provides necessary technology transfer</li> </ul>	<ul style="list-style-type: none"> <li>• JICA provides necessary technical transfer through the technical training in Japan.</li> <li>• DINAMA provides technology transfer of industrial wastewater management to staff of Municipalities, using Manuals to be established in &lt;Output2.4&gt;.</li> </ul>	

Output	Activities and Output of Pilot Projects (Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
	through the technical training in Japan. → Technical level has been raised through Group Training Course “Industrial Wastewater Treatment Technique II”		
2.6: River water quantity observation system is established		<ul style="list-style-type: none"> <li>• DNH under the collaboration with DINAMA and relevant organizations establishes a system for observation of water quantity (river flow) in the Santa Lucía River Basin that is required for the simulation of the future water quality prediction.</li> </ul>	<ul style="list-style-type: none"> <li>• DNH under the collaboration with DINAMA and relevant organizations establishes a system for observation of water quantity (river flow) in the Santa Lucía River Basin that is required for the simulation of the future water quality prediction.</li> </ul>
2.7: An integrated information system for pollution sources is established	<ul style="list-style-type: none"> <li>• DINAMA already maintains some of relevant information on pollution sources.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA constructs an integrated information system with GIS database on pollution sources.</li> <li>• DINAMA inputs data and information of various pollution sources to the integrated information system.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA continues to collect and file data and information for domestic wastewater management, solid waste management, and non-point source pollution management in order to update them.</li> </ul>
2.8: Influence of pollution sources to river water is grasped	<ul style="list-style-type: none"> <li>• JICA provides necessary technical transfer through the technical training in Japan. → Technical level has been raised in some parts through Group Training Course “Industrial Wastewater Treatment Technique II” and Group Training Course “Domestic Wastewater Treatment Technique”.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA allocates proper staff assigned to the task of water quality assessment.</li> <li>• DINAMA makes preliminary survey on the pollution loads from various kind of wastewater.</li> <li>• DINAMA develops a simulation model for the assessment of the influence of pollution sources to the water environment.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA assesses the influence of various kinds of pollution sources to the water environment in a sustainable manner.</li> </ul>
<b>Module No.3: Strengthening of Ambient Water Quality Monitoring</b>			
3.1 Manuals related to monitoring are prepared	<ul style="list-style-type: none"> <li>• DINAMA and JICA Project Team jointly prepare a manual of monitoring network designing and sampling. → A manual consisting of the following part has already</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA amends established manuals, when necessary.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA amends established manuals, when necessary.</li> </ul>

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
	<p>been prepared.</p> <ul style="list-style-type: none"> <li>▪ Designing of Water Quality Monitoring Network</li> <li>▪ Methods of Field Work and Sampling</li> <li>▪ Field Testing Methods</li> <li>▪ Processing and Interpretation of Water Quality Data</li> </ul> <ul style="list-style-type: none"> <li>• DINAMA Laboratory updates the manual of laboratory measurement and analysis. → Almost completed.</li> </ul>		
3.2: Ambient water quality monitoring plan for the Santa Lucía River Basin is established	<ul style="list-style-type: none"> <li>• DINAMA and JICA Project Team jointly design executive plan of trial water quality monitoring in the Santa Lucía River Basin, using the Manual of &lt;Output 3.1&gt;. → Already designed.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA updates water quality monitoring plan in the Santa Lucía River Basin based on the outcome of pilot projects for ambient water quality monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA updates water quality monitoring plan in the Santa Lucía River Basin based on the strategies and specific action plans.</li> </ul>
3.3: Collaborated implementation system for sampling, analysis and evaluation is established	<ul style="list-style-type: none"> <li>• Consensus with DINAMA, DNH, OSE and Municipalities on a certain part of ambient water quality monitoring is reached, exchanging the Agreement. → Draft of the Agreement has already been approved, but the agreement has not yet been concluded.</li> <li>• DINAMA and Municipalities jointly carry out sampling and analysis of water and sediment for the ambient water quality monitoring. → Started joint work in December 2004.</li> </ul>	<ul style="list-style-type: none"> <li>• Agreement for the collaborated ambient water quality monitoring is concluded.</li> <li>• DINAMA and Municipalities jointly carry out sampling and analysis of water and sediment for the ambient water quality monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA and Municipalities jointly carry out sampling and analysis of water and sediment for the ambient water quality monitoring.</li> </ul>
3.4: Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened	<ul style="list-style-type: none"> <li>• DINAMA reinforces Water Quality Department for the implementation of sustainable ambient water quality monitoring. → The Department has been strengthened from two staff to three staff, and in addition, is scheduled to strengthen with about four</li> </ul>	<ul style="list-style-type: none"> <li>• JICA provides technical training for the sampling and analysis.</li> <li>• DINAMA provides technical transfer for sampling and analysis of water for Municipalities in a sustainable manner.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA provides technical transfer for sampling and analysis of water for Municipalities in a sustainable manner.</li> <li>• DINAMA conducts pesticide monitoring.</li> <li>• DINAMA maintains laboratory equipment and</li> </ul>



Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
	<p>interns.</p> <ul style="list-style-type: none"> <li>• JICA provides equipment necessary for the basic analysis in the laboratories of DINAMA and Municipalities. → JICA provided laboratory equipment in order to realize at least COD observation at each Municipality.</li> <li>• DINAMA checks the capability of pesticide analysis of DINAMA Laboratory. → Under implementation.</li> <li>• DINAMA provides technical transfer for sampling of water for Municipalities. → Already successfully implemented.</li> <li>• DINAMA provides technical transfer for analysis at the laboratory to Municipalities. → Already successfully implemented.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA conducts pesticide monitoring.</li> <li>• Municipalities raise the capacity of laboratory in order to cover BOD<sub>5</sub> analysis at every laboratory.</li> <li>• Branch laboratory of OSE in each Municipality raise the capacity in order to cover BOD<sub>5</sub> analysis.</li> <li>• DINAMA Laboratory obtains ISO/IEC 17025 Certificate for necessary items (This activity will be made by DINAMA itself separately from the JICA Project)</li> <li>• DINAMA maintains laboratory equipment and skills properly.</li> <li>• DINAMA raise the capacity of laboratory in order to meet the strategies and action plans.</li> <li>• DINAMA maintains proper numbers of staff for ambient water quality monitoring.</li> </ul>	<p>skills properly.</p> <ul style="list-style-type: none"> <li>• DINAMA raise the capacity of laboratory in order to meet the strategies and action plans.</li> <li>• DINAMA maintains proper numbers of staff for ambient water quality monitoring.</li> </ul>
3.5: Water quality information system is established	<ul style="list-style-type: none"> <li>• DINAMA, upon collaboration with relevant organizations through Technical Committee, jointly with JICA Project Team establishes computerized water quality information system inside DINAMA (SISICA DINAMA). → Developed.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA promotes to develop SISICA in the relevant organizations, e.g. OSE, RENARE, IMM, IMC, IMSJ, IMF, IML.</li> <li>• DINAMA establishes integrated SISICA</li> <li>• DINAMA continues to manage integrated SISICA</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA continues to manage integrated SISICA</li> </ul>
3.6: Water quality data are properly evaluated	<ul style="list-style-type: none"> <li>• DINAMA and JICA Project Team jointly work for processing and interpreting water quality data, by using currently available water quality data. → To be conducted in February-March 2005.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA processes and interprets water quality data in a sustainable manner.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA process and interpret water quality data in a sustainable manner.</li> </ul>

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
3.7: Water Quality Annual Report is publicized.	<ul style="list-style-type: none"> <li>DINAMA and JICA Project Team jointly prepare the chapter of water environment for Annual Environment Report using currently available data, and open through the DINAMA’s homepage. → To be conducted in February-March 2005.</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA annually publicizes Water Quality Annual Report, interpreting and compiling diverse information like DINAMA’s policy/strategies, water quality data, and others.</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA annually publicizes Water Quality Annual Report, interpreting and compiling diverse information like DINAMA’s policy/strategies, water quality data, and others.</li> </ul>
<b>Module No.4: Promotion of Education and Public Participation</b>			
4.1: Awareness of stakeholders for water quality is raised	<ul style="list-style-type: none"> <li>DINAMA issues News Letter on water quality and deliver it to stakeholders. → Started issuance for every four months.</li> <li>National and local medias (TV, newspaper, radio) report various activities of the present JICA Project. → Mainly local medias reported various activities.</li> <li>DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and prepare materials for dissemination for the use of campaigns and effectively utilize them. → Posters, pamphlets, and stickers have been prepared and utilized.</li> <li>Water Quality Forum (as discussed below) as a main actor holds local workshops. → Local workshops “Workshop on Effluent Management” and “Workshop on Pesticides Management” have been held.</li> <li>DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and prepare materials for education for water quality and effectively</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA issues in a sustainable manner News Letter on water quality and deliver it to stakeholders.</li> <li>DINAMA maintains a web page on water quality management</li> <li>National and Local Educational Authorities, Florida Water Quality Forum and DINAMA continue dissemination and education for water quality in Florida Municipality in a sustainable manner.</li> </ul>	<ul style="list-style-type: none"> <li>DINAMA issues in a sustainable manner News Letter on water quality and deliver it to stakeholders.</li> <li>DINAMA and Florida Water Quality Forum support water quality related activities in various areas.</li> </ul>

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
	<p>utilize them. → Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <ul style="list-style-type: none"> <li>• DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and conduct training sessions utilizing the above developed materials. → Training sessions were conducted for four times.</li> <li>• DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and conduct education sessions for teachers utilizing the above developed materials. → Education sessions were conducted for about eleven times.</li> <li>• DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and have meeting for the evaluation of education materials. → Already conducted.</li> <li>• Environmental education for children is conducted through the implementation of various campaigns. → Already conducted.</li> </ul>		
<p><b>4.2:</b> A system for the formulation of agreement on water quality management is created and public participation is</p>	<ul style="list-style-type: none"> <li>• Florida Water Quality Forum is established in Florida Municipality as a model area. → Already established.</li> <li>• Residents exchange their opinion on water</li> </ul>	<ul style="list-style-type: none"> <li>• Florida Water Quality Forum and DINAMA continue leading and implementing public participation campaigns.</li> <li>• DINAMA and Florida Water Quality Forum</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA and Florida Water Quality Forum support establishment of water quality forum in the other areas.</li> </ul>

Output	Activities and Output of Pilot Projects <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	Activities to be implemented in the mid-term (until 2008)	Activities to be implemented in the long-term (until 2013)
promoted.	<p>quality in the established Florida Water Quality Forum. → More than 70 residents attended to the First Plenary Meeting.</p> <ul style="list-style-type: none"> <li>• The Coordinating Body of Florida Water Quality Forum holds periodical meeting and discuss on the activities. → Held four meetings by December 2004.</li> <li>• Florida Water Quality Forum leads and implements public participation campaigns. → “Flora Preservation Campaign” and “Santa Lucía Chico River Cleaning Campaign” have been implemented and more than 100 people (students) attended.</li> </ul>	<p>assist the establishment of Water Quality Forums in other Municipalities and the federation of Water Quality Forum</p> <ul style="list-style-type: none"> <li>• Other Municipalities of the Project’s Area establishes their own Water Quality Forum</li> </ul>	
4.3: Awareness for water quality management in the relevant organizations is raised.	<ul style="list-style-type: none"> <li>• A working group for dissemination, education and public participation is created in DINAMA. → A working group has been created and actively worked.</li> <li>• Staff of DINAMA participates in the various campaigns, training and education sessions. → Implemented.</li> <li>• Municipality of Florida plays leading role for the establishment of Florida Water Quality Forum. → Conducted.</li> <li>• Staff of OSE participates to the campaigns. → Conducted.</li> <li>• Florida education authority promotes training and education sessions to schoolteachers. → Conducted.</li> <li>• Teachers of the Municipality of Florida actively participate to the preparation of</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA organize an internal unit to be responsible for education and public participation activities</li> <li>• DINAMA plays a leading role to raise awareness on water quality under the collaboration with relevant organizations.</li> </ul>	<ul style="list-style-type: none"> <li>• DINAMA plays a leading role to raise awareness on water quality under the collaboration with relevant organizations.</li> </ul>

<b>Output</b>	<b>Activities and Output of Pilot Projects</b> <i>(Results of the pilot projects implementation has been shown with “→” for convenience though it is discussed in the next Chapter)</i>	<b>Activities to be implemented in the mid-term</b> <b>(until 2008)</b>	<b>Activities to be implemented in the long-term</b> <b>(until 2013)</b>
	education materials. → Conducted.		

## **CHAPTER 5. IMPLEMENTATION OF PILOT PROJECTS**

### **5.1 Composition of Pilot Projects**

The following pilot projects have been identified and implemented in Phase II of the Project in the fiscal year 2004 in order to start the actual implementation of the capacity development on the water quality management. The results and lessons learned from the implementation of the pilot projects are described hereafter.

**PLP 1:** Capacity Development and Strengthening of Coordination

**PLP 1a:** Development of Capacity for Strategic Part of Water Quality Management

**PLP 1b:** Development of Capacity for Pollution Source Management

**PLP 1c:** Development of Capacity for Ambient Water Quality Monitoring and Strengthening of Coordination between Relevant Agencies

**PLP 2:** Establishment of Water Quality Information System

**PLP 3:** Establishment of Industrial Wastewater Management Manual and Strengthening of Coordination

**PLP 4:** Establishment of Manual for Monitoring Network Designing and Sampling

**PLP 5:** Promotion of Dissemination and Education

**PLP 6:** Promotion of Public Participation

### **5.2 PLP 1a: Development of Capacity for Strategic Part of Water Quality Management**

In order to implement the **Module No.1: Strengthening of Strategic Part**, establishment of a basic system and strengthening of the capacity have been targeted, and PLP 1a has been formulated. The objective of PLP 1a was to realize the capacity development for the strategic part of the systematic water quality management, namely, "Establishment of Policy and Strategies". Overall evaluation for the implementation of PLP 1a is as follows:

Establishment of Water Quality Management Committee (WQMC) in DINAMA is considered very effective if the function is fully utilized. WQMC meeting should not always be the formal one, any meeting for the horizontal collaboration for water quality management in DINAMA could be considered as the activity of WQMC.

Council for the Water Quality Management in the Santa Lucía River Basin is important to realize "Water Quality Management by River Basin" and "Integrated Water Quality Management". Necessity, method of creation, etc. for the Council have been discussed in the meeting with the Steering Committee in December 2004. It was concluded that the

Steering Committee for the present Project was providing the same function to that of the Council and thus the Council would not be established when the JICA Project is on going. Discussion on the establishment of the Council for the water quality management in river basins should be conducted in Phase IV of the Project, the last phase of the Project.

Although, the real effect of capacity development by the training in Japan is difficult to evaluate, it appears in the various aspects of the activities in the present Project.

### **5.3 PLP 1b: Development of Capacity for Pollution Source Management**

In order to implement the **Module No.2: Strengthening of Pollution Source Management**, strengthening of the personnel capacity has been targeted, and PLP 1b has been proposed. The objective of PLP 1b was to realize the capacity development for the pollution source management of the systematic water quality management. The result of the evaluation is as follows:

One of participants in the group training has attended the work of the manual preparation in the PLP 3, aiming to utilize the effect of the training in Japan. From now on it is expected that the outcomes of the technical training should be utilized in participants' daily activities.

### **5.4 PLP 1c: Development of Capacity for Ambient Water Quality Monitoring and Strengthening of Coordination with Relevant Agencies**

In order to implement the **Module No.3: Strengthening of Ambient Water Quality Monitoring**, strengthening of the organizational capacity, personnel capacity and establishment of collaboration system have been targeted, and PLP 1c has been formulated. The PLP 1c was evaluated based on the result and process of the implementation, below:

#### **(1) Strengthening of WQD's Function**

The WQD of DINAMA has been reinforced as the outcome of DINAMA's efforts during the period of the PLP 1c with the increase to a total of 3 staff. It is expected that the role of the WQD will become increasingly important, as the network of water quality monitoring is extended in the future. Its task in water quality monitoring includes not only the overall control in monitoring activities but also the management, process and interpretation of collected water quality data. To respond to such increasing tasks, the individual ability of staff, especially the ability of new comers of the WQD should be strengthened in monitoring-related specialty.

#### **(2) Sustainable Execution of Monitoring and Extension of Monitoring Network**

It is a significant achievement that the periodical water quality monitoring has been actually commenced in Uruguay. In the subsequent stage, the most important thing is to continue this monitoring activity by maintaining the established collaboration system under the Joint Work Agreement. In the meantime, it is extremely important for the municipal laboratories to develop their capacity with proper budget allocation.

The trial monitoring has taken place at a total of 32 monitoring locations with a total of 26 parameters (as the maximum including sediments). This scheme of monitoring was decided under the consideration for the present maximum capacity of both DINAMA and the municipal laboratories. Because this scheme is still not enough to completely clarify the water quality in the Project Area, the review to extend the network at each stage is necessary. Together, to support the extended network, further efforts are definitely necessary to develop laboratories' capacity for both the municipalities and DINAMA, based on a long-term strategy.

### **(3) Technology Transfer through PLP 1c**

The technology transfer from the JICA Project Team to the staff of DINAMA and the municipalities took place along the implementation of the PLP 1c. This has been conducted through various activities of the PLP 1c based on OJT in terms of the design of monitoring network, the selection of sampling stations, etc. The outcomes of this technology transfer were practically used in the subsequent Phase III (Master Plan Trial) in 2005.

## **5.5 PLP 2: Establishment of Water Quality Information System**

In order to implement the **Module No.3: Strengthening of Ambient Water Quality Monitoring**, establishment of a basic system for water quality data storage and effective utilization have been targeted, and PLP 2 has thus been formulated. Water Quality Information System has been designed for the use in the whole Uruguay, not only for the Santa Lucía River Basin. The objective of PLP 2 was to realize sharing and effective utilization of water quality data obtained in the ambient water quality monitoring.

### **(1) Establishment of Water Quality Information System**

SISICA DINAMA has almost been completed and presented in the Seminar on December 1. The condition before the start of the Project was that DINAMA's historical water quality data was stored personally and no other people could use them. The establishment of SISICA DINAMA provides a significant change in the system of ambient water quality management. A good system has been developed. From now on, promotion of the effective use of SISICA DINAMA is the important work.

### **(2) Publication of Environmental Annual Report**

The created draft version of the Water Quality Report is the product as one of components of a comprehensive environmental report to be publicized by DINAMA. It is expected that DINAMA start other parts of the comprehensive environmental report, such as air quality, solid waste, natural environment, etc, in earliest stage.

## **5.6 PLP 3: Establishment of Industrial Wastewater Management Manual and Strengthening of Coordination**

In order to implement the **Module No.2: Strengthening of Pollution Source Management**, establishment of manuals and strengthening of coordination have been targeted, and PLP 3 has thus been formulated. PLP 3 was evaluated as follows:



### **(1) Practical Use of Established Manuals and Guidance**

The completion of a series of manuals and guidelines is a significant outcome, considering the conventional and current situation that many practices are depending on mainly individual knowledge of staff. It is important that these documents be practically used through actual jobs and utilized as useful tools of the technology transfer in DINAMA and the municipalities.

### **(2) Continuing of Manual Preparation**

Of the manuals scheduled in the PLP 3, some of them need more continuing work. They are:

- Industrial User Inspection Manual (A1) (The tentative version is finished)
- Industrial Wastewater Sampling Manual (A2) (The tentative version is finished)
- Registration Manual of Competent Professional (A5)
- Self-monitoring Report Manual (A6)

These manuals are important for the strengthening of industrial wastewater management. Besides, they are supposed to utilize as material documents for the technology transfer from DINAMA to municipalities. Therefore, it is proposed that these manual works be continued in the Phase III.

### **(3) Continuous Work for Preparation of Authorization Manuals**

With respect to the authorization manual, referential documents being used by US-EPA are being studied in the PLP 3. As a result, it has become clear that this manual preparation requires much of work including the examination on related standards and specifications in connection with the present SADI and ADI system. For that reason, the preparation of this manual is conceived to take a long time, requiring the comprehensive review of SADI and ADI system. Therefore, it has been confirmed that this manual preparation will be carried out by DINAMA, as one of components in the period of the Phase III.

### **(4) Implementation of Joint Work**

The Joint Work Agreement was supposed for conclusion in the beginning of 2006. Following the essence of this Agreement, actual joint work between DINAMA and the municipalities expected to take place in 2005.

Along the context of this Agreement, the following coordination activities would take place during this period:

- Opening of the workshop for industrial wastewater management in the four municipalities (IMC, IMSJ, IMF and IML),
- Providing of administrative and technical data/information concerned with the authorization to the four municipalities, (Remark: Parts of this work have already started in the period of the PLP3.)
- Mutually exchanging of inspection results, and
- Actual coordinated activities along the Agreement in industrial user inspection.

Detail contents and their procedures should be discussed between DINAMA and municipalities prior to the actual implementation.

**(5) Technology Transfer throughout PLP 3**

The technology transfer from the JICA Project Team to the staff of DINAMA and the municipalities concerned took place along the implementation of the PLP 3. This has been conducted through various activities of the PLP 3 based on on-the-job training in terms of the design of administrative procedures, law-enforcement procedures, wastewater treatment technologies, etc. It is expected that the outcomes of this technology transfer be practically used in the subsequent Phase III.

**(6) DINAMA Members' Involvement in PLP 3**

Of the total of 8 members currently engaged in industrial wastewater management in the Environmental Control Division, only 3 members have been involved in the activities of the PLP 3. Besides, the responsible persons of industrial discharge matters did not participate in the last part of the PLP 3.

To ensure the quality of manuals and to diffuse widely the outcomes of the PLP 3, it was requested that more staff be involved in various kinds of activities under the firm commitment of responsible persons.

**5.7 PLP 4: Establishment of Manual for Monitoring Network Designing and Sampling**

In order to implement the **Module No.3: Strengthening of Ambient Water Quality Monitoring**, establishment of manuals has been targeted, and PLP 4 has thus been formulated. The PLP 4 is concerned with planning of trial monitoring to start periodical and systematic monitoring and furnishing of manuals necessary for secure QA/QC (quality assurance and quality control) in monitoring planning and actual monitoring activities. Implementation of PLP 4 was evaluated as follows:

**(1) Review and Updating of Water Quality Monitoring Plan**

It is a significant outcome that the water quality monitoring plan has been established through a series of site surveys and the mutual agreement between DINAMA and the municipalities. It is important that this plan be continuously reviewed and updated, reflecting lessons learnt from actual implementation and the monitoring network to be extended in the future.

It has been concluded as a result of the implementation of PLP 1c that DINAMA would not be able to follow the originally proposed executive plan of trial monitoring judging from the present capacity of DINAMA Laboratory and the logistic problem in the WQD. In order to alleviate heavy load, the plan has been modified in such a way that sample collections be conducted on bi-monthly basis (two-month intervals) and the number of samples and analysis parameters be as minimum as possible to meet the requirement of the ambient water quality monitoring in the Santa Lucía River Basin.

The sampling frequency will further need to be adjusted with DINAMA's national water quality monitoring program, which covers six major river basins of the country. This program for national monitoring has been suspended since 1995, but is likely to resume in June or July of the current year.

## (2) Practical Uses of Monitoring Manuals

The data and information in ambient water quality monitoring should be collected and generated in a scientifically justifiable way. Accordingly, all practices should be conducted by means of methodologies secured by QA/QC. For this reason, it is important that a series of monitoring manuals should be used practically throughout every activity and be modified timely, reflecting lessons learned.

## (3) Technology Transfer throughout PLP 4

The technology transfer from the JICA Project Team to the staff of DINAMA took place in the PLP 4. This has been conducted through various activities of the PLP 4 based on on-the-job training in terms of the design of monitoring network, methodologies relevant to QA/QC, etc. It is expected that the outcomes of this technology transfer be practically used in the subsequent Phase III (Master Plan Trial).

## 5.8 PLP 5/6: Promotion of Dissemination, Education and Public Participation

In order to implement the **Module No.4: Promotion of Education and Public Participation**, various pilot projects were proposed, and PLP 5&6 has thus been formulated. The necessity of the promotion of education, dissemination and public participation for water quality were confirmed and the Pilot Project 5/6 (PLP 5/6) has been proceeding through the consultations with DINAMA, related organizations (Florida Municipality and Primary Education Supervising Office of Florida) and the Steering Committee as well as related residents.

The PLP 5/6 are evaluated based on the results and progress of implementation of the activities by each objective as follows:

**Table 5.8.1 Evaluation of PLP 5&6**

Objective	Results/Progress	Evaluation
To improve awareness	<ul style="list-style-type: none"> <li>• Newsletters on water quality were issued and distributed to stakeholders.</li> <li>• National and local media (TVs, newspapers and radios) reported most of the activities.</li> <li>• Posters, pamphlets and stickers are distributed for the campaigns.</li> <li>• Two workshops ("Effluent Treatment" and "Pesticide Management") were held in Florida.</li> <li>• Four training sessions were held in Florida for stakeholders using the education materials.</li> <li>• Eleven education sessions were held in primary and secondary school of Florida using</li> </ul>	<ul style="list-style-type: none"> <li>• Materials and occasions were provided enough for the objective. It is not easy to measure actual effects of the activities in a short time.</li> <li>• Many activities related to water quality campaigns were planned and executed in a half month (two campaigns and two workshops, and other many education sessions). Its impact is fairly enough but the impression of each activity seems weak as a result.</li> </ul>

<b>Objective</b>	<b>Results/Progress</b>	<b>Evaluation</b>
	<p>the education materials.</p> <ul style="list-style-type: none"> <li>• Meetings with principals and teachers of Florida were held to assess the education materials.</li> </ul>	<ul style="list-style-type: none"> <li>• Although the number of participants varies by activity, enough people joined the sessions in general.</li> </ul>
<p>To formulate wider basis for consensus</p> <p>To promote public participation</p>	<ul style="list-style-type: none"> <li>• Water Quality Forum (FWQF) was setup.</li> <li>• More than 70 people joined FWQF and discussed the water quality issues.</li> <li>• Coordination Body of FWQF had meeting regularly and promoted two water quality campaigns and workshops.</li> <li>• Approximately 100 people participated in the river cleaning campaign. (Walking Tour of Flora Conservation Campaign was postponed to December 3.)</li> </ul>	<ul style="list-style-type: none"> <li>• Many people participated in FWQF and its preparatory sessions and Coordination Body meeting, and discussed the water quality issues ardently until late night. Members seem to develop ownership of the water quality.</li> <li>• The schedule had to be arranged in order to avoid the negative affects from presidential and local elections held in October 2004 and in May 2005, respectively.</li> </ul>
<p>To improve the motivation of the related agencies</p>	<ul style="list-style-type: none"> <li>• Working Group was established in DINAMA and had a meeting regularly.</li> <li>• DINAMA staffs promoted and joined campaign activities and education/training sessions for teachers.</li> <li>• Florida Municipality actively promoted campaign activities.</li> <li>• OSE staff joined the campaign activities.</li> <li>• Florida primary education supervising office promoted education/training sessions for teachers.</li> <li>• Teachers in Florida joined for the elaboration of the education materials.</li> </ul>	<ul style="list-style-type: none"> <li>• It could be judged as a large change in DINAMA that DINAMA staffs promote and joined the activities ardently.</li> <li>• In Florida, especially staffs of Hygiene Department and Public Relations Office promoted and joined the campaigns actively and ardently. They seem to develop ownership of the activities.</li> </ul>



## **CHAPTER 6. ESTABLISHMENT OF SECOND DRAFT INTEGRATED MASTER PLAN ON CAPACITY DEVELOPMENT FOR THE WATER QUALITY MANAGEMENT AND TRIAL IMPLEMENTATION**

As discussed in **Chapter 4**, the First Draft Integrated Master Plan on Capacity Development for Water Quality Management has been proposed for implementation in three stages, namely, pilot project implementation stage from April 2004 to March 2005; mid-term stage from April 2005 to 2008 (approximately 5-year period from the start of the Project); and, long-term stage from 2008 to 2013 (approximately 10-year period from the start of the Project).

Up to here, the First Draft Integrated Master Plan has been formulated and the pilot projects composing the initial activities of the Master Plan were implemented. The Second Draft Integrated Master Plan has been formulated for the period of 2005-2008 getting feedback of the results of the pilot project implementation. The Second Draft Integrated Master Plan was for the trial implementation by only the Uruguayan side in the Phase III of the Project in the fiscal year 2005 in order to check the appropriateness of the plan for the future implementation by the Uruguayan side.

### **6.1 Second Draft Integrated Master Plan**

The Second Draft Integrated Master Plan has been established as presented in **Figure 6.1.1**.



Figure 6.1.1 Second Draft Integrated Master Plan on Capacity Development for Water Quality Management

Output	Activities in the Mid-Term Stage (-2008)	Responsible Agency	Relevant Agencies	Schedule																Input	Degree of Easiness / Difficulty for Implementation of Activities
				2005				2006				2007				2008					
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
<b>Module No.1: Strengthening of Strategic Part</b>																					
<b>1.1:</b> Water quality management strategies and specific action plans of respective water quality approaches are established.	<ul style="list-style-type: none"> <li>DINAMA reviews the strategy of water quality management and the action plan established in the course of the Project, and modifies them (if necessary).                             <ul style="list-style-type: none"> <li>WQMC (Water Quality Management Committee in DINAMA) reviews the strategy of water quality management</li> </ul> </li> </ul>	DINAMA	---																	<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>WQMC</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: less required</li> <li>Budget: less required</li> <li>Technical level: standard</li> <li>Relevant agencies: inside DINAMA</li> <li>Work intensity: sporadic</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA sets the Work Plan for respective development modules, based on the action plan mentioned above.                             <ul style="list-style-type: none"> <li>WQMC establishes a work plan for the strengthening of water quality management capacity for next year</li> </ul> </li> </ul>	DINAMA	---																		
<b>1.2:</b> Decree No.253/79 is amended.	<ul style="list-style-type: none"> <li>DINAMA plays the leadership in the GESTA Water of COTAMA in making “Decree No.253/79 and Amendments” from the technical aspect.</li> </ul>	DINAMA	COTAMA																	<ul style="list-style-type: none"> <li>Human resources of DINAMA (related to legal aspects) and COTAMA, MVOTMA</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: less required</li> <li>Budget: less required</li> <li>Technical level: standard</li> <li>Relevant agencies: inside MVOTMA</li> <li>Work intensity: sporadic</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>Legal procedure for the “Decree No.253/79 and Amendments” proceeds.                             <ul style="list-style-type: none"> <li>MVOTMA prepares “Decree No.253/79 and Amendments”, and send it for the signature of all the relevant Ministers, and send it to Executive Power for approval (schedule is tentative)</li> </ul> </li> </ul>	MVOTMA	COTAMA																		
<b>1.3:</b> Water bodies’ specific use is declared based on the “Decree No.253/79 and Amendments”. (All the activities depend upon the contents of the “Decree No. 253/79 and Amendments”)	<ul style="list-style-type: none"> <li>DINAMA designates proper unit for the task of declaration of water bodies’ specific use.                             <ul style="list-style-type: none"> <li>Unit for declaration of water bodies’ specific use shall be under WQMC</li> </ul> </li> </ul>	DINAMA	---																	<ul style="list-style-type: none"> <li>Human resources of DINAMA (Environmental Quality Evaluation Division: EQED)</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: need assignment of personnel to the Unit</li> <li>Budget: required for man-power</li> <li>Technical level: standard</li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA coordinates with Council for Water Quality Management in River Basins (with the Steering Committee during the period of the JICA Project) for the declaration of water bodies’ specific use.                             <ul style="list-style-type: none"> <li>The Unit prepares a draft for declaration</li> <li>Periodical meeting shall be held</li> </ul> </li> </ul>	DINAMA	OSE, MGAP, INAPE, MSP and relevant agencies																	<ul style="list-style-type: none"> <li>Human resources of OSE, MGAP, INAPE, MSP and other relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>Relevant agencies: all the agencies related to water quality</li> <li>Work intensity: intense work is required for identification of river stretch for each specific use</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA coordinates with relevant organizations for the declaration of “water bodies of high quality”, and issues declaration.</li> </ul>	DINAMA	Relevant agencies																		
	<ul style="list-style-type: none"> <li>DINAMA coordinates with OSE, Municipalities, MGAP, INAPE, MSP, and relevant organizations for the declaration of “water bodies for specific use”, and issues declaration.</li> </ul>	DINAMA	OSE, MGAP, INAPE, MSP and relevant agencies																		
	<ul style="list-style-type: none"> <li>DINAMA coordinates with relevant organizations for the declaration of “water bodies under recovery”, and issues declaration.</li> </ul>	DINAMA	Relevant agencies																		
	<ul style="list-style-type: none"> <li>DINAMA continues to review the declaration of water bodies’ specific use.</li> </ul>	DINAMA	Relevant agencies																		
<b>1.4:</b> Present river water quality is evaluated	<ul style="list-style-type: none"> <li>DINAMA evaluates present river water quality utilizing SISICA referring to the water bodies’ specific use.</li> </ul>	DINAMA	---																	<ul style="list-style-type: none"> <li>Human resources of EQED, DINAMA</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: less required</li> <li>Budget: less required</li> <li>Technical level: standard (compare monitored value to the declared class)</li> <li>Relevant agencies: inside DINAMA</li> <li>Work intensity: sporadic</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>



Output	Activities in the Mid-Term Stage (-2008)	Responsible Agency	Relevant Agencies	Schedule																Input	Degree of Easiness / Difficulty for Implementation of Activities								
				2005				2006				2007				2008													
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV										
1.5: Necessity of Council for Water Quality Management in the Santa Lucía River Basin is discussed.	• Necessity of the establishment of Council for the Water Quality Management in River Basins is discussed in the meeting of the Steering Committee under the new government organization.	MVOTMA/DINAMA	DNH, OSE, RENARE, Municipalities and W.Q. Forum																					<ul style="list-style-type: none"> <li>• Human resources of MVOTMA and DINAMA</li> <li>• Human resources of OSE, MGAP, INAPE, MSP and other relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Human resources: less required</li> <li>• Budget: less required</li> <li>• Technical level: no specific problem</li> <li>• Relevant agencies: all the agencies related to water quality</li> <li>• Work intensity: sporadic</li> <li>• Overall: <del>easy</del> / <del>medium</del> / <del>difficult</del></li> </ul>				
	• DINAMA conducts necessary procedure for the legalization of the Council when the new government decides to establish the Council.	MVOTMA	---																										
	• Council for the Water Quality Management in the Santa Lucía River Basin is established when the new government decides to establish the Council. - Ad Hoc Council shall be established when the necessity is recognized in the Steering Committee - Official Council shall be established when it has been legalized.	MVOTMA/DINAMA	DNH, OSE, RENARE, Municipalities and W.Q. Forum																										
<b>Module No.2: Strengthening of Pollution Source Management</b>																													
2.1: Collaboration system among relevant agencies on pollution source management is maintained.	• 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.) - Evaluated the capacity of EnCD of DINAMA for the necessary work for this activity by the end of 2005. - DINAMA already maintains some information. - Establish a system for the systematic work - Exchange agreement if necessary	DINAMA	OSE, RENARE, Municipalities																					<ul style="list-style-type: none"> <li>• Human resources of EnCD</li> <li>• Human resources of relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Human resources: personnel of EnCD should be carefully examined and increased accordingly</li> <li>• Budget: should be carefully examined for required for personnel</li> <li>• Technical level: standard</li> <li>• Relevant agencies: all the agencies related to water quality.</li> <li>• Work intensity: sporadic</li> <li>• Overall: <del>easy</del> / <del>medium</del> / <del>difficult</del></li> </ul>				
	• DINAMA would collect the information on sewerage development in a sustainable manner. - Features of sewerage as GIS information (refer to Table 3.2.3) - Information on vacuum vehicle domestic wastewater system	DINAMA	OSE, Municipalities																										
	• DINAMA would collect the information on solid waste management. - Features of solid waste dumping site (GIS information) and general information on solid waste management in each Municipality	DINAMA	Municipalities																										
	• DINAMA would collect the information on non-point source pollution management. - Information on the use of fertilizer and pesticide.	DINAMA	RENARE, Municipalities																										
2.2: Capacity of relevant organization on pollution source management is strengthened	• JICA provides necessary technical transfer through the technical training in Japan. - Group training course “Industrial Wastewater Treatment Technique II”	DINAMA or relevant agencies																					• JICA Scheme: Training in Japan	• Overall: <del>easy</del> / <del>medium</del> / <del>difficult</del>					
2.3: Industrial wastewater management is conducted under the collaboration of DINAMA and Municipalities	• Agreement between DINAMA and Municipalities for the collaboration on industrial wastewater management is concluded. - Draft agreement has already been prepared. - After the completion of procedural and management manual as prepared in 2.4 below, collaborated work shall be discussed.	DINAMA Municipalities	---																					<ul style="list-style-type: none"> <li>• Human resources of EnCD, DINAMA</li> <li>• Human resources of industrial wastewater management in Municipalities</li> </ul>	<ul style="list-style-type: none"> <li>• Human resources: personnel of EnCD should be examined carefully and increased accordingly</li> <li>• Budget: should be carefully examined for required for personnel</li> <li>• Technical level: standard</li> <li>• Relevant agencies: Municipalities in the basin.</li> <li>• Work intensity: part of normal work</li> <li>• Overall: <del>easy</del> / <del>medium</del> / <del>difficult</del></li> </ul>				
	• DINAMA continues providing Municipalities with information of SADI and engineering data of industry.	DINAMA	Municipalities																										
	• DINAMA and Municipalities coordinate for the compliance inspection.	DINAMA	Municipalities																										
	• DINAMA and Municipalities mutually exchange the inspection results of industrial wastewater facilities in a sustainable manner.	DINAMA	Municipalities																										

Output	Activities in the Mid-Term Stage (-2008)	Responsible Agency	Relevant Agencies	Schedule																Input	Degree of Easiness / Difficulty for Implementation of Activities
				2005				2006				2007				2008					
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
2.4: Industrial wastewater related manuals are prepared	<ul style="list-style-type: none"> <li>DINAMA develops procedural and management manuals for industrial wastewater. <ul style="list-style-type: none"> <li>Self-monitoring Report Manual</li> <li>Authorization Manual of Industrial Wastewater Discharge</li> <li>Industrial User Inspection Manual</li> <li>Industrial Wastewater Sampling Manual</li> <li>Registration Manual of Competent Professional</li> </ul> </li> </ul>	DINAMA	---																	<ul style="list-style-type: none"> <li>Human resources of EnCD</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: difficult: some staff of EnCD should concentrate to the work</li> <li>Budget: standard (part of normal work)</li> <li>Technical level: standard</li> <li>Relevant agencies: inside DINAMA</li> <li>Work intensity: intense work by staff of EnCD is needed</li> <li>Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA amends established manuals, when necessary. <ul style="list-style-type: none"> <li>EnCD shall amendment when necessary</li> </ul> </li> </ul>	DINAMA	---																		
2.5: Capacity of DINAMA and relevant agencies on industrial wastewater management is developed	<ul style="list-style-type: none"> <li>JICA provides necessary technical transfer through the technical training in Japan. <ul style="list-style-type: none"> <li>Group training course "Industrial Wastewater Treatment Technique II"</li> </ul> </li> </ul>	DINAMA or Municipalities	---																	<ul style="list-style-type: none"> <li>JICA Scheme: Training in Japan</li> <li>Human resources of EnCD</li> </ul>	<ul style="list-style-type: none"> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> <li>Human resources: existing staff of EnCD and Municipalities</li> <li>Budget: standard (part of normal work)</li> <li>Technical level: standard</li> <li>Relevant agencies: Municipalities</li> <li>Work intensity: sporadic</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA provides technical transfer of industrial wastewater management to staff of Municipalities, using Manuals to be established in &lt;Output2.4&gt;.</li> </ul>	DINAMA Municipalities	---																		
2.6: River water quantity observation system is established	<ul style="list-style-type: none"> <li>DNH under the collaboration with DINAMA and relevant organizations establishes a system for observation of water quantity (river flow) in the Santa Lucía River Basin that is required for the simulation of the future water quality prediction. <ul style="list-style-type: none"> <li>DNH identifies necessary work including equipment for the establishment of proper system for observation of water quantity in the Santa Lucía River Basin.</li> <li>DNH strengthen the system for observation of water quantity in the Santa Lucía River Basin.</li> </ul> </li> </ul>	DNH	DINAMA																	<ul style="list-style-type: none"> <li>International technical assistance Experts <ul style="list-style-type: none"> <li>River management planner</li> <li>Hydrological observation</li> </ul> </li> <li>Structure and equipment <ul style="list-style-type: none"> <li>for water level and flow measurement</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Human resources: staff of DNH and foreign assistance shall be needed</li> <li>Budget: much required (Technical assistance from abroad shall be considered)</li> <li>Technical level: high: needs the study on the river management</li> <li>Relevant agencies: DINAMA</li> <li>Work intensity: intense work with technical assistance from abroad is necessary</li> <li>Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>
2.7: An integrated information system for pollution sources is established	<ul style="list-style-type: none"> <li>DINAMA constructs an integrated information system with GIS database on pollution sources. <ul style="list-style-type: none"> <li>EnCD under the collaboration with EQED studies and proposes necessary system specification</li> <li>EnCD creates a GIS database system for various pollution sources.</li> <li>Technical committee consisting of members from the relevant agencies shall be formulated for the creation of the system</li> </ul> </li> </ul>	DINAMA	OSE, RENARE, Municipalities																	<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of relevant agencies</li> <li>International technical assistance Input of the following experts. <ul style="list-style-type: none"> <li>Pollution source management</li> <li>Hydrology and meteorology</li> <li>Water quality</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Human resources: much required: should be carefully examined and staff of EnCD should be increased for this purpose and foreign assistance shall be needed</li> <li>Budget: much required (Technical assistance from abroad shall be considered) and should be carefully examined for local budget</li> <li>Technical level: high: simulation of water quality requires high technique.</li> <li>Relevant agencies: all the relevant</li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA inputs data and information of various pollution sources to the integrated information system.</li> </ul>	DINAMA	OSE, RENARE, Municipalities																		
2.8: Influence of pollution sources to river water is grasped	<ul style="list-style-type: none"> <li>DINAMA allocates proper staff assigned to the task of water quality assessment. <ul style="list-style-type: none"> <li>A unit shall be formulated preferably under EQED with collaboration from EnCD.</li> </ul> </li> </ul>	DINAMA	---																	<ul style="list-style-type: none"> <li>Technical level: high: simulation of water quality requires high technique.</li> <li>Relevant agencies: all the relevant</li> </ul>	

Output	Activities in the Mid-Term Stage (-2008)	Responsible Agency	Relevant Agencies	Schedule																Input	Degree of Easiness / Difficulty for Implementation of Activities
				2005				2006				2007				2008					
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
	<ul style="list-style-type: none"> <li>DINAMA makes preliminary survey on the pollution loads from various kind of wastewater. <ul style="list-style-type: none"> <li>Information stored in the GIS database for pollution sources shall firstly be evaluated.</li> <li>The Unit assigned to the task of water quality assessment makes a plan for the preliminary survey on the pollution loads.</li> <li>Preliminary survey on the pollution loads shall be conducted.</li> </ul> </li> </ul>	DINAMA	OSE, RENARE, Municipalities																	<ul style="list-style-type: none"> <li>simulation <ul style="list-style-type: none"> <li>GIS system</li> </ul> </li> <li>Equipment <ul style="list-style-type: none"> <li>Personal computers</li> <li>Software for pollution simulation</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>agencies.</li> <li>Work intensity: intense work with technical assistance from abroad is necessary</li> <li>Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA develops a simulation model for the assessment of the influence of pollution sources to the water environment. <ul style="list-style-type: none"> <li>The Unit assigned to the task of water quality assessment shall study for the necessary system for water quality assessment</li> <li>Water quality assessment system shall be developed</li> <li>Water quality shall be assessed for the possible future change in the basin</li> </ul> </li> </ul>	DINAMA	DNH, OSE, RENARE, Municipalities																		
<b>Module No.3: Strengthening of Ambient Water Quality Monitoring</b>																					
3.1: Manuals related to monitoring are prepared	<ul style="list-style-type: none"> <li>DINAMA amends established manuals, when necessary. <ul style="list-style-type: none"> <li>EQED should make necessary amendment.</li> </ul> </li> </ul>	DINAMA	---	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: less required and to be covered by staff of EQED</li> </ul>
3.2: Ambient water quality monitoring plan for the Santa Lucía River Basin is established	<ul style="list-style-type: none"> <li>DINAMA updates water quality monitoring plan in the Santa Lucía River Basin based on the outcome of ambient water quality monitoring. <ul style="list-style-type: none"> <li>EQED updates water quality monitoring plan in the Santa Lucía River Basin through discussion with relevant agencies for water quality monitoring</li> </ul> </li> </ul>	DINAMA	OSE, Municipalities and DNH	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	<ul style="list-style-type: none"> <li>Human resources of DINAMA and relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>Budget: less required</li> <li>Technical level: normal. Utilize the established manual in PLP 4 for updating of monitoring plan.</li> <li>Relevant agencies: inside DINAMA</li> <li>Work intensity: sporadic</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
3.3: Collaborated implementation system for sampling, analysis and evaluation is established	<ul style="list-style-type: none"> <li>Agreement for the collaborated ambient water quality monitoring is concluded. <ul style="list-style-type: none"> <li>Discussion on the collaborated ambient water quality monitoring is carried out after the election of Municipal mayors and with the new local government personnel</li> <li>Agreement shall be concluded</li> </ul> </li> </ul>	DINAMA, OSE, Municipalities	---	■	▲															<ul style="list-style-type: none"> <li>Human resources of EQED</li> <li>Human resources of relevant agencies</li> <li>Budget for monitoring and analysis in DINAMA and relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: staff of EQED and Municipalities</li> <li>Budget: required for personnel and equipment and supplies for monitoring and laboratory analysis</li> <li>Technical level: normal.</li> <li>Relevant agencies: relevant agencies</li> <li>Work intensity: periodic</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA and Municipalities jointly carry out sampling and analysis of water and sediment for the ambient water quality monitoring.</li> </ul>	DINAMA, OSE, Municipalities	---	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
3.4: Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened	<ul style="list-style-type: none"> <li>JICA provides technical training for the sampling and laboratory analysis. <ul style="list-style-type: none"> <li>Training in Japan shall be considered.</li> <li>Horizontal cooperation shall be considered including Japan Chile Partnership Program and other schemes</li> </ul> </li> </ul>	DINAMA or relevant agencies	---	■	■	■	■													<ul style="list-style-type: none"> <li>JICA Scheme: Training in Japan</li> <li>Horizontal cooperation (JCPP, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA provides technical transfer for sampling and analysis of water for Municipalities in a sustainable manner (incl. inter-calibration). <ul style="list-style-type: none"> <li>EQED conducts technical transfer for sampling when necessary</li> <li>Laboratories of DINAMA and Municipalities conduct inter-calibration</li> </ul> </li> </ul>	DINAMA	Municipalities	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of OSE and Municipalities</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: staff of laboratory in DINAMA, OSE and Municipalities should be increased for this purpose and foreign assistance shall be needed</li> <li>Budget: much required (Technical</li> </ul>

Output	Activities in the Mid-Term Stage (-2008)	Responsible Agency	Relevant Agencies	Schedule												Input	Degree of Easiness / Difficulty for Implementation of Activities				
				2005				2006				2007						2008			
				I	II	III	IV	I	II	III	IV	I	II	III	IV			I	II	III	IV
	<ul style="list-style-type: none"> <li>DINAMA conducts pesticide monitoring. <ul style="list-style-type: none"> <li>Laboratory of DINAMA identify necessary work including upgrading of equipment for the pesticide monitoring</li> <li>Laboratory of DINAMA strengthen the capacity for pesticide analysis</li> </ul> </li> </ul>	DINAMA	MGAP																	<ul style="list-style-type: none"> <li>International technical assistance</li> <li><u>Experts</u> <ul style="list-style-type: none"> <li>Pesticide analysis</li> </ul> </li> <li><u>Equipment for Water Quality Analysis</u> <ul style="list-style-type: none"> <li>for Pesticide</li> <li>for BOD (Municipalities and OSE branch Office)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>assistance from abroad shall be considered)</li> <li>Technical level: high: pesticide analysis requires high technique.</li> <li>Relevant agencies: OSE and Municipalities</li> <li>Work intensity: intense work with technical assistance from abroad is necessary</li> <li>Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>
	<ul style="list-style-type: none"> <li>Municipalities raise the capacity of laboratory in order to cover BOD<sub>5</sub> analysis at every laboratory. <ul style="list-style-type: none"> <li>IMC, IMSJ, IMF, IML identify necessary work including upgrading of equipment of the analysis covering BOD<sub>5</sub></li> <li>Laboratories of IMC, IMSJ, IMF, IML strengthen the capacity to cover BOD<sub>5</sub></li> </ul> </li> </ul>	Municipalities	DINAMA																		
	<ul style="list-style-type: none"> <li>Branch laboratory of OSE in each Municipality raise the capacity in order to cover BOD<sub>5</sub> analysis. <ul style="list-style-type: none"> <li>OSE identifies necessary work including upgrading of equipment of the analysis covering BOD<sub>5</sub> at branch laboratories of OSE</li> <li>OSE strengthen the capacity of its branch laboratories to cover BOD<sub>5</sub></li> </ul> </li> </ul>	OSE	DINAMA																		
	<ul style="list-style-type: none"> <li>DINAMA Laboratory obtains ISO/IEC 17025 Certificate for necessary items (This activity will be made by DINAMA itself separately from the JICA Project)</li> </ul>	MVOTMA/DINAMA	---																		
	<ul style="list-style-type: none"> <li>DINAMA maintains laboratory equipment and skills properly.</li> </ul>	DINAMA	---																		
	<ul style="list-style-type: none"> <li>DINAMA raise the capacity of laboratory in order to meet the strategies and action plans.</li> </ul>	DINAMA	---																		
	<ul style="list-style-type: none"> <li>DINAMA maintains proper number of staff for ambient water quality monitoring.</li> </ul>	DINAMA	---																		
3.5: Water quality information system is established	<ul style="list-style-type: none"> <li>DINAMA promotes to develop SISICA in the relevant organizations, e.g. OSE, RENARE, IMM, IMC, IMSJ, IMF, IML. <ul style="list-style-type: none"> <li>EQED promotes to develop SISICA in IMM, OSE and RENARE and assists the installation of the system</li> <li>DINAMA gives necessary training to IMC, IMSJ, IMF and IML, and to promote inputting monitoring data to SISICA DINAMA through Internet</li> <li>DINAMA promotes to develop SISICA in the relevant organizations</li> </ul> </li> </ul>	DINAMA	OSE, RENARE, Municipalities, etc.																	<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of relevant agencies</li> <li><u>System engineers</u> <ul style="list-style-type: none"> <li>2-person, 2-year</li> <li>Support establishment of other SISICA</li> <li>Develop Integrated SISICA</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Human resources: staff of EQED and input of system engineer shall be needed</li> <li>Budget: required to obtain system engineers</li> <li>Technical level: standard: refer the experience of SISICA DINAMA development</li> <li>Relevant agencies: related agencies</li> <li>Work intensity: intense work is necessary for the support of develop SISICA in other agencies and establishment of Integrated SISICA</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA establishes integrated SISICA. <ul style="list-style-type: none"> <li>EQED develops Integrated SISICA</li> </ul> </li> </ul>	DINAMA	OSE, RENARE, Municipalities, etc.																		
	<ul style="list-style-type: none"> <li>DINAMA continues to manage integrated SISICA.</li> </ul>	DINAMA	OSE, RENARE, Municipalities, etc.																		
3.6: Water quality data are properly evaluated	<ul style="list-style-type: none"> <li>DINAMA processes and interprets water quality data in a sustainable manner.</li> </ul>	DINAMA	---																	<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: less required: staff of EQED shall conduct the work</li> <li>Budget: less required</li> <li>Technical level: standard: utilize the Manual developed in PLP 4</li> <li>Relevant agencies: in DINAMA</li> <li>Work intensity: periodical</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>

Output	Activities in the Mid-Term Stage (-2008)	Responsible Agency	Relevant Agencies	Schedule																Input	Degree of Easiness / Difficulty for Implementation of Activities
				2005				2006				2007				2008					
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
																					←
3.7: Water Quality Annual Report is publicized.	<ul style="list-style-type: none"> <li>DINAMA annually publicizes Water Quality Annual Report, interpreting and compiling diverse information like DINAMA's policy/strategies, water quality data, and others.</li> </ul>	DINAMA	---	▲				▲				▲				▲				<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: staff of EQED shall conduct the work</li> <li>Budget: less required</li> <li>Technical level: standard:</li> <li>Relevant agencies: in DINAMA</li> <li>Work intensity: periodical</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
<b>Module No.4: Promotion of Education and Public Participation</b>																					
4.1: Awareness of stakeholders for water quality is raised	<ul style="list-style-type: none"> <li>DINAMA issues in a sustainable manner News Letter on water quality and deliver it to stakeholders. <ul style="list-style-type: none"> <li>WQMC decides the general contents of News Letter</li> <li>Publication group of DINAMA prepares a draft</li> <li>DINAMA issues the News Letter quarterly</li> </ul> </li> </ul>	DINAMA	---	-----																<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of Municipalities</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: Internal unit of DINAMA and existing personnel of relevant agencies shall participate</li> <li>Budget: less required: education material has been developed by PLP 5</li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA maintains a web page on water quality management <ul style="list-style-type: none"> <li>WQMC decides the necessary update of the web page</li> <li>Person in charge of web site maintains</li> </ul> </li> </ul>	DINAMA	---	-----																<ul style="list-style-type: none"> <li>Human resources of NGOs</li> <li>National and local education authorities</li> </ul>	<ul style="list-style-type: none"> <li>Technical level: standard:</li> <li>Relevant agencies: all the relevant agencies</li> <li>Work intensity: intense work for each activity is needed</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>National and Local Educational Authorities, Florida Water Quality Forum and DINAMA continue dissemination and education for water quality in Florida Municipality in a sustainable manner. <ul style="list-style-type: none"> <li>DINAMA National and Local Educational Authorities, and JICA hold Education Material Delivery Ceremony.</li> <li>Florida Water Quality Forum holds Workshop on Industrial Wastewater Treatment in Fray Marcos (August 5, 2005).</li> <li>Florida Water Quality Forum holds a workshop on Effluents of <i>Tambos</i> (small scale milk producers) (October 7, 2005)</li> <li>Florida Water Quality Forum holds Workshop for presentation of paper work related to water management by secondary or institute students</li> <li>Workshop with the participation of primary education director and teachers of Florida to design the scheme to introduce education materials of water quality management in the primary education curriculum is held (March 10, 2005).</li> <li>National and Local Educational Authorities carry out test of implementation of the design by teachers in the class room</li> <li>National and Local Educational Authorities, Florida Water Quality Forum and DINAMA continue dissemination and education for water quality in Florida Municipality in a sustainable manner.</li> </ul> </li> </ul>	Florida Water Quality Forum, DINAMA, Educational Authorities	Municipality of Florida, NGOs	▲				▲				▲				▲				<ul style="list-style-type: none"> <li>Human resources of Florida Water Quality Forum, DINAMA, Educational Authorities</li> </ul>	<ul style="list-style-type: none"> <li>Work intensity: intense work for each activity is needed</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
4.2: A system for the formulation of agreement on water quality management is created and public participation is promoted.	<ul style="list-style-type: none"> <li>Florida Water Quality Forum and DINAMA continue leading and implementing public participation campaigns. <ul style="list-style-type: none"> <li>Florida Water Quality Forum and DINAMA hold World Water Day Commemoration</li> <li>Florida Water Quality Forum and DINAMA hold Environment Day Commemoration</li> <li>Florida Water Quality Forum and DINAMA hold Campaign on Cleaning of Tomas Gonzalez River</li> <li>Florida Water Quality Forum and DINAMA continue promoting of public participation for water quality in Florida Municipality in a sustainable manner.</li> </ul> </li> </ul>	Florida Water Quality Forum, DINAMA	NGOs, Residents	▲				▲				▲				▲				<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of Municipalities</li> <li>Human resources of NGOs</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: Internal unit of DINAMA; existing personnel of Municipalities, NGOs shall participate</li> <li>Budget: required for campaigns</li> <li>Technical level: standard:</li> <li>Relevant agencies: all the relevant agencies</li> <li>Work intensity: intense work shall be needed for the establishment of water</li> </ul>

Output	Activities in the Mid-Term Stage (-2008)	Responsible Agency	Relevant Agencies	Schedule																Input	Degree of Easiness / Difficulty for Implementation of Activities
				2005				2006				2007				2008					
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
	<ul style="list-style-type: none"> <li>DINAMA and Florida Water Quality Forum assist the establishment of Water Quality Forums in other Municipalities and the federation of Water Quality Forum</li> </ul>	DINAMA, Florida Water Quality Forum	Municipalities	-----																	<ul style="list-style-type: none"> <li>quality forum in each municipality.</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>Other Municipalities of the Project's Area establishes their own Water Quality Forum               <ul style="list-style-type: none"> <li>- Municipality of Lavallega establishes and operates its own Water Quality Forum and conduct activities</li> <li>- Municipality of Canelones establishes and operates its own Water Quality Forum and conduct activities</li> <li>- Municipality of San José establishes and operates its own Water Quality Forum and conduct activities</li> <li>- Municipality of Montevideo establishes and operates its own Water Quality Forum and conduct activities</li> <li>- A federation of Water Quality Forums for the Santa Lucía River Basin is established and promote dissemination, education and public participation</li> </ul> </li> </ul>	Municipalities	DINAMA, OSE, DNH, NGOs, associations, etc																		
4.3: Awareness for water quality management in the relevant organizations is raised.	<ul style="list-style-type: none"> <li>DINAMA organize an internal unit to be responsible for education and public participation activities</li> </ul>	DINAMA	---	-																<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: Internal unit of DINAMA should be organized</li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA plays a leading role to raise awareness on water quality under the collaboration with relevant organizations.</li> </ul>	DINAMA	Relevant agencies	-----																<ul style="list-style-type: none"> <li>Human resources of Municipalities</li> </ul>	<ul style="list-style-type: none"> <li>Budget: less required</li> <li>Technical level: standard:</li> <li>Relevant agencies: all the relevant agencies</li> <li>Work intensity: creation of internal unit requires intense discussion</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>



## **6.2 Trial Implementation of the Second Draft Integrated Master Plan and Evaluation in the Phase III of the Project**

Trial implementation of the Second Draft Integrated Master Plan has been conducted in Phase III of the Project in the fiscal year 2005 by the Uruguayan side in order to confirm the adequacy of the plan for the sustainable implementation.

This section describes the final evaluation of the activities in Phase III on the basis of the "Evaluation Sheet" (see Main Report) prepared by the Uruguayan side during Phase III of the Project. The final evaluation has been summarized as follows for each module:

### **6.2.1 Module No.1: Strengthening of the Strategic Part**

- It is judged good that the strategy for the water quality management, namely, with three pillars of water quality management for river basins, systematic water quality management, and integrated water quality management, is acknowledged by DINAMA and relevant organizations in the country. Important is to monitor the situation of the organizational strengthening of Water Quality Department of DINAMA for the necessary work related to the declaration of water bodies' specific use under the Decree No. 253/79 and Amendments.
- Output No.1.1 (Water quality management strategies and specific action plans of respective water quality approach are established): It was proposed that Water Quality Management Committee in DINAMA would review the water quality management strategies and specific action plans established in Phase II. Although the meetings in the Water Quality Management Committee have not been held, the strategy for the water quality management, namely, with three pillars of water quality management for river basins, systematic water quality management, and integrated water quality management, is confirmed in the every Steering Committee meeting and it is acknowledged inside DINAMA. It could be judged that the strategy is already of Uruguay itself. The review of the action plans of respective water quality approach is to be conducted for each module and reported to the Steering Committee. Thus the Output No.1.1 could be judged realized.
- Output No.1.1 (continued.): Based on Law No.17930 National Budget, DINASA (National Directorate of Water and Sanitation) has been established on January 17th 2006. Article No. 327 of the said law declares that the Ministry of Housing, Use of Land and Environment shall propose to the Executive Power the formulation of national water and sanitation policies, according to what is stated under article 47 of the Constitution of the Republic. Article 328 of Law 17930 establishes that in order to fulfill the assignments stated on article 327 of the abovementioned law, the "National Directorate of Water and Sanitation" (DINASA) should be created, under subsection 14 Ministry of Housing, Use of Land and Environment, Executing Unit 001 "General Secretariat Directorate". During the meeting with the National Director of DINASA, the National Director mentioned that DINASA is the policy-making directorate and not the executing directorate. It was also mentioned that integration of all the organizations of water sector (quantity and quality) is important and the approach of integrated river basin management is deemed important. It was confirmed that the strategy of DINASA is in the same direction with the strategy of the present project and thus there expects no adverse impacts on the strategy of water quality management in Uruguay.



- Output No.1.2 (Decree No.253/79 is amended): For this output, JICA Project provided DINAMA with technical information. In the meeting on Module No.1, it has been confirmed the final version of Gesta Water Group would be submitted to COTAMA by May 2006.
- Output No.1.3 (Water bodies' specific use is declared based on the Decree No.253/79 and Amendments.): The Ministerial Order dated on 28th of February 2005 describes that all the rivers with the catchment area of 10 km<sup>2</sup> of more fall in Class 3 of the Decree No.253/79. Upon the amendment of Decree No.253/79, DINAMA is responsible for the identification for the specific use. "Water bodies of high quality" should be proposed by other agencies and DINAMA should declare it, thus no much work is expected. However, declaration of "Water bodies under recovering" requires certain activities of Water Quality Department of DINAMA and thus actual proposal of the increase of personnel has already been made.

### 6.2.2 Module No.2: Strengthening of Pollution Source Management

- Preparation of manuals scheduled in Phase III has been implemented and it could be judged good. Important point for the finalization of Integrated M/P is whether the Environmental Control Division would be strengthened with necessary personnel.
- Output No.2.1 (Collaboration system among relevant agencies on pollution source management is maintained.): Actual activities and the evaluation are as follows:
  - Activity: (Periodical meetings take place to exchange information on pollution source management.) It was reported that the periodical meetings have not been held due to the lack of human resources. It could be evaluated that the objective of the output "meetings take place" seems not clear and it has not been realized. It is proposed that actual collaboration work for Output No.2.6 (An integrated information system for pollution sources is established) and Output No.2.7 (Influence of pollution sources to river water is grasped) would be incorporated in the Final Integrated M/P.
  - Activity: (Evaluate the capacity of EnCD of DINAMA for the necessary work for this activity by the end of 2005.) EnCD already submitted a proposal for the future work with staff increase to the National Director.
  - Activity: (DINAMA maintains necessary data in a sustainable manner.) There are no changes from the status before the Project and updating of the data has not been carried out.
  - Activity: (DINAMA establishes a system for the information exchange on pollution source management among OSE, RENARE, municipalities and other organizations.) DINAMA and IMM already exchanged an agreement on pollution source management. For the other organizations and for the pollution sources other than industrial wastewater, continuous activities should be included in the Final Integrated M/P.
  - Activity: (Conclude agreement if necessary.) DINAMA and IMM already exchanged an agreement, but no progress in the other municipalities.
- Output No.2.4 (Industrial wastewater related manuals are prepared.) Of the seven scheduled manuals, four manuals, namely, "Guidance for industrial wastewater flow measurement", "Guidance for sampling, preservation and transportation of groundwater", "Registration Manual of Competent Professional", and "Authorization Manual of Industrial Wastewater Discharge" have been completed

and published by web. Of the remaining three, "Industrial User Inspection Manual" has already been prepared for the use of DINAMA based on the EPA manual and it is under the check by the legal advisor of DINAMA. It will then be sent to municipalities for check. It has been concluded that result and the status of the work would be reported in the Steering Committee meeting scheduled on March 10, 2006. Regarding "Industrial Wastewater Sampling Manual", EPA based version is completed and the customizing for DINAMA would be scheduled in 2006. "Self-monitoring Report Manual" should also be conducted in 2006. Five manuals of the scheduled seven have been completed and the Output No.2.4 is evaluated almost realized.

### **6.2.3 Module No.3: Strengthening of Ambient Water Quality Monitoring**

- Module No.3 is generally very active and it could be evaluated that this module achieved the best output among the four modules.
- Output No.3.1 (Manuals related to monitoring are prepared.) Final version of the contents has been prepared and in actual use. DINAMA publishing group already prepared final design version for the hard copy manual and printed. It could be judged that the originally expected output has been realized.
- Output No.3.2 (Ambient water quality monitoring plan for the Santa Lucía River Basin is established.) It has been implemented as scheduled. Monitoring sites of the monitoring plan prepared by the pilot project in Phase II has been amended by DINAMA at the beginning of Phase III and it is evaluated that the monitoring plan is prepared and used by Uruguay side itself.
- Output No.3.3 (Collaborated implementation system for sampling, analysis and evaluation is established.) Periodical technical committees took place; inter-laboratory calibration was proposed by Uruguay side and implemented; collaborated monitoring system has been established thus the output is well realized. The actual activity has thus been realized and the Agreement was scheduled to be discussed in Steering Committee meeting, though it was not realized and Steering Committee meetings have not been taken place in the absence of the JICA Project Team. In the Steering Committee meeting on February 3 2006, it has been agreed to proceed to conclude the agreement and the draft agreement prepared by the JICA Project Team to be sent to the legal advisor of DINAMA for the check. It could be judged good that the actual monitoring system has been established and the necessary work is being conducted. Thus it could be judged that the target output has been achieved. Necessity of periodical holding of Steering Committee meeting is recognized by Uruguay side and monthly meeting of the Steering Committee has been proposed, but it was not realized.
- Output N.3.4 (Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened.) The status is as follows:
  - Activity: (JICA provides technical training for the sampling and laboratory analysis.) Training for the specific purpose of the monitoring has not been realized.
  - Activity: (JICA provides technical training for the sampling and laboratory analysis.) Dispatch of specialist on pesticide analysis from Chile has been realized utilizing the scheme of JCPP from October 24 to November 1. It has been reported with much output.

- Activity: (DINAMA provides technical transfer for sampling and analysis of water for municipalities in a sustainable manner (incl. inter-calibration).) Technical transfer from DINAMA to municipalities and inter-calibrations have been taken place and it could be judged that the municipal laboratories have been strengthened steadily. It has been proved in the case of the water quality incident last year when the municipality conducted prompt monitoring upon the request of DINAMA.
- Activity: (Laboratory of DINAMA strengthens the capacity for pesticide analysis.) Pesticide analysis for the ambient water quality monitoring for the Santa Lucía River Basin is conducted by DINAMA Laboratory. Although the technical level for the pesticide analysis has been strengthened through the JCPP scheme, the analysis capacity of the laboratory for pesticide is low due to the lack of auto-sampler and much time is required. Evaluation of the pesticide analysis is important since pesticide is detected from water and sediment (higher rates in sediments) as reported in the Technical Committee in October 2005. Evaluation for pesticide in the periodical monitoring including the comparison with the standard value was scheduled in the Steering Committee meeting scheduled on April 14 2006, but not realized.
- Output No.3.5 (Water quality information system is established.) Campaigns for the effective use of SISICA took place in each municipality, OSE, DNH and RENARE. The different methods for the water quality data accumulation were proposed to IMM and the rest of the municipalities. In the case of IMM, it has a large amount of historical data with a lot of the monitoring points and analysis items, thus it has been proposed to establish SISICA IMM. IMM agreed to establish SISICA IMM and it is presently conducting necessary adjustment with the intranet system of IMM. It was scheduled to report in the Steering Committee scheduled on March 10 2006, but not realized. On the other hand, the other four municipalities have less monitoring point and the laboratory conducts some analysis for the common sample with DINAMA, thus it has been proposed to input data through internet directly to SISICA DINAMA. SISILAB has been established with the basic function and municipal laboratories request to introduce to their laboratory. Uruguay side agreed to include SISILAB to Output No.3.5. DINAMA made a request to JICA Project Team that JICA Project Team includes a specialist of laboratory management in order to raise the function of SISILAB in the 7th Field Work.
- Output No.3.6: (Water quality data are properly evaluated.) This output has not been realized well. There is a request from DINAMA and municipalities to make more technical transfer on the evaluation of the monitored data and it should be considered in the seminar or workshop scheduled in Phase IV. Method of evaluation is included in the Monitoring Manual, though technical transfer that includes evaluation of actually monitored data with some case studies is necessary.
- Output No.3.7: (Water quality annual report is publicized.) This output has not been realized will. One of the reasons is the lack of the capacity for the evaluation of the data as discussed under the Output No.3.6. Draft version of the water quality annual report has however been published electronically through JICA web page and through SISICA. Raising the quality of the annual report and publishing of hard copy version is the important work in Phase IV.

#### **6.2.4 Module No.4: Promotion of Dissemination, Education and Public Participation**

- Generally, certain output has been achieved including establishment of Florida Water Quality Forum, activities with Florida Water Quality Forum as the core, establishment of Lavallega Water Quality Forum, and preparation of education materials. Important point for the finalization of Integrated Master Plan is the establishment of the system and the action plan for the sustainable implementation of the activities, since there are some unsuccessful cases including the stagnation of the activities of Florida Water Quality Forum.
- Output No.4.1 (Awareness of stakeholders for water quality is raised.)
  - Issue of Newsletter in September 2005 has not been realized and it was scheduled in March 2006. Due to the capacity of the publishing group of DINAMA, quarterly issue is deemed difficult. In the year 2006, it was scheduled twice, March and October.
  - JICA web page has been completed and under operation. Ministry of Housing, Use of Land and Environment has a policy to elaborate web pages of national directorates including DINAMA, and the web pages of projects would be kept outside of the system of the Ministry. Link to the JICA Project page is already provided in the page of DINAMA.
  - Activities for the dissemination, education and public participation with the Florida Water Quality Forum established in Phase II as the core were stagnated. The reason is that several municipalities (industrial wastewater management, livestock, education, etc.) inside IMF relate to the holding of workshop, though the collaboration has hardly realized due to the new structure of the Florida Municipality after the erection in 2005. Re-vitalization of Florida Water Quality Forum is deemed important in Phase IV.
- Output No.4.2 (A system for the formulation of agreement on water quality management is created and public participation is promoted.)
  - Activities of the Florida Water Quality Forum have been conducted until June 2005 including, World Water Day commemoration, Environment Day commemoration. Cleaning of Tomas Gonzalez River has been halted since it has been realized as the other project.
  - Establishment of Lavallega Water Quality Forum has been realized earlier than the original schedule with the assistance of DINAMA and Florida Water Quality Forum. The forum held periodical meeting, four times after the establishment, and the future activities should be monitored.
- Output No.4.3 (Awareness for water quality management in the relevant organizations is raised.)
  - Strengthening of education and public participation in DINAMA has been realized as the establishment of a unit with the assignment of Ms. Luján Jara as a chief.
  - Awareness for water quality management in the relevant organization is realized through the abovementioned unit in DINAMA

### **6.3 Status of the Implementation of the Master Plan in Phase IV**

The previous section presented the results of the Master Plan implementation in Phase III of the Project. Phase III was the stage for the trial implementation of the Master Plan by the Uruguayan side. Activities proposed in the master plan have continuously been implemented in Phase IV of the Project, namely in the fiscal year 2006 mainly by the Uruguayan side with some input from JICA Project Team.

Outcome in Phase IV is summarized as follows:

#### **6.3.1 Module No.1: Strengthening of the Strategic Part**

- Discussions were held relating to the Output No.1.5 (Necessity of Council for Water Quality Management in the Santa Lucía River Basin is discussed.) JICA Project Team advised to create a council for water quality management in the Santa Lucía River Basin, it, however, has finally been decided to setup “Follow-up Committee for the Implementation of the Master Plan DINAMA/JICA in the Basin of Santa Lucía River and Sub-Basins of Carrasco and Pando Streams”. The Committee will be under COTAMA in order to fully utilize the coordination function of COTAMA. It is a good outcome and should be fully utilized for the sustainable implementation of the Master Plan.
- DINASA is working to identify its duty as originally proposed. It is necessary to include DINASA in Output No.1.5.

#### **6.3.2 Module No.2: Strengthening of Pollution Source Management**

- Environmental Control Division of DINAMA looks more active under the new director. As a part of the activities for Output 2.1 (Collaboration system among relevant agencies on pollution source management is maintained.), DINAMA and the Municipality of Florida jointly held a workshop on the pollution source management. It was successful. This status will be taken into consideration for the finalization of the Integrated Master Plan.
- Environmental Control Division has strong intention to finalize the remaining manuals.
- Discussion was held in the Steering Committee meeting and with the executives of DINAMA regarding the necessary future input for the implementation of the Master Plan. It has been agreed that inputs to the Output No.2.7 (An integrated information system for pollution sources is established) and Output No.2.8 (Influence of pollution sources to river water is grasped.) are deemed necessary. It will be taken into consideration for the finalization of the Master Plan.

#### **6.3.3 Module No.3: Strengthening of Ambient Water Quality Monitoring**

- As an activity for the Output No.3.3 (Collaborated implementation system for sampling, analysis and evaluation is established.) the ambient water quality monitoring in the Santa Lucía River Basin is being conducted in a sustainable manner, namely in March-April and June-July in the year 2006.
- The Agreement for the Joint Monitoring has finally been concluded in a ceremony on September 11, 2006 attended by the Minister of Housing, Use of Land and Environment and mayors of the five municipalities with the presence of Ambassador of Japan and the JICA Project Team as witness.

- Regarding Output No.3.4 (Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened.), DINAMA has a plan to provide necessary equipment of monitoring to the municipalities with the budget of 2006. The Municipality of Florida also has a plan to purchase an incubator for BOD analysis with the budget of 2006. Such actions of the Uruguayan side should be taken into consideration to the finalization of the Master Plan.
- SISILAB is still under elaboration to strengthen the function.
- Regarding Output No.3.7 (Water Quality Annual Report is publicized.), a monitoring report for the Santa Lucía River Basin is presently in the final preparation phase.

#### **6.3.4 Module No.4: Promotion of Dissemination, Education and Public Participation**

- Revitalization of Florida Water Quality Forum has been carried out. Although there is no concrete activity in this period, the Forum is deemed better status than before.
- Regarding Output No.4.3 (Awareness for water quality management in the relevant organizations is raised.), the education group in DINAMA is deemed active for every work.



## CHAPTER 7. FINAL INTEGRATED MASTER PLAN ON CAPACITY DEVELOPMENT FOR THE WATER QUALITY MANAGEMENT

### 7.1 Confirmation of the Policies and Strategies

#### 7.1.1 Principles of Water Quality Management in Uruguay

Principles of water quality management in Uruguay are herewith confirmed as: i) Water Quality Management for River Basins, ii) Systematic Water Quality Management, and, iii) Integrated Water Quality Management as follows.

##### Water Quality Management for River Basins

Water quality management should be conducted by river basin and not by administrative territory. This is needed for the adjustment of conflict between upstream and downstream areas, to grasp influence of water quality to river water utilization, and to grasp influence of pollution sources to river water quality, etc.

##### Systematic Water Quality Management

Water quality management should be conducted in a systematic manner considering the following cycle of the management.

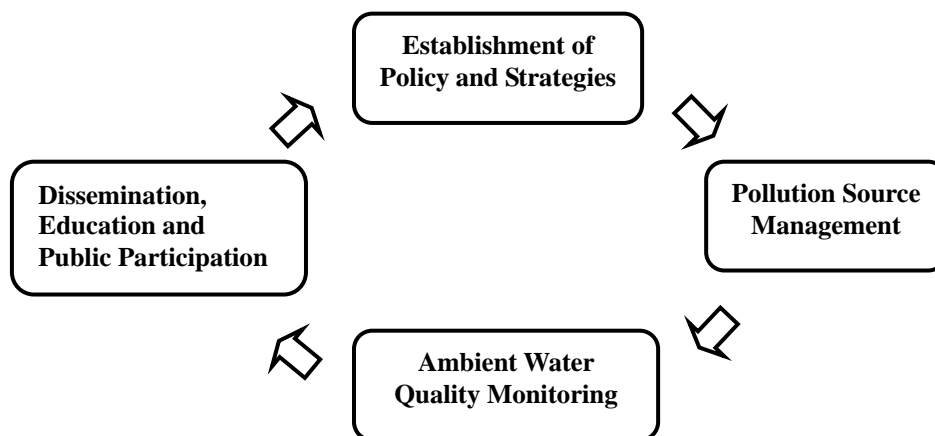


Figure 7.1.1 Proposed Cycle of Water Quality Management

##### Integrated Water Quality Management

Water quality management should be implemented in an integrated manner, namely under the collaboration of all the relevant organizations with the awareness of ownership. Integrated management also avoids concentration of loads to DINAMA and thus realizes sustainability of water quality management in Uruguay. Relevant organizations include, DINASA, DNH, RENARE, OSE, and Municipalities.



### **7.1.2 Concreted Directions by Module of Water Quality Management**

After the implementation of the First and Second Draft Master Plan, there identified no specific problem in the directions by module of water quality management. Concrete directions by module of water quality management as discussed in **Section 4.6** of this report are maintained in the Final Integrated Master Plan.

### **7.1.3 Objectives for the Capacity Development in Each Module**

Objectives for the capacity development in each module are maintained the same with those proposed in the First Draft Integrated Master Plan as follows:

**(1) Module No.1: Strengthening of Strategic Part**

- Water quality management for river basin is introduced
- Systematic water quality management is introduced
- Integrated water quality management is implemented

**(2) Module No.2: Strengthening of Pollution Source Management**

- Pollution source management is properly implemented

**(3) Module No.3: Strengthening of Ambient Water Quality Monitoring**

- Periodical ambient water quality monitoring in the Santa Lucía River Basin is implemented
- Water quality data of the whole nation is stored, evaluated, utilized and publicized

**(4) Module No.4: Promotion of Dissemination, Education and Public Participation**

- Dissemination, education and public participation are promoted in the Santa Lucía River Basin
- People's opinion is reflected to water quality management in the Santa Lucía River Basin

## **7.2 Final Integrated Master Plan (2004-2013)**

The Final Integrated Master Plan has been prepared for the period 2004 to 2013. It includes all the activities conducted up to the present time including those of the pilot projects and those implemented in Phase III, the stage for the trial implementation by Uruguayan side.



Output	Activities	Responsible Agency	Relevant Agencies	Schedule												Input	Degree of Easiness / Difficulty for Implementation of Activities																												
				2004				2005				2006						2007				2008				2009				2010				2011				2012				2013			
				1	2	3	4	1	2	3	4	1	2	3	4			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.3: Water bodies' specific use is declared based on the "Decree No.253/79 and Amendments". (All the activities depend upon the contents of the "Decree No. 253/79 and Amendments")	<ul style="list-style-type: none"> <li>DINAMA designates proper unit for the task of declaration of water bodies' specific use. <ul style="list-style-type: none"> <li>Unit for declaration of water bodies' specific use shall be under EQED</li> </ul> </li> </ul>	DINAMA	---																																									<ul style="list-style-type: none"> <li>Human resources of DINAMA (Environmental Quality Evaluation Division: EQED)</li> <li>Human resources of OSE, MGAP, INAPE, MSP and other relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: need assignment of personnel to the Unit</li> <li>Budget: required for man-power</li> <li>Technical level: standard</li> <li>Relevant agencies: all the agencies related to water quality</li> <li>Work intensity: intense work is required for identification of river stretch for each specific use</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>
	<ul style="list-style-type: none"> <li>DINAMA coordinates with "Follow-up Committee for the Implementation of the M/P DINAMA/JICA" for the declaration of water bodies' specific use. <ul style="list-style-type: none"> <li>The Unit prepares a draft for declaration</li> <li>Periodical meeting shall be held</li> </ul> </li> </ul>	DINAMA	OSE, MGAP, INAPE, MSP and relevant agencies																																										
	<ul style="list-style-type: none"> <li>DINAMA coordinates with relevant organizations for the declaration of "water bodies of high quality", and issues declaration.</li> </ul>	DINAMA	Relevant agencies																																										
	<ul style="list-style-type: none"> <li>DINAMA coordinates with OSE, Municipalities, MGAP, INAPE, MSP, and relevant organizations for the declaration of "water bodies for specific use", and issues declaration.</li> </ul>	DINAMA	OSE, MGAP, INAPE, MSP and relevant agencies																																										
	<ul style="list-style-type: none"> <li>DINAMA coordinates with relevant organizations for the declaration of "water bodies under recovery", and issues declaration.</li> </ul>	DINAMA	Relevant agencies																																										
	<ul style="list-style-type: none"> <li>DINAMA continues to review the declaration of water bodies' specific use.</li> </ul>	DINAMA	Relevant agencies																																										
1.4: Present river water quality is evaluated	<ul style="list-style-type: none"> <li>DINAMA evaluates present river water quality utilizing SISICA referring to the water bodies' specific use.</li> </ul>	DINAMA	---																																	<ul style="list-style-type: none"> <li>Human resources of EQED, DINAMA</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: less required</li> <li>Budget: less required</li> <li>Technical level: standard (compare monitored value to the declared class)</li> <li>Relevant agencies: inside DINAMA</li> <li>Work intensity: sporadic</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>								
1.5: Necessity of Council for Water Quality Management in the Santa Lucía River Basin is discussed.	<ul style="list-style-type: none"> <li>Ad Hoc Council for the Water Quality Management in the Santa Lucía River Basin is established.</li> </ul>	DINAMA	Relevant agencies																																	<ul style="list-style-type: none"> <li>Human resources of MVOTMA and DINAMA</li> <li>Human resources of OSE, MGAP, INAPE, MSP and other relevant agencies</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: less required</li> <li>Budget: less required</li> <li>Technical level: no specific problem</li> <li>Relevant agencies: all the agencies related to water quality</li> <li>Work intensity: sporadic</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>								
	<ul style="list-style-type: none"> <li>Necessity of the establishment of Council for the Water Quality Management in River Basins is discussed in the meeting of the Steering Committee under the new government organization.</li> </ul>	MVOTMA/ DINAMA	DNH, OSE, RENARE, Municipalities, etc.																																										
	<ul style="list-style-type: none"> <li>Necessity of the establishment of Council for the Water Quality Management in the Santa Lucía River Basin is discussed when any situation for the water quality management has been changed. <ul style="list-style-type: none"> <li>Ad Hoc Council shall be established when the necessity is recognized</li> <li>Legalization shall be conducted when the necessity of the Council is confirmed.</li> <li>Official Council shall be established when it has been legalized.</li> </ul> </li> </ul>	MVOTMA/ DINAMA	DNH, OSE, RENARE, Municipalities, etc.																																										

Note: — Completed intensive work, ■■■■ Completed sporadic work, ▲ Completed output, ■■■■■ Scheduled intensive work, ····· Scheduled sporadic work, ▲ Scheduled output



Output	Activities	Responsible Agency	Relevant Agencies	Schedule																Input	Degree of Easiness / Difficulty for Implementation of Activities																								
				2004				2005				2006				2007						2008				2009				2010				2011				2012				2013			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	<ul style="list-style-type: none"> <li>DINAMA continues providing Municipalities with information of SADI and engineering data of industry.</li> </ul>	DINAMA	Municipalities	Information of SADI was provided to IMM				Information of SADI should be provided to the other municipalities																																					
	<ul style="list-style-type: none"> <li>DINAMA and Municipalities conduct collaborated management of industrial wastewater               <ul style="list-style-type: none"> <li>- DINAMA and Municipalities coordinate for the compliance inspection.</li> <li>- DINAMA and Municipalities mutually exchange the inspection results of industrial wastewater facilities in a sustainable manner.</li> <li>- DINAMA plays a leading role in the industrial wastewater management.</li> <li>- Municipalities work as so-called "Liaison Office" in the industrial wastewater management.</li> <li>- DINAMA maintains to keep the sharing of the inspection of industrial wastewater facilities in a sustainable manner.</li> </ul> </li> </ul>	DINAMA	Municipalities	Details should be discussed between DINAMA and municipalities.																																									
2.4: Industrial wastewater related manuals are prepared	<ul style="list-style-type: none"> <li>DINAMA and JICA Project Team jointly prepare procedural manuals of industrial wastewater management.               <ul style="list-style-type: none"> <li>- Industrial User Inspection Manual</li> <li>- Industrial Wastewater Sampling Manual</li> <li>- Guidance for Industrial Wastewater Flow Rate Measurement</li> <li>- Guidance for Sampling, Preservation and Transportation of Underground Water</li> </ul> </li> </ul>	DINAMA	---	Tentative version																				<ul style="list-style-type: none"> <li>Human resources of EnCD</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: difficult: some staff of EnCD should concentrate to the work</li> <li>Budget: standard (part of normal work)</li> <li>Technical level: standard</li> <li>Relevant agencies: inside DINAMA</li> <li>Work intensity: intense work by staff of EnCD is needed</li> <li>Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>																				
	<ul style="list-style-type: none"> <li>DINAMA and JICA Project Team jointly prepare technical guidance for industrial wastewater management.</li> </ul>	DINAMA	---																																										
	<ul style="list-style-type: none"> <li>DINAMA develops procedural and management manuals for industrial wastewater.               <ul style="list-style-type: none"> <li>- Self-monitoring Report Manual</li> <li>- Authorization Manual of Industrial Wastewater Discharge</li> <li>- Registration Manual of Competent Professional</li> </ul> </li> </ul>	DINAMA	---	Originally proposed to be completed in the pilot projects, but not finished.																																									
	<ul style="list-style-type: none"> <li>DINAMA amends established manuals, when necessary.               <ul style="list-style-type: none"> <li>- EnCD shall amendment when necessary</li> </ul> </li> </ul>	DINAMA	---																																										
2.5: Capacity of DINAMA and relevant agencies on industrial wastewater management is developed	<ul style="list-style-type: none"> <li>JICA Project Team provides technical transfer of industrial wastewater management to DINAMA's staff, using Manuals to be established in &lt;Output 2.4&gt;.</li> </ul>	DINAMA	---																					<ul style="list-style-type: none"> <li>JICA Scheme: Training in Japan</li> <li>Human resources of EnCD</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: existing staff of EnCD and Municipalities</li> <li>Budget: standard (part of normal work)</li> <li>Technical level: standard</li> <li>Relevant agencies: Municipalities</li> <li>Work intensity: sporadic</li> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>																				
	<ul style="list-style-type: none"> <li>JICA provides necessary technical transfer through the technical training in Japan.</li> </ul>	DINAMA or Municipality	---	See Output 2.2 above																																									
	<ul style="list-style-type: none"> <li>DINAMA provides technical transfer of industrial wastewater management to Municipalities staff, using Manuals to be established in &lt;Output 2.4&gt;.</li> </ul>	DINAMA Municipalities	---																																										

Note: Completed intensive work, Completed sporadic work, Completed output, Scheduled intensive work, Scheduled sporadic work, Scheduled output

Output	Activities	Responsible Agency	Relevant Agencies	Schedule												Input	Degree of Easiness / Difficulty for Implementation of Activities																												
				2004				2005				2006						2007				2008				2009				2010				2011				2012				2013			
				1	2	3	4	1	2	3	4	1	2	3	4			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2.6: River water quantity observation system is established	<ul style="list-style-type: none"> <li>• DNH under the collaboration with DINAMA and relevant organizations establishes a system for observation of water quantity (river flow) in the Santa Lucía River Basin that is required for the simulation of the future water quality prediction.</li> <li>- DNH identifies necessary work including equipment for the establishment of proper system for observation of water quantity in the Santa Lucía River Basin.</li> <li>- DNH strengthen the system for observation of water quantity in the Santa Lucía River Basin.</li> </ul>	DNH	DINAMA																																	<ul style="list-style-type: none"> <li>• International technical assistance</li> <li><u>Experts</u></li> <li>- River management planner</li> <li>- Hydrological observation</li> <li><u>Structure and equipment</u></li> <li>- for water level and flow measurement</li> </ul>	<ul style="list-style-type: none"> <li>• Human resources: staff of DNH and foreign assistance shall be needed</li> <li>• Budget: much required (Technical assistance from abroad shall be considered)</li> <li>• Technical level: high: needs the study on the river management</li> <li>• Relevant agencies: DINAMA</li> <li>• Work intensity: intense work with technical assistance from abroad is necessary</li> <li>• Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>								
																																						<ul style="list-style-type: none"> <li>• Human resources of DINAMA</li> <li>• Human resources of relevant agencies</li> <li>• International technical assistance</li> <li>Input of the following experts.</li> <li>- Leader</li> <li>- Pollution source management</li> <li>- Hydrology and meteorology</li> <li>- GIS</li> <li>- Water quality simulation</li> <li>- Socioeconomy</li> </ul>	<ul style="list-style-type: none"> <li>• Human resources: much required: should be carefully examined and staff of EQCD should be increased for this purpose and foreign assistance shall be needed</li> <li>• Budget: much required (Technical assistance from abroad shall be considered) and should be carefully examined for local budget</li> <li>• Technical level: high: simulation of water quality requires high technique.</li> <li>• Relevant agencies: all the relevant agencies.</li> <li>• Work intensity: intense work with technical assistance from abroad is necessary</li> <li>• Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>						
2.7: An integrated information system for pollution sources is established	<ul style="list-style-type: none"> <li>• DINAMA maintains some of relevant information on pollution sources.</li> <li>• DINAMA constructs an integrated information system with GIS database on pollution sources.</li> <li>- EnCD under the collaboration with EQED studies and proposes necessary system specification</li> <li>- EnCD creates a GIS database system for various pollution sources.</li> <li>- Technical committee consisting of members from the relevant agencies shall be formulated for the creation of the system</li> </ul>	DINAMA	---																													<ul style="list-style-type: none"> <li>• Equipment</li> <li>- Personal computers</li> <li>- Software for pollution simulation</li> </ul>	<ul style="list-style-type: none"> <li>• Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>												
				<ul style="list-style-type: none"> <li>• DINAMA inputs data and information of various pollution sources to the integrated information system.</li> </ul>	DINAMA	OSE, RENARE, Municipalities																																							
2.8: Influence of pollution sources to river water is grasped	<ul style="list-style-type: none"> <li>• JICA provides necessary technical transfer through the technical training in Japan.</li> <li>• DINAMA allocates proper staff assigned to the task of water quality assessment.</li> <li>- A unit shall be formulated preferably under EQED with collaboration from EnCD.</li> <li>• DINAMA makes preliminary survey on the pollution loads from various kind of wastewater.</li> <li>- Information stored in the GIS database for pollution sources shall firstly be evaluated.</li> <li>- The Unit assigned to the task of water quality assessment makes a plan for the preliminary survey on the pollution loads.</li> <li>- Preliminary survey on the pollution loads shall be conducted.</li> </ul>	DINAMA, relevant agencies	---	See Output 2.2 above																								<ul style="list-style-type: none"> <li>• Equipment</li> <li>- Personal computers</li> <li>- Software for pollution simulation</li> </ul>	<ul style="list-style-type: none"> <li>• Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>																
				<ul style="list-style-type: none"> <li>• DINAMA allocates proper staff assigned to the task of water quality assessment.</li> <li>- A unit shall be formulated preferably under EQED with collaboration from EnCD.</li> </ul>	DINAMA	---																																							
							<ul style="list-style-type: none"> <li>• DINAMA makes preliminary survey on the pollution loads from various kind of wastewater.</li> <li>- Information stored in the GIS database for pollution sources shall firstly be evaluated.</li> <li>- The Unit assigned to the task of water quality assessment makes a plan for the preliminary survey on the pollution loads.</li> <li>- Preliminary survey on the pollution loads shall be conducted.</li> </ul>	DINAMA	OSE, RENARE, Municipalities																																				

Note: — Completed intensive work, ■■■■ Completed sporadic work, ▲ Completed output, ■■■■■ Scheduled intensive work, ····· Scheduled sporadic work, ▲ Scheduled output



Output	Activities	Responsible Agency	Relevant Agencies	Schedule												Input	Degree of Easiness / Difficulty for Implementation of Activities																														
				2004				2005				2006						2007				2008				2009				2010				2011				2012				2013					
				1	2	3	4	1	2	3	4	1	2	3	4			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
3.4: Capacity for both personnel and equipment for sampling, analysis and evaluation is strengthened	• DINAMA reinforces Water Quality Department for the implementation of sustainable ambient water quality monitoring.	DINAMA	---					■																																<ul style="list-style-type: none"> <li>Human resources of EQED</li> <li>Budget of JICA Project</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: staff of EQED and Municipalities</li> <li>Budget: JICA provides for equipment</li> <li>Technical level: normal.</li> <li>Relevant agencies: relevant agencies</li> <li>Work intensity: periodic</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>						
	• JICA provides equipment necessary for the basic analysis in the laboratories of DINAMA and Municipalities.	DINAMA	Municipalities					■																																<ul style="list-style-type: none"> <li>JICA Scheme: Training in Japan</li> <li>Horizontal cooperation</li> </ul>	<ul style="list-style-type: none"> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>						
	• DINAMA checks the capability of pesticide analysis of DINAMA Laboratory.	DINAMA	---									■																																			
	• JICA provides technical training for the sampling and laboratory analysis. - Training in Japan shall be considered. - Horizontal cooperation shall be considered including JCPP and other schemes	DINAMA or relevant agencies	---													■																								<ul style="list-style-type: none"> <li>JICA Scheme: Training in Japan</li> <li>Horizontal cooperation</li> </ul>	<ul style="list-style-type: none"> <li>Overall: easy / <del>medium</del> / <del>difficult</del></li> </ul>						
	• DINAMA provides technical transfer for sampling and analysis of water for Municipalities in a sustainable manner (incl. inter-calibration). - EQED conducts technical transfer for sampling when necessary - Laboratories of DINAMA and Municipalities conduct inter-calibration	DINAMA	Municipalities									■																												<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of OSE and Municipalities</li> <li>International technical assistance</li> <li>Experts</li> <li>Pesticide analysis</li> <li>Equipment for Water Quality Analysis</li> <li>for Pesticide</li> <li>for BOD (Municipalities and OSE branch Office)</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: staff of laboratory in DINAMA, OSE and Municipalities should be increased for this purpose and foreign assistance shall be needed</li> <li>Budget: much required (Technical assistance from abroad shall be considered)</li> <li>Technical level: high: pesticide analysis requires high technique.</li> <li>Relevant agencies: OSE and Municipalities</li> <li>Work intensity: intense work with technical assistance from abroad is necessary</li> <li>Overall: <del>easy</del> / <del>medium</del> / difficult</li> </ul>						
	• DINAMA conducts pesticide monitoring. - Laboratory of DINAMA identify necessary work including upgrading of equipment for the pesticide monitoring - Laboratory of DINAMA strengthen the capacity for pesticide analysis	DINAMA	MGAP									■																												<ul style="list-style-type: none"> <li>Requires more equipment and personnel</li> </ul>							
	• Municipalities raise the capacity of laboratory in order to cover BOD <sub>5</sub> analysis at every laboratory. - IMC, IMSJ, IMF, IML identify necessary work including upgrading of equipment of the analysis covering BOD <sub>5</sub> - Laboratories of IMC, IMSJ, IMF, IML strengthen the capacity to cover BOD <sub>5</sub>	Municipalities	DINAMA																																					<ul style="list-style-type: none"> <li>IMC is already capable. IMF is going to purchase an incubator.</li> </ul>							
	• Branch laboratory of OSE in each Municipality raise the capacity in order to cover BOD <sub>5</sub> analysis. - OSE identifies necessary work including upgrading of equipment of the analysis covering BOD <sub>5</sub> at branch laboratories of OSE - OSE strengthen the capacity of its branch laboratories to cover BOD <sub>5</sub>	OSE	DINAMA																																					<ul style="list-style-type: none"> <li>Originally proposed, but considered not necessary since ambient water quality monitoring is carried out by DINAMA and municipalities. OSE conducts only for the analysis of source water</li> </ul>							
• DINAMA laboratory promotes computerized system for the process and evaluation to raise the quality of the data - DINAMA develops SISILAB for its laboratory - DINAMA promotes to expand SISILAB to the other environment laboratories	DINAMA	Municipalities																																													
• DINAMA Laboratory obtains ISO/IEC 17025 Certificate for necessary items (This activity will be made by DINAMA itself separately from the JICA Project)	MVOTMA/DINAMA	---																																													

Note: ■ Completed intensive work, ■■■■ Completed sporadic work, ▲ Completed output, ■■■■■ Scheduled intensive work, . . . . . Scheduled sporadic work, ▲ Scheduled output





Output	Activities	Responsible Agency	Relevant Agencies	Schedule												Input	Degree of Easiness / Difficulty for Implementation of Activities																												
				2004				2005				2006						2007				2008				2009				2010				2011				2012				2013			
				1	2	3	4	1	2	3	4	1	2	3	4			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Module No.4: Promotion of Education and Public Participation</b>																		•	•																										
4.1: Awareness of stakeholders for water quality is raised	<ul style="list-style-type: none"> <li>DINAMA issues in a sustainable manner News Letter on water quality and deliver it to stakeholders. <ul style="list-style-type: none"> <li>WQMC decides the general contents of News Letter</li> <li>Publication group of DINAMA prepares a draft</li> <li>DINAMA issues the News Letter quarterly</li> </ul> </li> </ul>	DINAMA	---	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<p>Quarterly publication every year is difficult. It should be reviewed</p> <p>▲</p>	<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of Municipalities</li> <li>Human resources of NGOs</li> <li>National and local education authorities</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: Internal unit of DINAMA and existing personnel of relevant agencies shall participate</li> <li>Budget: less required: education material has been developed by PLP 5</li> <li>Technical level: standard</li> <li>Relevant agencies: all the relevant agencies</li> <li>Work intensity: intense work for each activity is needed</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>																									
	<ul style="list-style-type: none"> <li>National and local medias (TV, newspaper, radio) report various activities of the present JICA Project.</li> </ul>	DINAMA	Relevant agencies	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<p>Local media reported activities of pilot projects</p> <p>■</p>	<ul style="list-style-type: none"> <li>Central media reported Education Ceremony and Monitoring Agreement Ceremony</li> </ul> <p>▲</p>	<ul style="list-style-type: none"> <li>Central media reported Education Ceremony and Monitoring Agreement Ceremony</li> </ul> <p>▲</p>																									
	<ul style="list-style-type: none"> <li>DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and prepare materials for dissemination for the use of campaigns and effectively utilize them.</li> </ul>	DINAMA, Florida WQF	Relevant agencies	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<p>Posters, pamphlets, and stickers have been prepared and utilized.</p> <p>■</p>	<ul style="list-style-type: none"> <li>Workshop for industrial wastewater management by DINAMA-IMF</li> </ul> <p>▲</p>	<p>Workshop should be held sporadically</p> <p>▲</p>																									
	<ul style="list-style-type: none"> <li>Water Quality Forum (as discussed below) as a main actor holds local workshops.</li> </ul>	DINAMA, Florida WQF	Municipalities, Relevant agencies	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<p>A total of 9 workshops took place in municipalities</p> <p>■</p>	<ul style="list-style-type: none"> <li>Workshop for industrial wastewater management by DINAMA-IMF</li> </ul> <p>▲</p>	<p>Workshop should be held sporadically</p> <p>▲</p>																									
	<ul style="list-style-type: none"> <li>DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and prepare materials for education for water quality and effectively utilize them.</li> </ul>	DINAMA, Florida WQF	Municipalities, Education people	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<p>Videos for common people and children, illustrated story, and booklet have been under preparation.</p> <p>■</p>	<ul style="list-style-type: none"> <li>Education material is utilized in municipalities</li> </ul> <p>■</p>	<p>Education material is utilized in municipalities</p> <p>■</p>																									
	<ul style="list-style-type: none"> <li>DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and conduct training sessions utilizing the above developed materials.</li> </ul>	DINAMA, Florida WQF	Municipalities, Education people	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<p>Training sessions were held.</p> <p>■</p>	<ul style="list-style-type: none"> <li>Education material is utilized in municipalities</li> </ul> <p>■</p>	<p>Education material is utilized in municipalities</p> <p>■</p>																									
	<ul style="list-style-type: none"> <li>DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and conduct education sessions for teachers utilizing the above developed materials.</li> </ul>	DINAMA, Florida WQF	Municipalities, Education people	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<ul style="list-style-type: none"> <li>Education material is utilized in municipalities</li> </ul> <p>■</p>	<p>Education material is utilized in municipalities</p> <p>■</p>																									
	<ul style="list-style-type: none"> <li>DINAMA, JICA Project Team members, members of the Water Quality Forum (as discussed below), education related personnel and teachers, collaborate and have meeting for the evaluation of education materials.</li> </ul>	DINAMA, Florida WQF	Municipalities, Education people	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<p>Education sessions were held.</p> <p>■</p>	<ul style="list-style-type: none"> <li>Education material is utilized in municipalities</li> </ul> <p>■</p>	<p>Education material is utilized in municipalities</p> <p>■</p>																									
<ul style="list-style-type: none"> <li>Environmental education for children is conducted through the implementation of various campaigns.</li> </ul>	DINAMA, Florida WQF	Municipalities, Education people	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<p>Education material handover ceremony</p> <p>▲</p>	<ul style="list-style-type: none"> <li>Campaigns and school education</li> </ul> <p>■</p>	<p>Campaigns and school education</p> <p>■</p>																										

Note: ■ Completed intensive work, ■ Completed sporadic work, ▲ Completed output, ■ Scheduled intensive work, ■ Scheduled sporadic work, ▲ Scheduled output

Output	Activities	Responsible Agency	Relevant Agencies	Schedule												Input	Degree of Easiness / Difficulty for Implementation of Activities																												
				2004				2005				2006						2007				2008				2009				2010				2011				2012				2013			
				1	2	3	4	1	2	3	4	1	2	3	4			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	<ul style="list-style-type: none"> <li>DINAMA maintains a web page on water quality management               <ul style="list-style-type: none"> <li>WQMC decides the necessary update of the web page</li> <li>Person in charge of web site maintains</li> </ul> </li> </ul>	DINAMA	---					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
	<ul style="list-style-type: none"> <li>National and Local Educational Authorities, Florida Water Quality Forum and DINAMA continue dissemination and education for water quality in Florida Municipality in a sustainable manner.               <ul style="list-style-type: none"> <li>DINAMA National and Local Educational Authorities, and JICA hold Education Material Delivery Ceremony.</li> <li>Florida Water Quality Forum holds Workshop on Industrial Wastewater Treatment in Fray Marcos (August 5, 2005).</li> <li>Florida Water Quality Forum holds a workshop on Effluents of <i>Tambos</i> (small scale milk producers) (October 7, 2005)</li> <li>Florida Water Quality Forum holds Workshop for presentation of paper work related to water management by secondary or institute students</li> <li>Workshop with the participation of primary education director and teachers of Florida to design the scheme to introduce education materials of water quality management in the primary education curriculum is held (March 10, 2005).</li> <li>National and Local Educational Authorities carry out test of implementation of the design by teachers in the class room</li> <li>National and Local Educational Authorities, Florida Water Quality Forum and DINAMA continue dissemination and education for water quality in Florida Municipality in a sustainable manner.</li> </ul> </li> </ul>	Florida Water Quality Forum, DINAMA, Educational Authorities	Municipality of Florida, NGOs					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲						
4.2: A system for the formulation of agreement on water quality management is created and public participation is promoted.	<ul style="list-style-type: none"> <li>Florida Water Quality Forum is established in Florida Municipality as a model area.</li> <li>Residents exchange their opinion on water quality in the established Florid Water Quality Forum.</li> <li>The Coordinating Body of Florida Water Quality Forum holds periodical meeting and discuss on the activities.</li> </ul>	IMF	DINAMA, Residents, NGOs, Related agencies, stakeholders					▲	Setup on August 6, 2004																													<ul style="list-style-type: none"> <li>Human resources of DINAMA</li> <li>Human resources of Municipalities</li> <li>Human resources of NGOs</li> </ul>	<ul style="list-style-type: none"> <li>Human resources: Internal unit of DINAMA; existing personnel of Municipalities, NGOs shall participate</li> <li>Budget: required for campaigns</li> <li>Technical level: standard:</li> <li>Relevant agencies: all the relevant agencies</li> <li>Work intensity: intense work shall be needed for the establishment of water quality forum in each municipality.</li> <li>Overall: <del>easy</del> / medium / <del>difficult</del></li> </ul>						
		Residents	Florida WQF					▲	More than 70 residents attended to the First Plenary Meeting					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
		Florida WQF	IMF	■	■	■	■																																						

Note: ■ Completed intensive work, ■ Completed sporadic work, ▲ Completed output, ■ Scheduled intensive work, ■ Scheduled sporadic work, ▲ Scheduled output





### **7.3 Key Issues for the Future Activities in the Final Integrated Master Plan**

Key issues for the future activities in the Final Integrated Master Plan have been identified in due consideration of the degree of the achievement of the original target.

#### **7.3.1 Module No.1: Strengthening of Strategic Part**

##### **(1) Objective of the Module**

Objectives of the capacity development in Module No.1 are given as follows:

- Water quality management for river basin is introduced
- Systematic water quality management is introduced
- Integrated water quality management is implemented

##### **(2) Degree of the Achievement of the Original Target and Key Issues for the Future Activities**

Water quality management for the Santa Lucía River Basin has been introduced and is being implemented as the first case of the water quality management for a river basin as a unit in Uruguay, thus the necessity of the water quality management for river basins has become well recognized in the country.

Systematic water quality management with a cycle of the modules is also well recognized by DINAMA and relevant agencies. Establishment of the strategies of the water quality management by Uruguay itself should be conducted through the implementation of the Integrated Master Plan by reviewing the strategy proposed by JICA.

Decree No.253/79 and Amendments should be implemented by efforts of the Uruguay government as was conducted up to the present time. It should be boosted otherwise the work for the water bodies specific use could not be started.

Setup of Basin Council for the implementation of the integrated water quality management should be studied and promoted in the future.

#### **7.3.2 Module No.2: Strengthening of Pollution Source Management**

##### **(1) Objective of the Module**

Objective of the capacity development in Module No.2 is the following:

- Pollution source management is properly implemented

##### **(2) Degree of the Achievement of the Original Target and Key Issues for the Future Activities**

Input for the capacity development in Module No.2 in the JICA Project focused on the promotion of collaboration between the agencies and elaboration of manuals. Of these, certain output has been achieved for the elaboration of manuals, collaboration between DINAMA and relevant agencies, however, has not progressed except with

IMM that already maintains some collaboration with DINAMA. The status of the collaboration is improving after entering to the Phase IV with the efforts of EnCD, DINAMA for the joint work for industrial wastewater management. The sustainable efforts are deemed necessary.

Module No.2 is far behind the required status compared to the modules No.3 and No.4, and it could not be recovered by the capacity development by the Uruguay itself. Input of technical assistance from countries with much experience should be implemented for the development of the capacity. Establishment of an integrated pollution source information system and a simulation model to grasp the influence of the pollution sources to the river water quality should be given higher priority.

### **7.3.3 Module No.3: Strengthening of Ambient Water Quality Monitoring**

#### **(1) Objective of the Module**

Objectives of the capacity development in Module No.3 are as follows:

- Periodical ambient water quality monitoring in the Santa Lucía River Basin is implemented
- Water quality data of the whole nation is stored, evaluated, utilized and publicized

#### **(2) Degree of the Achievement of the Original Target and Key Issues for the Future Activities**

Through the JICA Project, monitoring manuals have been elaborated, an ambient water quality monitoring plan for the Santa Lucía River Basin has been established, a collaborated implementing system for the sampling, analysis and evaluation has been established, a water quality information system has been established, and the periodical ambient water quality monitoring in the Santa Lucía River Basin is being implemented.

Capacity development of both personnel and equipment for sampling, analysis and evaluation should be implemented in a sustainable manner with an input by Uruguay itself.

Annual report of water quality has been published as a result of the water quality monitoring in the pilot project. Sustainable publication of the annual report of water quality is indispensable for the maintenance of the established ambient water quality monitoring system.

SISICA, a water quality information system, should be evolved to the Integrated SISICA that targets information sharing with the relevant agencies.

In the field of analysis and evaluation in laboratory, SISILAB, an information system in laboratory, should be evolved so as to raise the efficiency and quality of the laboratory work.

#### **7.3.4 Module No.4: Promotion of Dissemination, Education and Public Participation**

##### **(1) Objective of the Module**

Objectives of the capacity development in Module No.4 are as follows:

- Dissemination, education and public participation are promoted in the Santa Lucía River Basin
- People's opinion is reflected to water quality management in the Santa Lucía River Basin

##### **(2) Degree of the Achievement of the Original Target and Key Issues for the Future Activities**

Activities on dissemination and education were implemented as the elaboration and effective use of education materials and implementation of various campaigns. JICA Project implemented such activities mainly in the municipalities of Florida and Lavalleja, but effective utilization of the education materials was promoted in all the relevant five municipalities. Such activities should be continued in a sustainable manner.

As a system for the formulation of agreement on water quality management, Water Quality Forum was set up in the municipalities of Florida and Lavalleja. These Water Quality Forums should be managed in a sustainable manner in the future. Water Quality Forums in the other three municipalities should be established by the effort of the municipalities with the help of already established Forums and DINAMA.

Federation of Water Quality Forums for the Santa Lucía River Basin should be established by the effort of Uruguay.





