No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES (MARN)

REPUBLIC OF GUATEMALA

THE PROJECT FOR CAPACITY DEVELOPMENT FOR WATER ENVIRONMENT CONSERVATION IN THE METROPOLITAN AREA

PROJECT COMPLETION REPORT

DECEMBER 2009

CTI ENGINEERING INTERNATIONAL CO., LTD.

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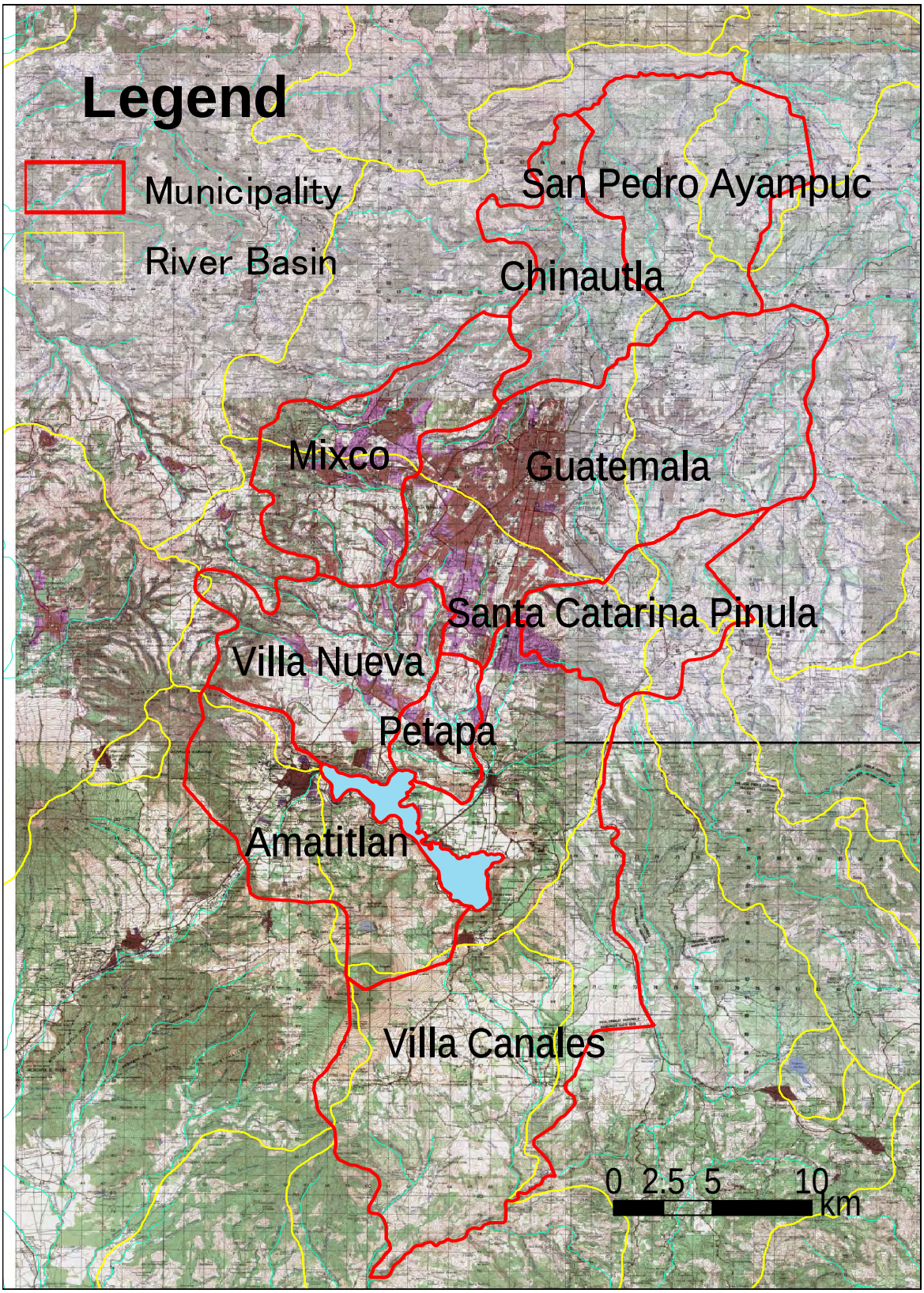
The Currency Exchange Rate as of October 1, 2009 is as follows:

USD1.00 = Q8.460 = JPY89.759



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EXECUTIVE SUMMARY

1. Outlines of the Project

Established so recently in 2000, the administration capacity of the Ministry of Environment and Natural Resources (MARN) had been very low, and almost no significant activities had been implemented for the conservation of water environment. In May 2006 MARN enacted the Wastewater Regulation (el Reglamento de las Descargas y Reuso de Aguas Residuales y Disposición de Lodos (Acuerdo Gubernativo No.236-2006)), and it was decided that the Project would focus on the capacity development for the smooth implementation of the Wastewater Regulation. Outlines of the Project are summarized as follow:

Outline of the Project

Item		Content
Project Title		The Project for Capacity Development for Conservation of Water Environment in the Metropolitan Area, Guatemala
Project Area		Nine municipalities in the Metropolitan Area (Guatemala, Mixco, Villa Nueva, Villa Canales, Santa Catarina Pinula, Amatitlan, San pPedro Ayampuc, Chinautla, San Miguel Petapa)
Project Period		March 2006 to December 2009 (46 months)
Target Groups		Personnel of MARN and LBNS
Overall Goal		The policy of conservation of water resources in the metropolitan area is reinforced.
Project Purpose		MARN's implementation capacity of the wastewater regulation for water environment conservation in the Metropolitan Area is reinforced.
Output	0	A system of implementation of the Project is established.
	1	Strategy formulation capacity for effective enforcement of the wastewater regulation is reinforced.
	2	The system of monitoring, evaluation and follow-up for the implementation of the Wastewater Regulation is established.
	3	Sustainable system of compilation and administration for water environmental information is established.
	4	The environmental education and dissemination of aspects related to the Wastewater Regulation under collaboration with the municipalities, AMSA, MINEDUC and other governmental and non-governmental organizations is reinforced

2. Strategies and methodologies for Project Operation

(1) Strategies for Project Operation

The Project was implemented in accordance with the following three strategies:

- JCC meetings are held frequently to facilitate the collaboration with other related organizations,
- The method of the PCM (Project Cycle Management) is applied for the management of the project, and
- The TWGs shoulder project activities.

In order to facilitate the collaboration with the related organizations, the JCC meetings was held 13 times in the course of the Project, as frequently as two or three times a contract year. The committee members were representatives from directions and units of MARN, MSPAS, MINEDUC, SEGEPLAN, AMSA, INFOM, EMPAGUA, ERIS-USAC, the nine municipalities, NGOs, etc.

The PCM (Project Cycle Management) was applied to manage the progress of the Project. Five versions of PDM and PO were proposed or applied in the course of the Project. Based on discussions at the JCC meetings and results of a baseline survey, the PDM_1 and PO_1 were determined in January 2007. In March 2008 the PDM and PO were revised to PDM_2 and PO_2 during the Mid-term Evaluation, so that the capacity development of the CP personnel would be ensured and policies of the new MARN after the government change could be incorporated. In August 2009 the PDM and PO were revised to the PDM_3 and PO_3 slightly in accordance with the extension of the

Project Period.

Project activities have been made by a coordination group and four technical working groups (TWGs) that correspond to the four outputs. Each TWG is composed of 2 to 10 counterparts of MARN and LBNS, supported by JICA experts in charge. Each TWG, under the initiative of the JICA experts, prepared more detailed activities plans in accordance with the PO and implemented it. While the JICA experts were in Guatemala, the TWG members met almost once a week to confirm the progress of tasks of each member. In the 4th and 5th contract years joint meeting by representatives of the four TWGs and the coordinating group was also held to share information of the activities of the four groups almost every month.

Composition of TWGs

Group	Output	Area of Activities	Directions or Units of Members	JICA Experte
Coordination Group	-	Common Activities	URHC	Katayama, Sasaki
TWG1	Output-1	Policy and Strategy	DGPEA, URHC, DGCL	Katayama, Sebastian
TWG2	Output-2	Wastewater Regulation (Monitoring)	URHC, DGGARN, LBNS	Kageyama, Joram
TWG3	Output-3	Water Environmental Information	SIA, URHC, DGGARN	Kurata
TWG4	Output-4	Water Environmental Education and Dissemination	DGFOPAS, URHC, URPP	Ito, Sebastian, Sasaki

(2) Methodologies for Project Operation

The Project Period of 46 months was divided into 5 contract-years according to the Japanese fiscal year system. Activities by the contract year are summarized as follows:

Main Activities by Contract Year

Contract Year	Commonn	Output-1	Output-2	Output-3	Output-4
1st Year (Mar. to Aug. '06)	Discussions on PDM and PO	Information collection	Information collection	Information collection	Information collection
2nd Year (Oct. '06 to Mar. '07)	Baseline survey	Study on strategies for effective enforcement of the Wastewater Regulation	Preparation of wastewater monitoring	Designing of specifications of database system	Dissemination of theWastewater Regulation
3rd Year (May '07 to Mar. '08)	Mid-term Evaluation	Elaboration of strategies for effective enforcement of the Regulation	Wastewater mnitoring (pilot project)	Development of database system	Development of water environmental education
4th Year (May '08 to Mar. '09)	Support for CP training in Japan	Elaboration of Strategy for social participation for water environmental education	Wastewater monitoring (under responsibility of MARN)	Development of database system	Design of the MIMEDE Project
5th Year (Jul. '09 to Dec. '09)	Terminal Evaluation	Presentation of theabove strategies	Wastewater monitoring (under responsibility of MARN)	Repair and improvement of data base	Implementation of the MIMEDE Project

3. Achievements of the Project

(1) Input

Inputs by the Japanese and Guatemalan sides are as follows:

Inputs by Japanese and Guatemalan Sides

Japanese/Gautemalan	Item	Contents
Japanese Side	Dispatch of JICA Experts	71.33 months of JICA experts in total (70.83 months in Guatemala and 0.50 months in Japan) were input for the Project.
	Overseas Training for Counterparts	19 counterparts in total were dispatched to training in Japan or third countries.
	Equipment and Materials	A vehicle, equipment for water analysis, reagents, office equipment, etc. that are worth about 10 million Japanese yen in total were input for the Project.
	Local Expenses for Project Operation	The expenses for the activities of the JICA experts totaled about 59 million Japanese yen.
Guatemalan Side	Counterpart personnel	A total of 38 counterparts were assigned in the project period of 46 months.
	Office space and furniture	Office space and furniture enough for seven persons was provided to the JICA Project Team.
	Expenses for project operation	A total of about 3 million Quetzales (about 400,000 US dollars) was input for the project operation.

(2) Achievement Status of Outputs and Project Purpose

As a result of precise investigation on the PDM indicators, it is concluded that all the five Outputs and the Project Purpose were achieved as planned.

(3) Possibility of Achievement of Overall Goal

Judging from a fact that there are still a big gap between the current condition and the Overall Goal, it seems very difficult to achieve the Overall Goal. However, it is never hopeless if the efforts and achievements made for the Project are considered. If the Government continues its environment-friendly social development policies that focus on conservation and improvement of water environment and the Wastewater Regulation is effectively enforced as it stipulates, the Overall Goal would be possibly achieved.

4. Devises and Lessons for Project Operation, Recommendations and Conclusions

(1) Devices and Lessons for Project Operation

Regarding devices for the project operation that the JICA Project Team elaborated are the three strategies described in Chapter 2. Strategies and methodologies for Project Operation.

An important lesson was learnt from the Project. It is that due care about the regulated parties, the industrial sectors in particular, is indispensable for more effective enforcement of the Wastewater Regulation. MARN, who imposes the regulation on industries, must face them resolutely. On the other hand MARN should make maximum efforts to approach them for seeking their understanding and cooperation about the enforcement of the Wastewater Regulation.

(2) Recommendations

For the realization of the Overall Goal “The policy of conservation of water resources in the metropolitan area is reinforced.”, the JICA Project Team makes recommendations to the Government of Guatemala on two types of issues, those of policy and those of the wastewater monitoring, as follows:

Policy Issues

- Ensuring of finance for municipalities to develop sewerage systems with treatment plants
- Strengthening of collaboration with municipalities for implementation of the Wastewater Regulation
- Implementation of incentive instruments
- Establishment of Environmental Quality Standards for water
- Necessity of efforts for seeking understanding of stakeholders towards the revision of the Wastewater Regulation
- Strengthening of legal framework
- Strengthening of URHC
- Strengthening of collaboration with related organizations

Issues of Wastewater Monitoring

- Promotion of technical study
- Improvement of absorption well
- Placement of competent person for managing process of wastewater monitoring
- Data Interpretation and Feedback
- Outsourcing of Quality Analysis of Wastewater and Sludge

(3) Conclusions

The Project is concluded as follows:

- The Project has been supporting MARN for 46 months, through joint activities with the counter personnel, especially for the implementation of the Wastewater Regulation that was enacted shortly after the commencement of the Project.
- The Project proposed four strategies for the effective enforcement of the Wastewater Regulation, and in accordance with one of them, an incentive project for industries, the MIMEDE Project was designed and implemented.
- In collaboration with LBNS of MSPAS the wastewater monitoring was carried out for 400 industries, and its results were compiled in a wastewater monitoring report.
- As a management tool for information of wastewater dischargers and water quality of rivers and lakes, an water environmental data base system was developed, and its operation was commenced.
- In collaboration with MINEDUC water environment education materials (a manual and a video) for secondary schools were developed. In order to spread the materials, more than 500 teachers were trained.
- Through the above activities, MARN, which used to have almost zero capacity in terms of wastewater management at the very beginning of the Project, was strengthened as much as the project purpose "MARN's implementation capacity of the Wastewater Regulation for water environment conservation was reinforced" was achieved.
- Since the Project made efforts to approach and involve industrial sectors, the Project won understandings and cooperation from them, for the implementation of

the wastewater monitoring in particular.

- The JICA Project team hopes that the overall goal “The policy of conservation of water resources in the metropolitan area is reinforced.” will be attained through the effective implementation of the Wastewater Regulation.

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LIST OF ANNEXES

ABBREVIATIONS

Abbreviations	English	Spanish	Japanese
Organizaciones			
ACOVA	Community Association of Neighborhood in Action)	Asociación Comunitaria de Vecinos en Acción	行動する地域コミュニティー組合
AID	Agency of International Development	Agencia Internacional para el Desarrollo	国際開発庁
AGISA	Guatemalan Association of Sanitary and Environmental Engineering	Asociación Guatemalteca de Ingeniería Sanitaria y Ambiental	グアテマラ衛生環境工学協会
AMSA	Authority for the Sustainable Management of the Watershed and the Lake Amatitlán	Autoridad para el Manejo Sustentable de la Cuenca y del Lago de Amatitlán	AMSA
ANAM	National Association of Municipalities	Asociación Nacional de Municipalidades	自治体連合
ASORECH	Association of Non Governmental Organizations of Natural Resources and Environment in Chiquimula	Asociación de Organizaciones No Gubernamentales de los Recursos Naturales y el Medio Ambiente en Chiquimula	チキムラ天然資源環境 NGO 協会
ASOREMA	Association of Environmental NGOs in Guatemala	Asociación de ONG Ambientalistas de Guatemala	グアテマラ NGO 連合
BANGUAT	Central Bank of Guatemala	Banco de Guatemala	グァテマラ中央銀行
BCIE	Central American Economic Integration Bank	Banco Centroamericano de Integración Economía	中米経済統合銀行
BID	Inter-American Development Bank	Banco Interamericano de Desarrollo	米州開発銀行
BIRF	International Bank for Reconstruction and Development (WB)	Banco Internacional de Reconstrucción y Fomento	世界銀行
CACIF	Coordinators Committee for the Association of Agriculture, Commerce, Industry and Finance	Comité Coordinador de Asociaciones Agrícolas, Comerciales, Industriales y Financieras	グアテマラ企業連合会
CCAD	Central American Environment and Development Commission	Comisión Centroamericana de Ambiente y Desarrollo	中央アメリカ環境開発委員会
CEMAT	Mesoamerican Center of Studies for Appropriate Technology	Centro Mesoamericano de Estudios sobre Tecnología Apropiada	適切な技術に関するメソアメリカ研究センター
CGP+L	Guatemalan Center of Cleaner Production	Centro Guatemalteco de Producción mas Limpia	グアテマラクリーナープロダクションセンター
CAN	National Water Commission, Mexico	Comisión Nacional del Agua, México	メキシコ国家水委員会
CIG	Industry Chamber of Guatemala	Cámara de Industria de Guatemala	グアテマラ国工業会議所
COCODES	Committee of the Development Councils	Comité de los Consejos de Desarrollo	開発協議委員会
COMACIF	Environmental Management Commission of CACIF	Comisión de Manejo Ambiental de CACIF	同上企業連合会の環境管理委員会

Abbreviations	English	Spanish	Japanese
COMACIG	Environmental Commission of the Chamber of Industry of Guatemala	Comisión del Medio Ambiente de Cámara de Industria de Guatemala	グアテマラ工業会議所環境委員会
COMUDES	Municipal Committee of Development Council Committee	Comité・Municipal del Consejo de Desarrollo	自治体開発協議委員会
CONAF	National Forest Corporation	Corporación Nacional Forestal	国立森林公社（チリ）
CONALFA	National Committee of Alphabetizations	Comisión Nacional del Alfabetización	国家識字率向上委員会
CONAMA	National Environmental Commission	Comisión Nacional del Medio Ambiente	国家環境委員会
CONAP	National Council of Protected Area	Consejo Nacional de Áreas Protegidas	国家保護区委員会
COPECAS	Permanent Committee of Coordination of Water and Sanitation	Comité Permanente de Coordinación de Agua y Saneamiento	上下水道調査委員会
CTUA	Water Use Technology Center	Centro de Tecnología del Uso del Agua	水利用技術センター（アルゼンチン）
EMPAGUA	Guatemala Municipal Water Supply Corporation	Empresa Municipal de Agua de la Ciudad Guatemala	グァテマラ市水道公社
EPA	Environmental Protection Agency, USA	Agencia de Protección Ambiental de Estados Unidos	米国環境保護局
DANIDA	Danish International Development Assistance	Asistencia Danesa Internacional para el Desarrollo	デンマーク国際開発援助
DICADE	Direction of Quality and Development of the Education	Dirección de Calidad y Desarrollo de la Educación	グアテマラ教育省教育開発局
DGCL	General Directorate of Legal Accomplishment	Dirección General de Cumplimiento Legal	グアテマラ環境・天然資源省 法務執行局
DGFOPAS	General Directorate of Formation, Organization and Social Participation	Dirección General de Formación, Organización y Participación Social	グアテマラ環境・天然資源省 教育、組織、社会参加局
DGGARN	General Directorate of Environmental Management and Natural Resources	Dirección General de Gestión Ambiental y Recursos Naturales	グアテマラ環境・天然資源省 環境管理天然資源局
DIGECADE	General Directorate of Educational Quality Management	Dirección General de Gestión de Calidad Educativa	教育品質管理局
DGPEA	General Directorate of Environmental Politics and Strategies, MARN	Dirección General de Politicas y Estrategias Ambientales, MARN	環境天然資源省 環境政策戦略局
FUNDEMABV	Foundation of Defense of Environment of Baja Verapaz	Fundación de Defensa del Medio Ambiente de Baja Verapaz	Baja Verapaz 環境保護団体（NGO）
GOG	Government of Guatemala	Gobierno de Guatemala	グァテマラ国政府
GOJ	Government of Japan	Gobierno de Japón	日本国政府

Abbreviations	English	Spanish	Japanese
IARNA	Agriculture, Natural Resources and Environment Institute	Instituto de Agricultura, Recursos Naturales y Ambiente	農業・天然資源・環境研究所
IBRD (BIRF)	International Bank for Reconstruction and Development (WB)	Banco Internacional de Reconstrucción y Fomento (BM)	世界銀行
IDA	International Development Association	Asociación Internacional de Desarrollo	国際開発協会
IDB	Inter-American Development Bank	Banco Interamericano de Desarrollo	米州開発銀行
IHP	International Hydrological Program	Programa Hidrológico Internacional	国際水文学計画
IMTA	Mexican Institute of Water Technology, Mexico	Instituto Mexicano de Tecnología del Agua, México	メキシコ水工研究所
INA	National Water Institution	Instituto Nacional del Agua	国立水研究所（アルゼンチン）
INAB	National Forest Institute	Instituto Nacional de Bosques	国立森林庁
INE	National Institute of Statistics	Instituto Nacional de Estadística	国立統計庁
INFOM	National Institute of Municipal Development	Instituto Nacional de Fomento Municipal	地方自治振興庁
INSIVUMEH	National Institute of Seismology, Vulcanology, Meteorology and Hydrology	Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología	国立地震火山気象水文庁
INTECAP	Technical Institute of Training and Productivity	Instituto Técnico de Capacitación y Productividad	研修・生産性技術会館
JBIC	Japan Bank for International Cooperation	Banco de Cooperación Internacional del Japón	国際協力銀行
JICA	Japan International Cooperation Agency	Agencia de Cooperación Internacional del Japón	独立行政法人 国際協力機構
KFW	Kreditanstalt für Wiederaufbau (German) German development Bank (English)	Banco Alemán de Reconstrucción (al cual pertenece el Banco Alemán de Desarrollo)	ドイツ復興金融公庫
LBNS	National Health Laboratory	Laboratorio Nacional de Salud	国立保健試験所
MARN	Ministry of Environment and Natural Resources	Ministerio de Ambiente y Recursos Naturales	環境天然資源省
MAVDT	Ministry of Environment, Housing and Territory Development, Colombia	Ministerio de Ambiente, Vivienda y Desarrollo Territorial, Colombia	コロンビア環境住宅国土開発省
MINECO	Ministry of Economy	Ministerio de Economía	経済協力省
MINEDUC	Ministry of Education	Ministerio de Educación	教育省
MINFIN	Ministry of Public Finance	Ministerio de Finanzas Publicas	財務省
MP	Ministry of Public	Ministerio Público	検察庁
MSPAS	Ministry of Public Health and Social Assistance	Ministerio de Salud Pública y Asistencia Social	保健省
OGA	Guatemalan Accreditation Organization	Organización Guatemalteca de Acreditación	グアテマラ認証機関
PREMACA	Regional Environment Program for Central America	Programa Regional de Medio ambiente en C.A.	中央アメリカ地域環境プログラム

Abbreviations	English	Spanish	Japanese
PROMUDEL	Program Municipalities for Local Development	Programa Municipios para el Desarrollo Local	地方開発のための自治体プログラム
RELABSA	National Network of the Health and Environmental Laboratories	Red Nacional de Laboratorios de Salud y Ambiente	保健・環境に携わるラボの全国組織
SAA	Secretariat of Environmental Affairs	Secretaria de Asuntos Ambientales	環境関連事務局
SAT	Tributary Administration Superintendence	Superintendencia de Administración Tributaria	租税管理局
SEGEPLAN	General Secretariat of Economic Planning	Secretaria General de Planificación Económica	経済企画委員会
SIA	Unit of Environmental Information System, MARN	Unidad de Sistema de Información Ambiental, MARN	環境天然資源|省　環境情報システム部
SRH	Secretariat of Hydraulic Resources	Secretaria de Recursos Hidráulicos	水資源庁
URHC	Unit of Water Resources and Watershed	Unidad de Recursos Hídricos y Cuencas, MARN	環境天然資源|省　水資源流域部
URL	Rafael Landivar University	Universidad de Rafael Landivar	ラファエルランディーバル大学
URPP	Unit of Public Relations and Protocol, MARN	Unidad de Relaciónes Publicas y Protocolos, MARN	環境天然資源|省　広報議定部
USAID	United States Agency for International Development	Agencia Internacional de Desarrollo de Estados Unidos	米国国際開発庁
UNESCO	United Nations Educational, Scientific, Cultural Organization	Organización de las Naciones Unidas para la Educación, la ciencia y la Cultura	ユネスコ
UVG	University of Valle de Guatemala	Universidad del Valle de Guatemala	Valle de Guatemala 大学
WB	World Bank	Banco Mundial	世界銀行
WHO	World Health Organization	Organización Mundial de Salud	世界保健機構
Terms			
BOD	Biochemical Oxygen Demand	Demanda Bioquímica de Oxígeno	生物的酸素要求量
CAFTA-DR	Central America-Dominican Republic-United States Free Trade Agreement	Tratado de Libre Comercio Centro América – República Dominicana	中米-ドミニカ共和国-米国自由貿易協定
CITES	Convention on International Trade in Endangered Species of wild flora and fauna	Convención sobre la comercialización de Especies de flora y fauna en peligro de extinción	野生動植物絶滅種の国際貿易に関する協定
COD	Chemical Oxygen Demand	Demanda Química de Oxígeno	化学的酸素要求量
EIA	Environmental Impact Assessment	Evaluación de Impacto Ambiental	環境影響評価
EIRR	Economic Internal Rate of Return	Tasa Interna de Retorno Económico	経済的内部償還率
FIRR	Financial Internal Rate of Return	Tasa Financiera Interna de Retorno	財務的内部償還率
GDP	Gross Domestic Product	Producto Interno Bruto	国内総生産
IEE	Initial Environmental Examination	Evaluación Ambiental Inicial	初期環境影響評価

Abbreviations	English	Spanish	Japanese
ISIC	International Standard Industrial Classification	Clasificación Industrial Internacional Uniforme (CIIU)	国際工業分類基準
MIMEDE	Model of Incentives for Improvement of Performance in Integrated Management of Industrial Wastewater in the Metropolitan Area	Modelo de Incentivos para Mejorar el Desempeño en el Manejo Integrado de las Aguas Residuales de Tipo Especial en el Área Metropolitana	首都圏での産業排水の統合的管理実施状況の改善のための奨励策
NPV	Net Present Value	Valor Presente Neto	順現在価値
O/M	Operation and Management	Operación y Mantenimiento	運転管理
PDM	Project Design Matrix	Matriz de Diseño de Proyecto	ピーディーエム
PO	Plan of Operation	Plan de Operación	ピーオー
TWG	Technical Working Group	Grupo Técnico de Trabajo	テクニカルワーキンググループ
VAT	Value-Added Tax	Impuesto al Valor Agregado (IVA)	付加価値税
WET	Water Education for Teachers	Educación sobre el tema del Agua para Maestros	教員のための水教育
WWTP	Wastewater Treatment Plant	Planta de Tratamiento de Aguas Residuales	汚水処理場

CHAPTER 1

OUTLINES OF THE PROJECT

1.1 Backgrounds of the Project

The Metropolitan Area of the Republic of Guatemala (hereinafter referred to as "Guatemala"), which is a central core of socio-economic activities of the country, has a population of 2.1 million and an area of 1,100 km^2. The area is split into the Motagua River Basin (the Caribbean Sea side) and the Maria Linda River Basin (the Pacific side), and the both river basins and the Amatitlan Lake are facing contamination problems in their water resources.

The Government of Guatemala has been making efforts to mitigate the above water environment problems. In 2000 the government established the Ministry of Environment and Natural Resources (hereinafter referred to as "MARN"), which was given mandates to formulate policies concerning the integrated water environment management.

The administrative capability of MARN before the implementation of this Project was weak in terms of the Current Wastewater Regulation, integrated water resources management, among other issues. The ministry had not execute significant activities for the smooth application of the current water discharges regulation, water quality monitoring and environmental education. Collaboration and coordination with other related organizations such as municipalities, private sectors, non governmental organizations, among others, which is a must for planning and implementation measures for the water environment protection.

With the above background, the Government of Guatemala made a request to the Government of Japan for the implementation of a project for improvement of water quality of Lake Amatitlan. In response to the request, Japan International Cooperation Agency (hereinafter referred to as "JICA") of the Government of Japan dispatched a preliminary study team to Guatemala between August and September 2005. As a result of a series of surveys and discussions, MARN and JICA agreed on the implementation of the Project for Capacity Development for Water Environment Conservation in the Metropolitan Area. Finally JICA selected in March 2006 as consultants for the Project CTI Engineering International Co., Ltd., who formed the Project Team.

1.2 Outlines of the Project

(1) Overall Goal and Project Purpose

Overall Goal: The policy of conservation of water resources in the metropolitan area is reinforced.

Project Purpose: MARN's implementation capacity of the Current Wastewater Regulation for water environment conservation in the Metropolitan Area is reinforced.

(2) Outputs

(0) A system of implementation of the Project is established.

(1) Strategy formulation capacity for effective enforcement of the Current Wastewater Regulation is reinforced.

(2) The system of monitoring, evaluation and follow-up for the implementation of the Current Wastewater Regulation is established.

(3) A sustainable system of compilation and administration for water environmental information is established.

(4) The environmental education and dissemination of aspects related to the Current Wastewater Regulation under collaboration with the municipalities, AMSA, MINEDUC and other governmental and non-governmental organizations is reinforced.

(3) Project Area

The project area is nine municipalities in Guatemala Department: Guatemala, Mixico, Villa Nueva, Villa Canales, Chinautla, San Miguel Petapa, San Pedro Ayampuc, Santa Catarina Pinula and Amatitlan.

(4) Project Organization

Figure 1.2.1 presents the organizational structure for the implementation of the Project.

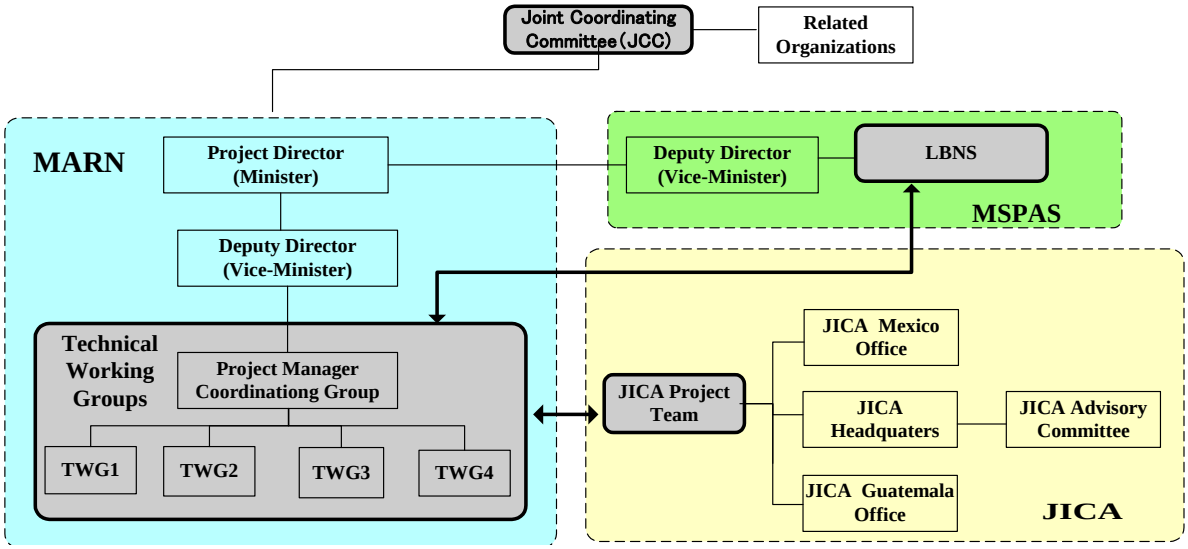


Figure 1.2.1 Organization Chart

The Minister of MARN is Project Director. The Vice Minister in charge of natural resources is Deputy Project Director. The Coordinator of the Unit of Water Resources and Watersheds of MARN is Project Manager.

Project activities have been made by four technical working groups (TWGs) that correspond to the four outputs. Each TWG is composed of 2 to 10 counterparts of MARN and LBNS, supported by JICA experts in charge. There is a Coordinating Group headed by the Project Manager above the four TWGs. The composition of the groups is presented as shown in Table 1.2.1:

Table 1.2.1 Composition of TWGs

Group	Output	Area of Activities	Directions or Units of Members	JICA Experte
Coordination Group	-	Common Activities	URHC	Katayama, Sasaki
TWG1	Output-1	Policy and Strategy	DGPEA, URHC, DGCL	Katayama, Sebastian
TWG2	Output-2	Current Wastewater Regulation (Monitoring)	URHC, DGGARN, LBNS	Kageyama, Joram
TWG3	Output-3	Water Environmental Information	SIA, URHC, DGGARN	Kurata
TWG4	Output-4	Water Environmental Education and Dissemination	DGFOPAS, URHC, URPP	Ito, Sebastian, Sasaki

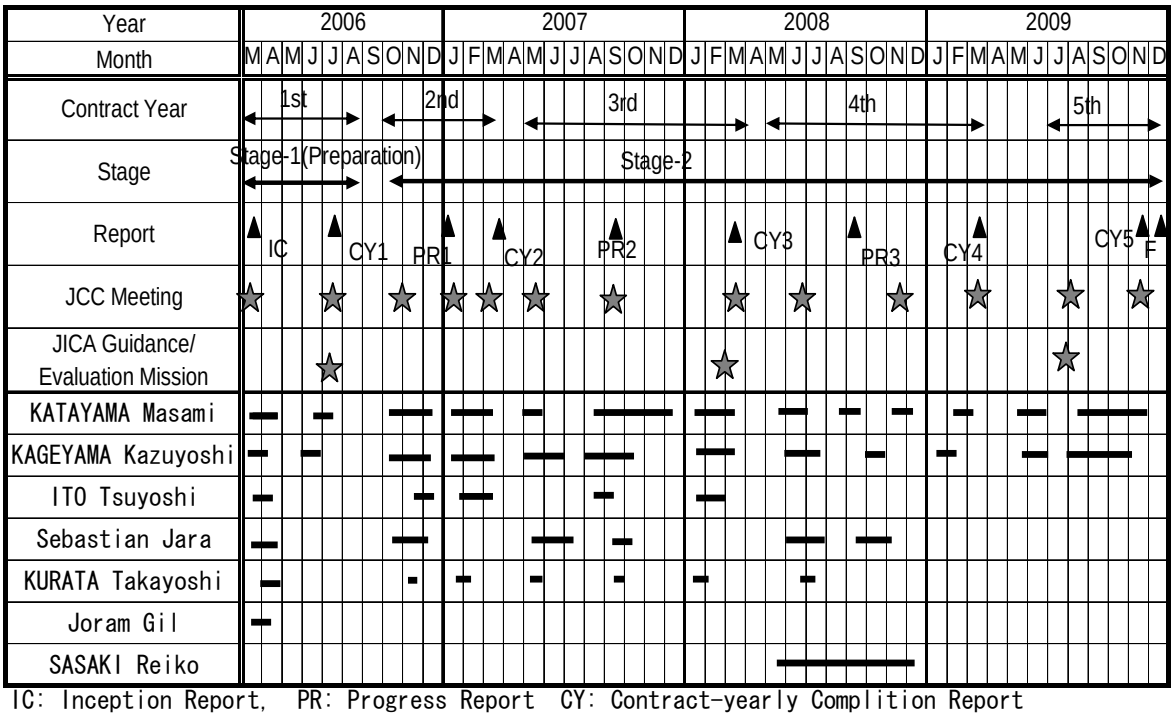
The Ministry of Public Health and Social Assistance (MSPAS) joined the Project in April 2007 as the second counterpart that was in charge of analysis of wastewater and sludge for the wastewater monitoring.

The Joint Coordinating Committee (JCC), chaired by the Project Director, is composed of representatives of MARN, MSPAS and related organizations such as MINEDUC, AMSA, INFOM, CIG, the 9 municipalities, NGOs, among others.

(5) Project Schedule

The total project period is 46 months from March 2006 to December 2009. The project was originally scheduled to end in September 2009, but the project period was extended by three months until December considering that the project was suspended between May and June 2009 due to an influence of the new influenza AH1N1.

The 46 month project period is divided into two stages, namely the first 6 months of the Stage-1 for the preparation of the Project from March 2006 to August 2006, and the rest of 40 months is the Stage-2 for the actual implementation of the Project from October 2006 to December 2009.



IC: Inception Report, PR: Progress Report CY: Contract-yearly Complition Report
FR: Final Report

Figure 1.2.2 Tentative Project Schedule

(6) Staffing Schedule

The members of the JICA Advisory Committee and the Project Team are as listed in Table 1.2.2. The members of the Project Team will be mobilized, as shown in Figure 1.2.2.

Table 1.2.2 Members of JICA Advisory Committee and Project Team

Name	Designation
JICA Advisory Committee	
KAMATA Hiroko	Chairperson (Institution for International Cooperation, JICA)
OMURA Kei	Member (Wastewater Control) (Aichi Prefecture, Japan)
JICA Project Team (Consultant Team)	
KATAYAMA Masami	Team Leader / Policy and Strategy Specialist
KAGEYAMA Kazuyoshi	Water Quality Management / Wastewater Control and Monitoring Specialist
ITO Tsuyoshi	PCM and Environmental Education Specialist
Sebastian G. Jara	Organization and Institution/Environmental Education and Dissemination
KURATA Takayoshi	Water Quality Analysis and Laboratory Specialist, Water Quality Information Specialist
Joram Gil	Contamination Sources Specialist
SASAKI Reiko	Assistance of Environmental Education and Dissemination/Training Program

CHAPTER 2

STRATEGIES AND METHODOLOGIES FOR PROJECT OPERATION

2.1 Strategies for Project Operation

The Project was implemented in accordance with the following three strategies:

- JCC meetings are held frequently to facilitate the collaboration with other related organizations,
- The method of the PCM (Project Cycle Management) is applied for the management of the project, and
- The TWGs shoulder project activities.

2.1.1 JCC Meetings

There are many organizations involved in the implementation of the implementation of the Current Wastewater Regulation. Without collaboration with those organizations, it is very difficult to effectively enforce the regulation. In order to facilitate the collaboration, the JCC meeting was held 13 times in the course of the Project, as frequently as two or three times a contract year. The committee members are representatives from MARN's directions and units, MSPAS, MINEDUC, SEGEPLAN, AMSA, INFOM, EMPAGUA, ERIS-USAC, the nine municipalities, NGOs, etc. Outlines of the 13 meetings are presented in Table 2.1.1.

Table 2.2.1 JCC Meetings

JCC Meeting	Contract Year	Date	No of Participants	Main topics
1st	1st Year	March 29, 2006	32	• Inception Report • Set-up of JCC • Nomination of Counterparts
2nd	1st Year	July 4, 2006	39	• Revision of PDM、PO • Water Environment Management in Aichi, Japan
3rd	2nd Year	November 2, 2006	35	• Activity Plan for 2nd Year
4th	2nd Year	January 23, 2007	39	• Elaboration of PDM_1、PO_1 • Report of Training in Mexico and Colombia
5th	2nd Year	March 12, 2007	26	• Progress of Project • Collaboration with MSPAS for Wastewater Monitoring
6th	3rd Year	May 29, 2007	35	• Activity Plan for 3rd Year • Announcement of Nomination of MSPAS as 2nd Counterpart Agency
7th	3rd Year	September 28, 2007	48	• Progress of Project
8th	3rd Year	March 5, 2008	40	• Result of Midterm Evaluation • Wastewater Management in Aichi, Japan • Progress of Project
9th	4th Year	June 10, 2008	40	• Progress of Wastewater Monitoring • Activity Plan of 4th Year
10th	4th Year	December 3, 2008	116	• Report of Training in Japan • Activities of Mixco Municipality for Wastewater Management • Progress of Project
11th	4th Year	March 9, 2009	15	• Progress of Project • Activity Plan for 5th Year
12th	5th Year	August 6, 2009	35	• Result of Terminal Evaluation • Progress of Project • Request of MARN for 2nd Phase of the Project • Wastewater Management in Aichi, Japan
13th	5th Year	December 3, 2009	30	• Conclusion of Project

2.1.2 PDM and PO -based Project Operation

The PCM (Project Cycle Management) was applied to manage the progress of the Project. Under this method the Project is regarded as a cycle, and monitoring and evaluation of the Project is made

at every phase based on the PDM (Project Design Matrix) and PO (Plan of Operation) to enhance the quality of the Project.

As presented in Table 2.1.1, five versions of PDM and PO were proposed or applied in the course of the Project. PDM_0 and PO_0 is an initial version that was elaborated for the Inception Report by modifying the ones proposed during the Preliminary Study for this Project. The initial version was totally revised into PDM_{01} and PO_{01} at the 2nd JCC Meeting, where it was decided that the Project would focus on the capacity development for the implementation of the Current Wastewater Regulation that was enacted in May 2006. However, PDM_{01} and PO_{01} were still incomplete, missing quantitative target values of some indicators. Finally complete PDM and PO were established as PDM_1 and PO_1 in January 2007 at the 4th JCC Meeting by determining the missing values based on results of a baseline survey conducted between November and December 2006.

In March 2008, PDM_1 and PO_1 were revised again to PDM_2 and PO_2 during the Midterm Evaluation. Main points of the revision are that the capacity development of the counterpart personnel was highlighted, and that a public participation approach of the new government that took office in January 2008 were taken into consideration. PDM_2 and PO_2 were the bases for the activities of the 4th and 5th contract years, and were very slightly revised to PDM_3 and PO_3 in August 2009 in response to the extension of the project period.

The five versions of PDM and PO were presented in Annex-2.

Table 2.1.2 History of PDM and PO

PDM	Time of Preparation/Revision	Points of Revision of PDM	Points of Revision of PDM	Reason for Revision
PDM_0 PO_0	March 2006 （Inception Report）			
PDM_{01} $PO_{0\,1}$	July 2006 （the 2nd JCC Meeting）	The purpose, outputs and activities were totally revised from a viewpoint of strengthening of the implementation of the Current Wastewater Regulation. However, target values of some quantitative indicators were yet to be set up.	The sub-activities of the PO were also totally revised in order to strengthen the implementation of the Current Wastewater Regulation.	It was decided at the 2nd JCC Meeting that the Project would focus the implementation of the Current Wastewater Regulation (the Government agreement 236-2006) that was enacted in May 2006.
PDM_1 PO_1	January 2007 （The 4th JCC Meeting）	The outputs and indicators were mainly modified to ensure the capacity development.	The outputs and indicators were mainly modified to ensure the capacity development.	Since a baseline survey of the missing PDM indicators was conducted between November and December 2006, it became ready to determine the target values of the indicators.
PDM_2 PO_2	March 2008 （Midterm Evaluation）	The outputs and indicators were mainly modified to ensure the capacity development of counterpart personnel.	Several new sub-activities were added to ensure the capacity development of the counterpart personnel and to incorporate a public participation approach of the new government.	The Midterm Evaluation required revision of the PDM and PO to highlight the capacity development of the counterpart personnel and to incorporate a public participation approach of the new government.
PDM_3 PO_3	August 2009 （Terminal Evaluation）	The project period was extended.	The terms of the sub-activities were extended.	It was decided at the 12th JCC Meeting that the Project period would be extended until December 2009.

2.1.3 TWG-based Activities

Activities and sub-activities described in the PO were executed by the TWGs that are corresponding to the four outputs. The coordinating group, co-headed by the Project Manager and the Leader of the

JICA Project Team, coordinated and supervised the group activities. Name, direction/unit and assignment period of each of the TWG members is presented in Annex-3.

The total number of the TWG members is as many as 38, but the average actual operational members were about 15. More than half of the members already quitted MARN or LBNS in the project period mainly due to expiration of their short-term employment contracts. On the other hand MARN has been changing the employment contracts of its employees from short-term ones to permanent ones since 2009. It is expected that this change will contribute to not only decrease of the frequent employee changes but also to enhancement of the Project sustainability.

Each TWG, under the initiative of the JICA experts, prepared more detailed activities plans in accordance with the PO and implemented it. While the JICA experts were in Guatemala, the TWG members met almost once a week to confirm the progress of tasks of each member. In the 4th and 5th contract year's joint meeting by representatives of the four TWGs and the coordinating group was also held to share information of the activities of the four groups almost every month.

2.2 Methodologies of Project Operation

The flow of the Project is presented in Figure 2.2.1, and applied methodologies of each contract year are described as below:

2.2.1 1st Contract Year (March to August 2006)

(1) [A] Works in Japan

a) [A-1] Collection and Analysis of Available Data and Information

To smoothly implement the subsequent fieldwork, the JICA Project Team has collected, compiled and analyzed available data and information related to the Project.

b) [A-2] Evaluation of Strategies and Operation Plan of the Project

The JICA Project Team has examined the strategies, contents and methodologies of the Project.

c) [A-3] Preparation of Inception Report

The JICA Project Team has reviewed data, reports and publications obtained from JICA Preparatory Study Team and other agencies concerned. This Inception Report contains the backgrounds, strategies, work items, work schedule, staffing and methodologies of the Project, and the undertakings of both the governments.

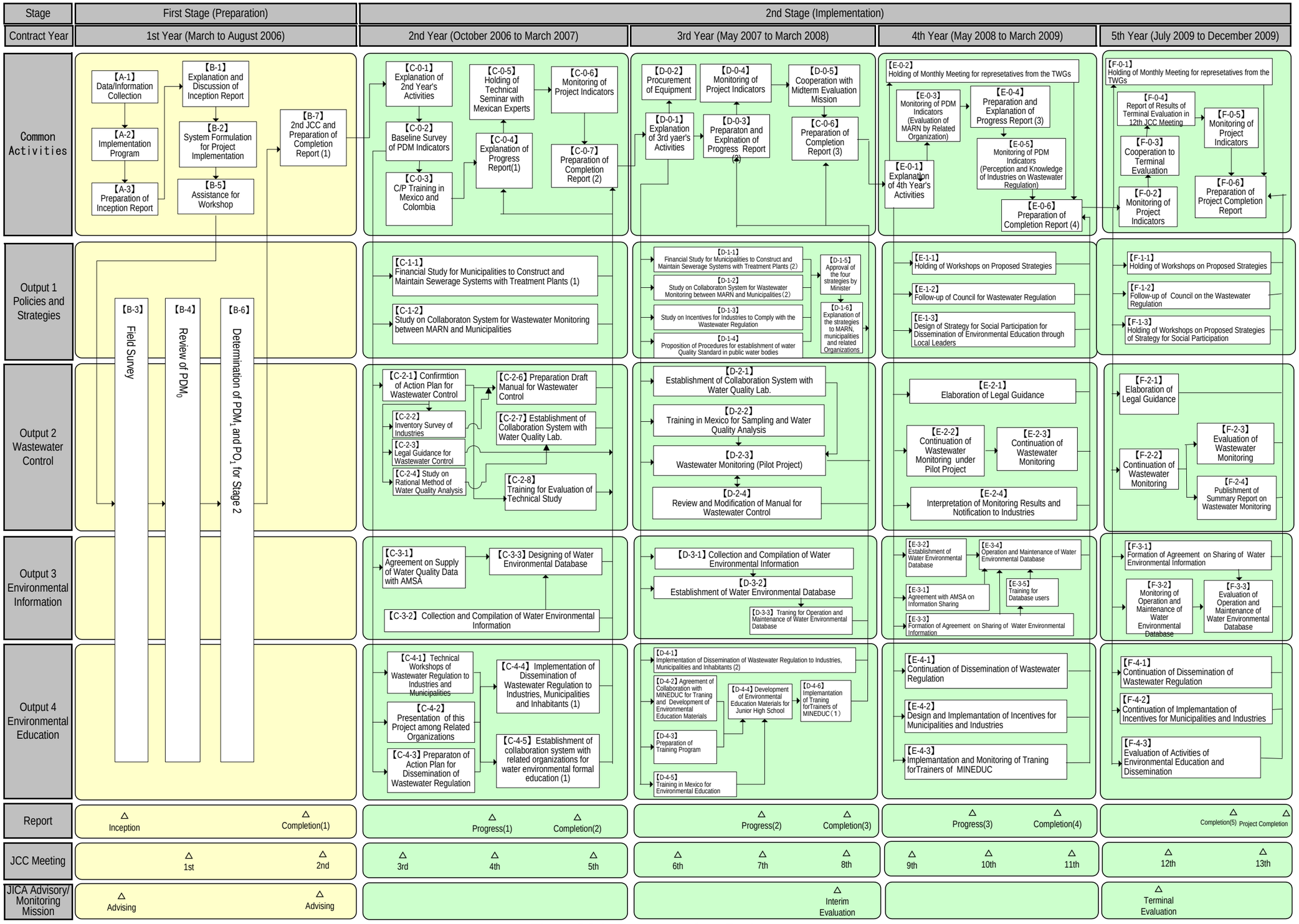


Figure 2.2.1 Flowchart of the Project

(2) [B] Works in Guatemala

a) [B-1] Presentation and Discussion of the Inception Report

The JICA Project Team presented the Inception Report to MARN and other agencies concerned and explained the strategies, project components, work schedule, staffing and methodologies of the Project. The Inception Report was accepted by the Joint Coordinating Committee (JCC) on 29 March 2006.

b) [B-2] Confirmation and Establishment of the Project Implementation System

For establishing proper implementation system of the Project, the JICA Project Team confirmed the following items:

- Confirmation of undertakings of both Governments,
- Assignment of the counterpart personnel, and
- Operation and management of JCC based upon Record of Discussion (D/D).

c) [B-3] Field Reconnaissance

The JICA Project Team conducted field reconnaissance survey with counterpart personnel. The field reconnaissance survey included observation of the present conditions and interview with residents in an effort to learn changes and trends of water environment in recent years.

d) [B-4] Review of Project Design Matrix (PDM)

MARN, who succeeded in enactment of the Current Wastewater Regulation (Governmental Agreement No. 236-2006), requested the JICA Project Team to develop the Project in harmony with MARN's programs concerning the implementation of the Current Wastewater Regulation, as described in 9) of the Minutes of Meetings of the 1st JCC Meeting dated 29 March 2006 (see Annex-1).

In due consideration of the request, PDM (Project Design Matrix) and PO (Plan of Operation) presented in the Inception Report were reviewed through a series of discussions with the counterparts of MARN.

e) [B-5] Supports for Workshops

Two workshops were held in this stage under the supports of the JICA Project Team. A PCM (Project Cycle Management) workshop was held on 6 April 2006 with participation of 43 people from MARN and related organizations. On 21 April 2006 a capacity assessment workshop was held with participation of eight (8) of the fourteen (14) counterparts.

f) [B-6] Preparation of PDM_{01} and PO_{01} for Stage 2

The PDM and PO for Stage-2 were revised through the reviewing of [B-4]. Several activities related to the implementation of the Current Wastewater Regulation were incorporated into the PDM_{01} and PO_{01}. However, PDM_{01} and PO_{01} were still incomplete, missing quantitative target values of some indicators.

g) [B-7] The 2nd JCC Meeting and Preparation of Completion Report

The PDM_{01} and PO_{01} were approved by the JCC at the 2nd JCC Meeting held on 4 July 2006. The JICA Project Team prepared the Completion Report by compiling all activities during the 1st contract year, and submitted it to MARN.

(1) [A] Works in Japan

a) [A-1] Collection and Analysis of Available Data and Information

To smoothly implement the subsequent fieldwork, the JICA Project Team has collected, compiled and analyzed available data and information related to the Project.

2.2.2 2nd Contract Year (October 2006 to March 2007)

(1) [C-0] Common Works

a) [C-0-1] Explanation of Proposed Activities for the 2nd Year

The 3rd JCC meeting was held on Thursday, November 2, 2006, to give an explanation on proposed activities for the 2nd year.

b) [C-0-2] Determination of Quantitative Targets of PDM Indicators based on Baseline Survey

Baseline data before the implementation of the project, including score of capacity assessment, percentages of perception of MARN and the Current Wastewater Regulation among the municipalities, industries and inhabitants, etc, were surveyed through capacity assessment and interviews.

Based on the results of the baseline survey, quantitative target values of the missing PDM indicators were determined. Accordingly the PDM and PO were completed as PDM_1 and PO_1, which were approved in the 4th JCC Meeting on January 23, 2007.

c) [C-0-3] Counterpart Training in Mexico and Colombia

Counterpart training programs in Mexico and Colombia were implemented respectively from November 5 to November 11 and from November 26 to December 2 in cooperation with CNA and MAVDT. 4 trainees of the MARN counterparts participated in the wastewater control training programs that were arranged by the Mexican and Colombian agencies.

d) [C-0-4] Preparation of Progress Report

The progress of all activities through the middle of December 2006 were described in this Progress Report (1), which was presented in the 4th JCC meeting in January 23, 2007. e)[C-0-5] Holding of Technical Seminar with Invitation of Mexican Experts

In addition to the training programs in Mexico and Colombia, a technical seminar on water environment management and water environmental education with Mexican experts from IMTA as lectures was held in February 2007 with a total of 35 participants from MARN, the related organizations and the municipalities.

f) [C-0-6] Monitoring of PDM Indicators

The project indicators in the PDM were monitored to verify the progress of the project, although only five months have passed since the implementation of this Project substantially started in October 2006. It was confirmed that the project was going on almost as scheduled.

g) [C-0-7] Monitoring of PDM Indicators

All activities in the 2nd contract year were complied in the Completion Report(2), of which contents were presented in the 5th JCC meeting in March 2007.

(2) [C-1] Output-1

a) [C-1-1] Financial Study for Municipalities in Connection with Construction and Operation/Maintenance of Sewerage System with Treatment Plant

This preliminary study aims to propose a financial framework for the development of sewerage system with treatment plants. In the 2nd contract year following studies were made:

- Selection of Guatemala and Santa Catarina Pinula Municipalities as model municipalities;
- Data/Information Collection from the two municipalities;
- Study on cost for development and operation and maintenance of sewerage system with treatment plants;
- Interview survey to inhabitants on willingness to pay for sewerage system;
- Data/information collection on possible financial sources;
- Preliminary Financial Analysis; and
- Observations.

b) [C-1-2] Establishment of Mutual Collaboration System with Municipalities for Wastewater Monitoring

As a first step of the study, responsibilities of the municipalities for the implementation of the Current Wastewater Regulation were identified. Then a SWOT analysis was made for MARN and the municipalities in terms of the implementation of the Current Wastewater Regulation. Based on the results of the SWOT analysis, future possibilities of MARN and the municipalities were also discussed in the TWG1.

(3) [C-2] Output-2

a) [C-2-1] Confirmation of Proposed Activities for Implementation of the Current Wastewater Regulation

Activities proposed in the PDM and PO were reconfirmed with MARN at the beginning of the second stage.

b) [C-2-2] Inventory Survey for Industrial Factories

Lists of industries have been collected from AMSA, INFOM, INE, Banco de Guatemala and a few municipalities. About 1,500 significant industries are being

selected and compiled into a table from the lists, considering the type of activities and number of employees.

c) [C-2-3] Preparation of Legal Guidance of the Current Wastewater Regulation

Concrete procedures for sanctions and monitoring are not clearly described in the current regulation, the lawyers of MARN prepared a legal guidance. The JICA Project Team monitored this work.

d) [C-2-4] Study on Rational Way for Water Quality Analysis

MARN had a plan to establish its own water quality laboratory. On the other hand commissioning to other organization or renting lab were also considered as alternative plans to the own laboratory plan.

As a result of the cost survey, it was concluded that signing an agreement with the laboratory of MSPAS was the most feasible option for the water quality analysis.

e) [C-2-5] Preparation of Draft Manual for the Current Wastewater Regulation

Information useful for Preparation of a manual for the Current Wastewater Regulation was collected from Mexico and Colombia through the training program of C-0-3.

f) [C-2-6] Establishment of Partnership with a Competent Agency for Water Quality Analysis

The water quality and sludge analysis for the monitoring of the pilot project was implemented since May 2007. An agreement for the commissioning was being finalized by MARN, MSPAS and the JICA Project Team.

g) [C-2-7] Training for Evaluation of Technical Study

The guideline for the evaluation of the technical study was elaborated by MARN in coordination with the Industrial Chamber. Between 5 and 9 March 2007, MARN held a five-day workshop for bringing-up human resources capable of evaluation of the technical study, using the elaborated guideline, and in that event participated 30 consultants.

(4) [C-3] Output-3

a) [C-3-1] Agreement with AMSA for Supply of Water Quality Data

Water quality monitoring data of AMSA were supposed to be incorporated into the database system of this Project. In return the database system would provide processed information of water quality as well as wastewater control information in the Metropolitan area to related organizations including AMSA. To secure regular data supply from AMSA to MARN, an agreement between the two organizations might be necessary. However, negotiation for the agreement had not been started yet because transfer of AMSA under MARN was now being deliberated in the Congress.

b) [C-3-2] Collection and Compilation of Water Environmental Information

Digital maps that could be base maps of the database system were being collected from MAGA. Water quality monitoring data of AMSA were also continued to be collected.

c) [C-3-3] Design of Database for Water Environmental Information

The structure of the database system was tentatively designed through discussions in the Technical Working Group 3 (TWG3) and the work specifications for database development were also determined. In addition, hardware and software required for the database development were defined.

(5) [C-4] Output-4

a) [C-4-1] Technical Workshops of the Current Wastewater Regulation by MARN and CIG

Guidance activities of MARN and Chamber of Industry for the technical study of the Current Wastewater Regulation were monitored and considered for elaboration of an action plan for dissemination activities of the Regulation at【C-4-3】.

b) [C-4-2] Presentation of the Project among Related Organizations for Promoting their Collaboration

The TWG4 visited the 9 municipalities in the Project Area to request them to participate in dissemination activities of the Current Wastewater Regulation.

c) [C-4-3] Preparation of Action Plan for Dissemination/Environmental Education Related to the Current Wastewater Regulation

Based on the consideration results at 【C-4-1】and 【C-4-2】, TWG4 discussed effective activities for the dissemination and environmental education to elaborate an action plan for dissemination and environmental education in the Guatemala Metropolitan Area related to the Current Wastewater Regulation.

d) [C-4-4] Implementation of Dissemination/Environmental Education Activities for Industries, Municipalities, and the Residents related to the Current Wastewater Regulation

In accordance with the action plan, the TWG4 discussed the messages and design of the dissemination materials such as TV and radio spots, poster, sticker, newspaper advertisement, and banner for Current Wastewater Regulation. Then, the final products were prepared by commissioning to a private agency.

The dissemination activity was inaugurated on 31 January 2007 at the Technical Institution of Training and Productivity with some 130 participants. Following the inauguration ceremony, dissemination workshops with municipality officials, industries, and the local residents were held at five municipalities of the Project Area in February 2007.

e) [C-4-5] Establishment of Collaboration System with Related Organizations for Water Environmental Formal Education

As the preparation activity for the formal water environmental education that was planned for the 3rd contract year, several discussions were made in March 2007 between the members of TWG4 and officials of MINEDUC.

2.2.3 3rd Contract Year (May 2007 to March 2008)

(1) [D-0] Common Works

a) [D-0-1] Explanation of Proposed Activities for the 3rd Year

The 6th JCC meeting was held on Tuesday, May 29, 2007, to give an explanation on the proposed activities for the 3rd year plan.

b) [D-0-2] Procurement of Equipment

The JICA Project Team was engaged in the procurement of equipment necessary for activities of the Project.

c) [D-0-3] Preparation and Explanation of Progress Report

The progress of all activities through the middle of September 2007 were compiled in this Progress Report (2), contents of which were presented in the 7th JCC meeting in 28 September 2007.

d) [D-0-4] Monitoring of PDM Indicators

Prior the Midterm Evaluation of the Project, the JICA Project Team conducted the capacity assessment and the interview survey on the perception of MARN and the Current Wastewater Regulation among inhabitants, industries and municipalities in the same way as the 2nd contract year.

e) [D-0-5] Explanation of Proposed Activities for the 3rd Year

The Midterm Evaluation of the Project was made between 19 February and 6 March. The JICA Project Team provided necessary information about the Project and also participated in discussions and workshops for the project evaluation.

f) [D-0-6] Preparation of Completion Report

The progress of all activities in the 3rd contract year was compiled in the Completion Report (3), contents of which were presented in the 8th JCC meeting in 5 March 2008.

(2) [D-1] Output-1

a) [D-1-1] Financial Study for Municipalities to Construct and Maintain Sewerage System with Treatment Plants

Four measures to improve the financial situations of the municipalities for development sewerage systems with treatment plants were proposed.

b) [D-1-2] Study on Collaboration System for Wastewater Monitoring between MARN and Municipalities

Necessity of collaboration between MARN and municipalities was confirmed and an action plan for realizing the collaboration was also proposed.

c) [D-1-3] Study on Incentives for Industries to Comply with the Current Wastewater Regulation

Urgent incentive instruments that could be implemented with less time and cost were proposed to induce industries, to comply with the Current Wastewater Regulation. In addition, some measures that Guatemala should consider in middle and/or long term basis for the promotion of compliance of industries were discussed.

d) [D-1-4] Proposition of Procedures for Establishment of Environmental Quality Standards for Public Waters

Necessity of EQSs (Environmental Quality Standards) was confirmed and a general procedure for elaboration of the EQSs was also proposed.

e) [D-1-5] Approval of the Four Strategies by Minister

The proposed draft four strategies were approved by the former Minister of Environment and Natural Resources on 11 January 2008.

f) [D-1-6] Explanation of the Strategies to MARN, Municipalities and Other Related Organizations

The proposed draft four strategies were also submitted to the new Minister on 22 January, and were also presented in the Forum for Discussion on the Current Wastewater Regulation on February 21, 2008.

(3) [D-2] Output-2

a) [D-2-1] Establishment of Collaboration System with Water Quality Laboratory

Following the 2nd year, efforts of the personnel concerned were continued to establish collaboration system with LBNS for the water and sludge analysis of the wastewater monitoring. It was agreed by the Minutes of Meetings dated April 30, 2007 among MARN, MSPAS, JICA, SEGEPLAN and the JICA Project Team that MSPAS became the second counterpart for this Project. Then finally the three parties, MARN, MSPAS and the JICA Project Team reached an agreement (Convenio) on responsibilities of each party for the implementation of the wastewater monitoring under this Project on May 28.

b) [D-2-2] Training in Mexico for Sampling and Water Quality Analysis

Prior to the commencement of the monitoring activities, two counterparts of the TWG2 were dispatched to IMTA for three weeks between 20 May and 9 June 2007 to learn theoretical and practical aspects of discharge measurement and sampling of wastewater.

c) [D-2-3] Wastewater Monitoring as Pilot Project

The wastewater monitoring was commenced at the middle of July 2007 in accordance with the above-mentioned agreement. As of the middle of March 2008, wastewater sampling and water quality analysis was completed for about 140 industries, much less than 200 industries of the original target number for the Pilot Project.

d) [D-2-4] Review and Modification of Manual for Wastewater Control

The manual for wastewater control was elaborated through negotiations with COMACIF, and was announced in January 2008.

(4) [D-3] Output-3

a) [D-3-1] Collection and Compilation of Water Environmental Information

In January 2008 the new Minister of MARN and the Executive Director of AMSA verbally agreed about continuous supply of continuous supply of water quality data of the rivers and the Amatitlan Lake from AMSA to MARN. However, it was still desirable to exchange an official document between the two institutions to reinforce the above vebal promise, although AMSA continued to supply data to MARN on a friendly basis.

Orthophoto maps were collected from MAGA in May 2007.

b) [D-3-2] Establishment of Water Environmental Database

The establishment of the water environmental database was entrusted in May 2007 to a local agency. The development was behind the original schedule. A prototype database was completed but its expansion to a full-scale one was still in the process of being constructed, expected to get ready in the early stage of the 4th contract year.

(5) [D-4] Output 4

a) [D-4-1] Implementation of Dissemination of Current Wastewater Regulation to Industries, Municipalities and Inhabitants

Dissemination workshops were held at the remaining four municipalities where such workshop was not held in the 2nd year.

TV spot on the Current Wastewater Regulation was aired by local TVs between May and August 2007. On February 12, 2008 a forum titled “Mechanisms for bettering wastewater quality in Guaemala was held with 135 attendants from governmental and non-governmental sectors. In addition, another forum titled “Discussions on the Current Wastewater Regulation (Reglamento de Descargas y Reuso de Aguas Residuales y Disposición de Lodos Acuerdo Gubernativo No.236-2006) was also held on 21 February, 2008 with 74 attendants.

b) [D-4-2] Agreement of Collaboration with MINEDUC for Training and Development of Environmental Education Materials

On January 10, 2008, MARN, MINEDUC and the JICA Project Team reached a collaboration agreement for training and development of environmental education materials, although the collaboration works at the practical level had already started as early as January 2007.

c) [D-4-3] Preparation of Training Program

The TWG4 members were continuing discussions about the training program for trainers for secondary school teachers with MINEDUC.

2.2.4 4th Contract Year (May 2008 to March 2009)

(1) [E-0] Common Works

a) [E-0-1] Explanation of 4th Year's Activities

The 9th JCC meeting was held on Tuesday, June 10, 2008, to give an explanation on the proposed activities for the 4th year.

b) [E-0-2] Holding of Monthly Joint Meeting

Joint meeting by representatives from all the four TWGs and the coordinating group was held nine times, almost every month (May 28, June 28, July 18, September 5, October 3, October 27, December 9, February 6, March 10), to facilitate sharing of information about the progress of activities of all the four groups.

c) [E-0-3] Monitoring of PDM Indicators (Evaluation of MARN by Related Organizations)

A questionnaire survey to officials of the related organizations was made to monitor their evaluation on MARN in terms of their performances related to wastewater control.

d) [E-0-4] Preparation of Progress of the Project

The Progress Report was prepared, compiling project activities and their outputs obtained until mid-September. The report was submitted to the Guatemalan Side in November 2008.

e) [E-0-5] Monitoring of PDM Indicators (Perception and Knowledge of Industries on Current Wastewater Regulation)

As in the 2nd and 3rd years, a telephone interview survey on perception and knowledge of industries on the Current Wastewater Regulation was conducted in February 2009.

f) [E-0-6] Preparation of Completion Report

The Completion Report (4) was prepared, based on presentations and discussions made in the 11th JCC Meeting held on March 9, 2009.

(2) [E-1] Output-1

a) [E-1-1] Workshops on Draft Strategies

Workshops on the draft strategies that were elaborated in the 3rd year had been suspended because revising of the Current Wastewater Regulation was being discussed in a MARN-led council as described herein after. It was suggested that these workshops be held in the 5th year.

b) [E-1-2] Follow-up of Council for Revision of the Current Wastewater Regulation

MARN set up a council comprised of technical experts from related organizations for the revision of the present Current Wastewater Regulation. The JICA Project Team followed up discussions in the council and presented its observations when requested by MARN. A draft of the revision was compiled by the council in January 2009, and would be subject to discussions with stakeholders.

c) [E-1-3] Design of Strategy for Social Participation to Disseminate Water Environmental Education

A NGO was entrusted to conduct a basic study for elaboration of a strategy for social participation for promotion of water environmental education, in accordance with the TOR that was prepared by the TWGs 1 and 4. The NGO submitted to the TWGs the final report in March 2009.

(3) [E-2] Output-2

a) [E-2-1] Elaboration of Legal Guidance

Since the Current Wastewater Regulation was being discussed toward its revision in the activities of E-1-2, the elaboration of the legal guidance for the Current Wastewater Regulation had been suspended since the Government Change.

b) [E-2-2] Wastewater Monitoring under Pilot Project

MARN completed the wastewater monitoring for 200 industries at the beginning of June 2008 under the pilot project based on the trilateral agreement among MARN, MSPAS and the JICA Project Team.

c) [E-2-3] Continuation of Wastewater Monitoring

The PDM requires MARN to conduct with its own resources the monitoring for 200 industries more, in addition to the 200 industries under the pilot project, by September 2009 at the expense of itself. It was in the middle of November 2008 that MARN could restart the wastewater monitoring by tentatively using the remains of reagents that was purchased by the JICA Project Team for the pilot project.

Regarding the water quality analysis after the remains of reagents finish, MARN and MSPAS reached an agreement on February 13, 2009.

(4) [E-3] Output-3

a) [E-3-1] Establishment of Agreement with AMSA for Information Sharing

On February 13, 2009, the same day as the MARN-MAPAS agreement, the Agreement on data/information sharing was made finally between MARN and AMSA.

b) [E-3-2] Establishment of Water Environmental Database

The full-scale water environmental database was finally completed in July 2008 by a local agency after repeated system inspections.

c) [E-3-3] Agreement for Water Environmental Information Sharing

The PO (Plan of operation) requires the Project to reach an agreement on sharing of water environmental information with the other related organizations as well. EMPAGUA and INFOM who are conducting water quality monitoring for potable water supply were regarded as the probable partners.

d) [E-3-4] Operation and Maintenance of Database

SIA of MARN had been engaged in the maintenance of the database system. URHC of MARN was inputting data of the evaluation of the technical studies and of the

wastewater monitoring. As of March 1, the evaluation data of 109 industries and the monitoring data of 187 industries had been stored in the database. In accordance with the agreement dated 13 February 2009 between MARN and AMSA, AMSA also begun to start inputting water quality data of the Amatitlan Lake and its tributaries. Due to repeated system modification, however, system troubles began to take place.

e) [E-3-5] Training for Database Users

Under the initiative of the TWG3 members, training for the operation of the database system were conducted to the staff of URHC and those of AMSA in the workshops in July and August.

(5) [E-4] Output-4

a) [E-4-1] Continuation of Dissemination of Current Wastewater Regulation to Industries, Municipalities and Inhabitants

MARN is concerned about low perception and poor knowledge of industries about the Current Wastewater Regulation that has been revealed by the telephone interview surveys under this project. With the objective to disseminate the current waste water regulation, MARN held four workshops in February 2009 to socialize the Current Wastewater Regulation.

b) [E-4-2] Designing of Incentives for Municipalities and Industries

A project titled MIMEDE, "Modelo de Incentivos para Mejorar el Desempeño en el Manejo Integrado de las Aguas Residuales de Tipo Especial en el Área Metropolitana" was inaugurated on March 5, 2009. This is a pilot project that aims to utilize potential influence of the public to industries. MARN would rate the performance of industries in terms of wastewater management, and would recognize highly rated ones. In this way, industries were expected to be encouraged and/or guided to improve their environmental performance under watch of citizens, customers and investors.

c) [E-4-3] Implementation and Monitoring of Training for Trainers

Using education materials (Manual and Video) developed in collaboration with MINEDUC, a workshop was held on February 13, 2008 to discuss how to utilize these materials effectively. Some 40 school teachers in total participated at the workshop, and then they held other workshops to further disseminate to their colleagues what they learnt. The TWGs 1 and 4 conducted a follow-up survey on these secondary workshops with MINEDUC.

2.2.5 5th Contract Year (July 2009 to December 2009)

(1) [F-0] Common Works

a) [F-0-1] Holding of Joint Group Meeting

Joint meeting by representatives from all the four TWGs and the coordinating group was held two times (August 10 and November 27) to facilitate sharing of information about the progress of activities of all the four groups.

b) [F-0-2] Monitoring of PDM Indicators

In order to monitor the PDM indicators as of the Terminal Evaluation, the capacity assessment and the questionnaire surveys were conducted between July and August in the same way as before.

c) [F-0-3] Cooperation for Terminal Evaluation

The JICA Project Team cooperated with MARN and the Japanese Terminal Evaluation Team for the smooth implementation of the Terminal Evaluation between July and August.

d) [F-0-4] Holding of the 12th JCC Meeting

The 12th JCC Meeting was held on August 6 to present results of the Terminal Evaluation. In addition it was decided that the Project Period would be extended by 3 months until December 2009.

e) [F-0-5] Monitoring of PDM Indicators

In order to monitor the PDM indicators as of the end of the Project, the capacity assessment and the questionnaire surveys were conducted again in November 2009.

f) [F-0-6] Conclusion of the Project

On December 3 the 13th JCC meeting was held to conclude the Project. Based on the discussions in the meeting, this Project Completion Report was compiled as well as the Completion Report (5).

(2) [F-1] Output-1

a) [F-1-1] Workshops on Draft Strategies

The workshop on the draft strategies that had been suspended since the 4th year was held on November 12. Observation on the draft strategies were collected from the participants form MARN and the related organizations.

b) [F-1-2] Follow-up of Movement for Revision of the Current Wastewater Regulation

MARN modified the last version of the revision of the Current Wastewater Regulation again in consideration of suggestions from EPA (USA). Related organizations were consulted in November about the draft revision, and it would be modified again before discussions in January and February with the major stakeholders, industrial sectors and municipalities.

c) [F-1-3] Presentation of Strategy for Social Participation

The draft strategy for social participation for dissemination of water environmental education was also presented at the workshop of [F-1-1].

(3) [F-2] Output-2

a) [F-2-1] Elaboration of Legal Guidance

The JICA Project Team has been following the elaboration of the legal guidance for the Current Wastewater Regulation. In July the draft version that was elaborated in the 3rd year was modified. It will be finalized in accordance with the revision of the Current Wastewater Regulation.

b) [F-2-2] Continuation of Wastewater Monitoring Related Activities

MARN has been implementing the monitoring related activities on its own initiative since the completion of the pilot project in the 4th year. MARN completed the wastewater monitoring for 200 industries by the middle of November.

c) [F-2-3] Evaluation of System of Wastewater Monitoring and Interpretation

The system for the wastewater monitoring and the interpretation of its results was evaluation by examining the monitoring related activities. Based on this evaluation, modification of the wastewater manual made in [D-2-4] was proposed.

e) [E-2-4] Preparation of Wastewater Monitoring Report

The Wastewater Monitoring Report was elaborated by the TWG2 and was presented at the award ceremony of the MIMEDE Project on November 30. The report includes evaluation and interpretation results of the 400 industries subjected to the wastewater monitoring.

(4) [F-3] Output-3

a) [F-3-1] Agreement for Water Environmental Information Sharing

MARN has been discussing with EMPAGUA about sharing of water environmental information. A draft agreement is being examined by EMPAGUA.

b) [F-3-2] Operation and Maintenance of Database

Since system troubles arose for the database in the 4th year, the database system was corrected and improved by a local agency under the supervision of SIA. The database is being regularly updated as the TWG2 and AMSA input data.

c) [F-3-3] Evaluation of Operation and Maintenance of Database

A workshop was held on November 20 with members of TWGs 2 and 3, and AMSA to evaluate the operation and maintenance of the database.

(5) [F-4] Output-4

a) [F-4-1] Continuation of Dissemination of the Current Wastewater Regulation to Industries, Municipalities and Inhabitants

The TWG2 and TWG4 continued to make efforts for the dissemination of the Current Wastewater Regulation by utilizing such any opportunities like the workshop for the draft strategies.

b) [F-4-2] Implementation of MIMEDE Project

The MIMEDE project was implemented to encourage and stimulate industries for compliance with the Current Wastewater Regulation. In conclusion, only one industry was awarded as water-environmentally friendly company at the award ceremony on November 30, although three industries applied for the MIMEDE project.

c) [F-4-3] Implementation and Monitoring of Training for Trainers

On July 28 the TWG4 members and some 15 school teachers gathered to evaluate all the activities and the environmental education materials made under the collaboration between MARN and MINEDUC.

CHAPTER 3

ACHIEVEMENTS OF THE PROJECT

3.1 Inputs

3.1.1 Inputs by Japanese Side

The inputs by the Japanese side are categorized to dispatch of JICA experts, overseas training for counterpart personnel, equipment and materials, and local expenses for project operation. Details of these items are presented in Annex-3, and described as follows:

Table 3.1.1 Input by Japanese Side

Item	Quantity of Input
Dispatch of JICA Experts	71.33 months of JICA experts in total (70.83 months in Guatemala and 0.50 months in Japan) were input for the Project.
Overseas Training for Counterparts	19 counterparts in total were dispatched to training in Japan or third countries.
Equipment and Materials	A vehicle for wastewater sampling, equipment for water analysis, reagents, office equipment (computers, tables, chairs), etc that are worth 10 million Japanese yen in total were donated to the Guatemalan side, consumed already or are being used for the Project.
Local Expenses for Project Operation	The expenses for the activities of the JICA experts totaled about 57 million Japanese yen.

(1) Dispatch of JICA Experts

Assignment period by JICA expert is presented in Table 3.1.1. The total assignment period is 71.33 months, 70.83 months for works in Guatemala and 0.50 months is for those in Japan.

Table 3.1.2 Input by Japanese Side

Name of Expert	Assignment	Assignment Period (Month)		
		In Guatemala	In Japan	Total
KATAYAMA Masami	Team Leader / Policy and Strategy Specialist	20.97	0.50	21.47
KAGEYAMA Kazuyoshi	Water Quality Management / Wastewater Control and Monitoring Specialist	19.00	0.00	19.00
ITO Tsuyoshi	PCM and Environmental Education Specialist	6.13	0.00	6.13
Sebastian G. Jara	Organization and Institution/Environmental Education and Dissemination	11.73	0.00	11.73
KURATA Takayoshi	Water Quality Analysis and Laboratory Specialist, Water Quality Information Specialist	5.07	0.00	5.07
Joram Gil	Contamination Sources Specialist	1.00	0.00	1.00
SASAKI Reiko	Assistance of Environmental Education and Dissemination/Training Program	6.93	0.00	6.93
	Total	70.83	0.50	71.33

(2) Overseas Training for Counterpart Personnel

A total of 19 counterparts were sent to Japan, Mexico, Columbia, Argentina, or Chile for training programs designed originally for this Project (14 counterparts) or for conventional training programs of JICA (5 counterparts). Table 3.1.3 gives outlines of the original training programs.

Table 3.1.3 Training Programs Originally Designed for the Project

Training Agency, Country	Period	Subjects	Number of Trainees	Remarks
CAN, Mexico	5/11/2006 to 11/11/2006 (7 days)	Information collection on wastewater management in Mexico	4	
MAVDT, Colombia	26/11/2006 to 2/12/2006 (7 days)	Information collection on wastewater management in Colombia	4	
IMTA, Mexico	20/5/2007 to 9/6/2007 (21 days)	Theory and practice of wastewater sampling and discharge measurement	2	
IMTA, Mexico	25/7/2007 to 17/8/2007 (24 days)	Water environmental education	2	
Ministry of Environment, Minamata Municipality, and Aichi Prefecture, Japan	14/11/2008 to 23/11/2008 (10 days)	Japan's policy on water environment management, history of Minamata Disease, and practices of water environment management by Aichi Prefecture	2	Vice-minister of MARN and Director of ANACAFE participated.

(3) Equipment and Materials

Equipment and materials, of which total price is about 10 million Japanese yen, were input to MARN and LBNS for the operation of the Project. Almost all the equipment are still being used except for consumables such as reagents.

Table 3.1.4 Summary of Equipment and Materials

JICA Category	Recipient or User Agency	Equipment	Price (1,000 yen)
Donation Equipment	MARN	Office Equipment, Auto-sampler, vehicle for sampling and disk-array	5,198.9
	LBNS	Equipment for water quality analysis and office equipment	1,994.3
		Sub-total	7,193.2
Equipment Assigned to JICA Experts	MARN	GPS and Workstation	580.6
Other Equipment	MARN	Office furniture	193.7
	LBNS	Consumables for water quality analysis	2,058.2
		Sub-total	2,251.9
		Grand-total	10,025.7

(4) Local Expenses for Project Operation

The local expenses that JICA input for the project implementation during the five contract years totaled about 57 million Japanese yen. Its breakdown is summarized in Table 3.1.5.

Table 3.1.5 Summary of Local Expenses

Item	Expense (1,000 yen)
n (no training/administration)	28,106
Purchase of donation equipment	7,193
Transportation of donation equipment	0
Purchase of equipment assigned to experts	580
Transportation of equipment assigned to experts	0
Purchase of other equipment	2,269
Transportation of other equipment	0
Preparation of Report（Printing & Binding）	1,953
Preparation of Report（other than Printing & Binding）	2,653
Subcontract to Local Consultants	12,903
Subcontract to Local NGOs	1,516
	57,173

3.1.2 Input by Guatemalan Side

The inputs by the Guatemalan side are categorized to counterpart personnel, office space and furniture for the JICA Project Team and expenses for project operation. Details of these items are presented in Annex-3, and described as follows:

Table 3.1.6 Input by Guatemalan Side

Item	Quantity of Input
Counterpart personnel	A total of 38 counterparts were assigned in the project period of 46 months.
Office space and furniture	Office space and furniture enough for seven persons was provided to the JICA Project Team in the building of MARN in Guatemala Municipality.
Expenses for project operation	A total of about 3 million Quetzales (about 400,000 US dollars) was input for expenses including personnel expenses for the counterparts and those for wastewater monitoring, office space, etc.

(1) Counterpart Personnel

A total of 38 counterparts (36 from MARN and 2 from LBNS) were assigned in the project period of 46 months. However, member change, mainly caused by resignation, was so often that the average actual operational members were about 15. Assignment periods of the 38 counterparts were given in Annex-3.

(2) Office Space

In the building of MARN in Zona 10, Guatemala Municipality, office space enouh for 7 persons was ensured for the JICA Project Team. In addition, furniture like tables and chairs, a telephone line and Internet service were also provided to the JICA Project Team.

(3) Expenses for Project Operation

The Guatemalan Side beard about 3.1 million Quetzales (about 400,000 US Dollars).for personnel expenses for the counterparts, and those for office space, wastewater monitoring, etc. Details of the expenses are given in Annex-3.

3.2 Output Products

Output products that were made under the Project are listed in Table 3.2.1. Electronic files of these products except for a few of them are stored in the CD attached to this report:

Table 3.2.1 List of Products

Output	No.	Product	Contents	Location of Storage
Output-1	1-1	Draft strategies for effective enforcement of the Current Wastewater Regulation	Draft strategies proposed for effective enforcement of the Current Wastewater Regulation especially regarding finance for municipalities to develop sewerage system with treatment plants, collaboration between MARN and municipalities, incentives for industries and establishment of environmental quality standards.	Attached CD
	1-2	Draft Strategy for Social Participation for Dissemination of Water Environmental Education	Draft strategy proposed to promote dissemination of water environmental education for Guatemala and Santa Catarina Municipalities.	Attached CD
Output-2	2-1	Inventory of Industries	A list of 1,498 industrial factories that are regarded as potential water contamination sources based on information collected from Bank of Guatemala, etc.	Attached CD
	2-2	General Manual for the Current Wastewater Regulation	General manual for the Current Wastewater Regulation that was elaborated through discussions COMACIF and published in January 2008 as "Ministerial Agreement 105-2008".	Attached CD
	2-3	Agreement of Technical Cooperation among MARN, MSPAS and JICA	Tripartite agreement among MARN, MSPAS and JICA made in May on water quality analysis for the wastewater monitoring for the pilot project.	Attached CD
	2-4	Agreement of Technical Cooperation among MARN, MSPAS and JICA	Agreement between MARN and MSPAS made in February 2009 on water quality analysis for the wastewater monitoring after the pilot project.	Attached CD
	2-5	Report on Results of Wastewater Monitoring (Pilot Project)	Report on results of Wastewater Monitoring for 200 industries under the Pilot Project	Attached CD
	2-6	Report on Results of Wastewater Monitoring (Post Pilot Project)	Report on results of Wastewater Monitoring for 200 industries under MARN's initiative (Post Pilot Project)	Attached CD
	2-7	Report on Results of Wastewater Monitoring (Pilot Porject + Post Pilot Project)	Report on results of Wastewater Monitoring for all the 400 industries	Attached CD
	2-8	Draft Legal Guidance	Draft legal guidance titled "Internal Draft: Digest of Legislation Related to Wastewater Discharges and Reuse, and Sludge Disposition in Guatemala"	Still Confidential
Output-3	3-1	Agreement of Technical Cooperation between MARN and AMSA	Agreement between MARN and AMSA made in February 2009 on data sharing of water environmental information.	Attached CD
	3-2	Draft Agreement of Technical Cooperation between MARN and EMPAGUA	Draft agreement between MARN and EMPAGUA on data sharing of water environmental information.	Attached CD
	3-3	User Manual for Water Environmental Information Database	User manual for the above database system.	Attached CD
	3-4	Water Environmental Information Database System	GIS database system including MARN's wastewater monitoring related data and AMSA's water quality data of the Amatitlan Lake and its tributaries.	MARN's Server
Output-4	4-1	Agreement on Cooperation among MARN, MINEDUC and JICA	Tripartite agreement among MARN, MINEDUC and JICA made in January 2008 on development of water environmental education and implementation of capacity development of secondary school teachers.	Attached CD
	4-2	Materials for dissemination of the Current Wastewater Regulation	Poster, sticker and TV spot prepared for the dissemination of the Current Wastewater Regulation	See Photograph in Page iv
	4-3	Materials for water environmental education secondary school students	Environmental education materials (textbook and video) prepared in accordance with the above agreement.	See Photograph in Page v

3.3 Status of Execution of Outputs

The status of the execution of the outputs as of August 2009 had been examined during the Terminal Evaluation. It was updated again in November 2009 by incorporating results of activities after the Terminal Evaluation, as follows:

3.3.1 Output-0

The PDM_1 and PO_1 were prepared in January 2007 and the system of TWGs was also established in the 1st contract year. The Output-0 was fulfilled.

Table 3.3.1 Output-0 and Its Indicators

Output-1	(Preparation of the Project) The implementation system for the Project is established.
Indicators	0-1. The modification of the PDM and PO have finished 0-2. The system of Technical Working Groups (TWG) is established.

3.3.2 Output-1

The advance status of the evaluation indicators and the status of execution of the output-1 are described as follows:

Table 3.3.2 Output-1 and Its Indicators

Output-1	(Policy Formulation Capacity) Strategy formulation capacity for effective enforcement of the Current Wastewater Regulation is reinforced.
Indicators	1-1. By December 2007 the proposed strategies for the effective application of the Current Wastewater Regulation (Financial Framework for the municipalities, Mechanisms for the collaboration with municipalities, Incentives for industries and Procedures for the elaboration of environmental normative) 1-2. The draft four proposed strategies are approved by the Minister of Environment and Natural Resources 1-3. These draft four strategies are consulted with organizations related to the project. 1-4. At least one of the strategies is officially approved. 1-5. By September 2009, at least 2CP members can implement the process (which includes study, analysis, planning, coordination) of elaboration of strategies related with the Current Wastewater Regulation.

The draft strategies for the effective application of the Current Wastewater Regulation (Financial Framework for the municipalities, Mechanisms for the collaboration with municipalities, Incentives for industries and Elaboration of environmental quality standards) were elaborated by January 2008. The four mentioned strategies were approved by the former minister on January 11th. 2008. After the Government change, the four proposed strategies were presented to the new Minister on January 22, 2008 and the summary was also presented in the forum of the Current Wastewater Regulation organized on February 21, 2008.

During the Mid-term Evaluation between February and March 2008 the PDM was modified and an indicator, “At least one of the strategies is officially approved.” was newly added. In this framework the Minister of Environment and Natural Resources on March 5th, 2009 launched the MIMEDE project (an incentive project), with the participation in the inauguration event of more than 200 from industries, civil societies and related institutions.

During the 4th year a draft strategy for social participation through local leaders for the dissemination of water environmental education was elaborated for each of the two municipalities of Guatemala

and Santa Catarina. The members of the TWGs 1 and 4 supervised a local NGO who conducted a basic study for the strategy preparation.

The draft strategies for effective enforcement of the Current Wastewater Regulation and for social participation for the dissemination of water environmental education were consulted with officials of MARN and related organizations at the workshop in November 2009.

The JICA Project Team concludes that there are at least 2 officials experienced and capable to carry out a series of processes by themselves of strategy elaboration (studies, analyses, planning, and coordination)for the application of the Current Wastewater Regulation.

In conclusion, the Output-1 was fulfilled.

3.3.3 Output-2

The advance status of the evaluation indicators and the status of execution of the output-2 are described as follows:

Table 3.3.3 Output-2 and Its Indicators

Output-2	（Current Wastewater Regulation） The system of monitoring, evaluation and follow-up for the implementation of the Current Wastewater Regulation is established.
Indicadores	2-1. For November 2006 a rational way for the water quality analysis is studied. 2-2. For September 2009 the manual for wastewater monitoring is used. 2-3. For September 2009 a manual for legal processes is prepared. 2-4. For May 2007 an Inventory of industries and agricultural - industries is prepared. 2-5. For August 2009 the wastewater sampling and analysis for 400 industries and agricultural-industries is conducted. (200 under the pilot project until April 2008 and the remaining 200 under MARN's responsibility) 2-6. For September 2009 at least 3 CP representatives are able to carry out a series of technical processes for the application of the Current Wastewater Regulation.

In the 2nd year a study on the capacity of laboratories for quality analysis of wastewater and sludge was carried out and as a result of the study LBNS of MSPAS was proposed as the laboratory for the wastewater monitoring. In accordance with the agreement that was signed in May 2008 among MARN, MSPAS and JICA for the collaboration for the wastewater monitoring, two experts of LBNS and two persons hired by the Project were devoted to carry out the quality analysis of wastewater and sludge for the pilot project. In February 2009 an agreement for technical cooperation between MARN and MSPAS was further made for the continuation of LBNS as the laboratory for the wastewater monitoring after the pilot project. Under this agreement two persons hired by MARN are being engaged in the quality analysis of wastewater and sludge at LBNS, being trained by the LBNS staff.

The TWG2 prepared a draft of the wastewater monitoring manual at the beginning of June 2007, which served as a base for the elaboration of the General Manual on the Current Wastewater Regulation, was published as the Ministerial Agreement No. 105-2008. The wastewater monitoring is being continued in accordance with the General Manual.

In December of 2006, the first draft of the legal guidance on the Current Wastewater Regulation got ready. Then, with a financial support from the DR-CAFTA-USAID Project, the second draft was elaborated in October 2007 by an external consultant hired under a financial support from DR-CAFTA-USAID Project. The finalization of the legal guidance is been suspended waiting for the revision of the Current Wastewater Regulation, although the second draft was remade to the third draft in June 2009.

The inventory of industries of the project area was completed in April 2007.

Within the framework of the pilot project, the wastewater monitoring (sampling and water quality analysis) of 200 industries were conducted from July 2007 until June 2008. After the pilot project MARN completed the wastewater monitoring of another 200 industries in October 2009, based on a new agreement with MSPAS made in February 2009. This means that MARN could achieve the target for the wastewater monitoring, 400 industries before the Project ends.

Regarding the indicator 2-6, the Terminal Evaluation in August 2009 pointed out a shortage of human resources to implement the process for the application of the Current Wastewater Regulation. In response to that, MARN could finally hire in November 2009 a person in charge of data management, who had been employed by the JICA Project Team for about two months after the Terminal Evaluation temporarily for making up the shortage. It can be considered that the problem of the shortage of human resources is being mitigated by this employment. The TWG2 that was reinforced by the new member elaborated the report of the wastewater monitoring by the middle of November 2009 as MARN committed during the Terminal Evaluation. From this fact it can be understood that the problem of the shortage of human resources is being mitigated by this employment, and accordingly the system for the implementation of the process of the Current Wastewater Regulation has been almost established.

As a result of the above discussions on the indicators, it is concluded that the Output-2 was almost achieved by the end of the Project.

3.3.4 Output-3

The advance status of the evaluation indicators and the status of execution of the output-3 are described as follows:

Table 3.3.4 Output-3 and Its Indicators

Output-3	(Establishment of Water Environmental Information System) Sustainable system of compilation and administration for water environmental information is established.
Indicators	3-1. The Digital Map is obtained from MAGA. 3-2. Information about the water quality is collected continually by AMSA. 3-3. By September 2008 the database on the water environment is established. 3-4. By September 2009 the access number to the database on the water environment from MARN reaches at 100. 3-5. By September 2009, 3 officials from MARN are capable to upgrade the database continually.

In May 2007 digital maps were obtained from MAGA, and data of water quality monitoring for the Amatitlan Lake ant its tributaries are being collected continuously from the 2nd year. In February 2009, MARN and AMSA signed an agreement for technical cooperation for data sharing. The collaboration between the two agencies was reinforced by the agreement, although the data provision by AMSA had been continued on a friendly basis even before the agreement.

GIS-based water environmental database system that contains the monitoring-related data by MARN and the water quality monitoring data of AMSA was developed step-wisely under a subcontract to a local system company. The proto-type database was developed by March 2008, and it was upgraded to the full-scale one by June 2008. As some system troubles became to take place after small modifications by MARN, the data system was corrected and improved in the 5th year. The access number already exceeded 2,400 as of November 13, 2009, although this number includes uncountable re-accesses after freezing of the system. More than 3 persons of MARN and AMSA can update the database by inputting data. For the modification of the system software, however, professional help is recommendable, although SIA is capable of a simple modification.

It is concluded that the Output-3 was generally achieved by the end of the Project.

3.3.5 Output-4

The advance status of the evaluation indicators and the status of execution of the output-4 are described as follows:

Table 3.3.5 Output-4 and Its Indicators

Output 4	(Water Environmental Education and Dissemination) The environmental education and dissemination of aspects related to the Current Wastewater Regulation under collaboration with the municipalities, AMSA, MINEDUC and other governmental and non-governmental organizations is reinforced.
Indicators	4-1. The perception and knowledge on the Current Wastewater Regulation among the municipalities, industries and local residents improve from 15% in November 2006 to 30% in September 2009. 4-2. Materials for the dissemination of the Current Wastewater Regulation are developed by March 2007. 4-3. Materials of the environmental education for secondary school cycle are developed by December 2007. 4-4. By September 2008 the CP staff achieve the capacity to carry out trainings to 30 teachers of secondary school. 4-5. At least 10 of the trained teachers can train at least 10 more each one.

The average percentage of municipalities, industries and local residents about the Current Wastewater Regulation was gradually improved: 15% in November 2006, 21% in February 2008 (at the moment of the Mid-term Evaluation), 25% in July 2009 (at the moment of the Terminal Evaluation) and % in November 2009.

Materials for the dissemination of the Current Wastewater Regulation such as a poster, a sticker, a banner, TV and radio spots were prepared by March 2007.

Water environmental education materials for secondary school students (a manual titled “Manual of Environmental Education on Water Resources in the Metropolitan Area”, and a video attached to the manual) were also prepared in February 2008. Training workshops for the environmental education using the developed materials were held by the TWG4 three times between October 2008 and February 2009, and a total 40 school teachers participated in the workshops. . Following the workshops organized by the TWG4, similar training workshops were organized 22 times between April and May by 22 of the 40 trained teachers. The total number of the trained teachers in these workshops reached 532.

It is concluded that the Output-4 was achieved by the end of the Project.

3.4 Achievement of Project Purpose

The status of the execution of the outputs as of August 2009 had been examined during the Terminal Evaluation. It was updated again in November 2009 by incorporating results of activities after the Terminal Evaluation.

Table 3.3.6 Project Purpose and Its Indicators

Purpose of the Project	MARN’s implementation capacity of the Current Wastewater Regulation for water environment conservation in the Metropolitan Area is reinforced.
Indicator	1. The Results of the Evaluation of the Capacity of the MARN about the Current Wastewater Regulation improve from 1.08 points in November 2006 to 3.5 points in September 2009. 2. The perception of MARN improve: ① The evaluation for the relative organizations to the Regulation of Waste waters toward the MARN improve for September of 2009 in comparison with the basic line settled down in the months of May and June of 2008. ② The level of perception of MARN for the local residents captured by the phone survey reach 50% in September of 2009. 3. The personnel of URHC from MARN increases from 8 in July 2006 to 16 by September 2009. 4. Two cooperation agreements were subscribed among MARN, the municipalities and other actors

	related starting from 2008.

The score of the capacity assessment had already exceeded the target of 3.5 points as of the Terminal Evaluation in August 2009, finally reached 3.67 points.

Regarding the evaluation of MARM by the related organizations, it can be considered that the evaluation is being improved through the project activities as the score was greatly increased from 9.96 points between July and September 2008 to 13.09 points between May and August 2009, although the score in November 2009 was slightly down. The perception of MARN by local residents finally reached 64.5% much more than the target value of 50 %.

The number the URHC personnel was 8 in July 2006, 9 in March 2007, 15 in February 2008, 18 in August 2009, and finally 19 in November 2009. The number is continuously increasing, and the status change from short-term contract to permanent one is also in progress. In this way, the human resources of URHC are being strengthened.

As for the collaboration with related organizations, MARN made two agreements after the Mid-term Evaluation. The first one is the agreement for technical cooperation with MSPAS and the second one is that with AMSA as explained in the previous sections. Both the agreements were signed on the same day, February 13, 2009. In addition MARN is discussing with EMPAGUA for an agreement for data-sharing.

With all the above mentioned, It is considered that the Purpose of the Project has been achieved.

3.5 Possibility of Achievement of Overall Goal

The overall goal and its indicator are presented in Table3.3.7. They are very ambitious and challenging.

Table 3.3.5 Overall Goal and Its Indicator

Global Goal	The policy of conservation of water resources in the metropolitan area is reinforced.
Indicator	Five municipalities of the Project area and 50% of the extracted industries (from a minimum of 200) fulfill the goal of reduction of the first stage. (municipalities: year 2015, Industries: year 2011)

According to the report of the wastewater monitoring that was made for 400 industries in the Metropolitan Area, 12**%**(46 industries) of the industries achieved the first stage or higher stage levels. 149 of the 400 industries (37%) already conducted the Technical Study. As for the municipalities, Santa Catarine Pinula Municipality already conducted the Technical Study. It is guessed that more industries and municipalities are making efforts to comply with the Wastewater Regulation, although the Overall Goal is still far.

Therefore, if the Government continues its environment-friendly social development policies that focus on conservation and improvement of water environment and if the Wastewater Regulation is effectively enforced as it stipulates, the Overall Goal will be achieved.

CHAPTER 4

DEVICES AND LESSONS FOR PROJECT OPERATION AND RECOMMENDATIONS

4.1 Devices and Lessons for Project Operation

4.1.1 Devices for Project Operation

As explained in "Section 2.1 Strategies for Project Operation", the Project Team devised the three strategies for the smooth implementation of the Project:

- Collaboration of Related Organizations through JCC meetings, etc.
- Adaptation of PCM based on PDM
- TWG-based Project Activities

Regarding the collaboration with the related organizations, MARN succeeded in making agreements with MSPAS, AMSA and MINEDUC, and could achieved the wastewater monitoring, the establishment of the database system and the water environmental education for secondary schools, utilizing expertise and human resources of the these organizations under these agreements. It is important for MARN, of which human and financial resources are limited, to further develop the collaborative relationship with more organizations.

The PDM-based project management was very effective probably because the CPs were familiar with "Logical Frame" that is similar to PDM. Based on the PDM and PO, the Project was very closely monitored two times in the course of the Project through the Mid-term Evaluation and the terminal Evaluation. Then the PDM and PO of the Project were adjusted for the realization of the Project purpose.

The TWG-based activities were meaningful for growing consciousness of the CPs for the participation in the Project. The group meeting was held almost weekly to manage the progress of tasks of the CPs while the JICA expert in charge was in Guatemala. Since the 4th year the joint meeting with representatives from the four TWGs and the coordination group has been held almost monthly to share the progress of the activities of all the groups.

However, it sometimes became difficult to maintain the group activities due to frequent member change mainly caused by resignation of counterparts. Polarization of the counterparts into the active and the inactive members was also observed, although some of the inactive members gradually quitted the TWGs and MARN. Now MARN is transferring the employment status of its employees form the unstable short-period contract to the stable permanent one. Accordingly this kind of TWG-based activities will function more effectively for future projects.

4.1.2 Lesson from Friction with Industrial Sectors

The Current Wastewater Regulation is generally not welcomed positively by the regulated parties like industries and municipalities. Under the recent severe economic situations in particular, the regulation might be a troublesome thing for most of them. The Project has generally progressed without causing any fatal problems as scheduled, but once arose a friction with the industrial sectors that suspended part of the project activities for a certain period. The friction was probably caused by misunderstanding of the industrial sectors, but since then the Project has made efforts to approach them to facilitate their understanding about and participation in this Project. Consequently the Project progressed smoothly. Experiences and lessons learnt during and after the friction are described below:

The Project started a telephone interview to industries in the middle of June 2007 to know the progress of the Technical Study. Two and half months later, on August 28, 2007, the minister of

MARN suddenly received a telephone call from a top of CACIG criticizing the telephone interview by saying something like “MARN and JICA are threatening companies. It is an act of intervention in the domestic affairs of Guatemala.” As the telephone interview was nothing but businesslike, it was considered that the protest was generated by misunderstanding and rootless. However, the minister took it very seriously, and decided to suspend the interview.

This affair reminded the JICA Project Team that the Project is dealing with politically sensitive issues, and that the Project had been lacking considerations over the industrial sectors who are one of the most important stakeholders. Until then the Project was focusing on the related government organizations, the municipalities and local residents, and less approach was being made to the industrial sectors that could be a strongest opposition power against the Project if treated inappropriately.

Since then the Project began to intentionally approach the industrial sectors. Though the Project Team could not see the top of CACIG in spite of persistent requests, the JICA Project Team could see the executive members of CIG and succeeded in their understanding about the Project. Since then the Project has obtained cooperation from CIG in many events. In November 2008 the Project sent the executive director of the research center of ANACAFE who was concurrently a member of COMACIF to a training program in Japan with the Vice-minister of MARN. In 2009 the Project implemented the MIMEDE Project, an incentive project for industries in the Metropolitan area. In these ways the Project has been making efforts to involve the industrial sectors in the Project. The telephone interview was restarted again about 8 weeks later, and was continued until the end of the Project without any protests from industries.

This affair implies an important lesson as follow:

MARN, who imposes the regulation on industries, must face them resolutely. On the other hand MARN should make maximum efforts to approach them for seeking their understanding and cooperation about the enforcement of the Current Wastewater Regulation.

4.2 Recommendations

For the realization of the Overall Goal “The policy of conservation of water resources in the metropolitan area is reinforced.” the JICA Project Team makes recommendations to the Government of Guatemala as follows:

4.2.1 Recommendations on Policies for Water Resources Conservation

The Project proposed four strategies for effective enforcement of the Current Wastewater Regulation (Reglamento de Descargas y Reuso de Aguas Residuales y Disposición de Lodos: Acuerdo Gubernativo No.236-2006) as fruits of the activities of the TWG1. They are 1)Ensuring of finance for development of sewerage system by municipalities, 2)Collaboration with municipalities, 3)Incentives for industries and 4)Establishment of Environmental Quality Standarads (EQSs). Including the four strategies a total of eight recommendations are made for the water resources conservation as follows:

(1) Ensuring of Finance for Development of Sewerage System by Municipalities

Municipalities are obliged to develop sewerage systems with treatment plants to comply with the Current Wastewater Regulation. However, the problem is the finance for the development of sewerage systems. In order to mitigate this difficulty, it is strongly recommended to implement the following four measures, 1)Awareness raising, 2)Structural reform of municipal public services (cost reduction), 3)Intervention of the Central Government, and 4)Development of low cost sewerage and sanitation systems.

(2) Collaboration with Municipalities

Municipalities have high potential as partners to MARN for the implementation of the Current Wastewater Regulation. It is recommended to strengthen collaboration with municipalities for the wastewater management from the reasons as below:

- MARN of which capacity in terms of human and financial resources is limited can not cover all the country,
- Municipalities are familiar with local conditions and are also responsible for environmental issues at municipal level,
- The joint cooperation process helps MARN and the municipalities to utilize their limited resources more efficient.
- In principle a water pollution problem should be primarily dealt with locally.

(3) Incentive Instrument for Industries

For the effective enforcement of the Wastewater Regulation, not only a stick (a strong measure) but also a carrot (a reward) is necessary. In this Project an incentive project for industries in the Metropolitan Area, the MIMEDE Project was implemented. However, the number of industries that participated in it was so small, and it is hard to say that the MIMEDE Project was successful. It is recommended that the system of MIMEDE Project should be reviewed and implemented again for all the country. In addition, incentive instruments for municipalities to develop sewerage system with treatment plants should be studied.

(4) Establishment of Environmental Quality Standards (EQSs)

Environmental Quality Standards (EQSs) for water are the foundation of the water quality-based management of the water environment. The EQSs define the goals for a water body by designating its uses and setting criteria to protect those uses. Guatemala, who has obtained a tool for wastewater control, the Current Wastewater Regulation, does never evaluate the effect of the wastewater control because they have no goals. Therefore, it is recommended, establishing the EQSs for water as soon as possible. The Regulation for Wastewater Discharges, Reuse and Sludge Disposition will also function more effectively in combination with the EQSs.

(5) Efforts for Seeking for Understanding of Stakeholders towards Revision of the Current Wastewater Regulation

MARN is coming nearer to the final stage for the revision of the Current Wastewater Regulation that was enacted in May 2006. The latest draft revision is generally more severe to industries and municipalities than the present one. It includes obligation of reporting of the Technical Study to MARN, issuance of license and collection of fee, definition of fines for violation and negligence, shortening of accomplishment schedule, more stringent limits of some parameters, control of discharge to underground and lentic bodies, etc.

MARN is going to start discussions with representatives of the industries and the municipalities early next year. The Project Team hopes that MARN will to devote themselves to the discussions so that the revision could be accepted by the stakeholders as much as possible.

(6) Law Enforcement

Law enforcement will be an urgent need for strengthening the administration of water environment. Although the regulation on wastewater control is in force, discharge of polluted water is hardly controllable unless legal measure is properly taken. In this respect, it is desirable for MARN to build up its administrative mandate by the law.

(7) Strengthening of URHC

Due to the lack of human resources in the Unit of Water Resources and Watersheds (URHC) of MARN, it is still difficult to administer and manage water environment of the whole country, although URHC is being strengthened recently. Therefore, it will be absolutely necessary to reinforce the organization by increasing professional personnel. In this regard, one competent person should be hired to work as an assistant coordinator with a view to improving administrative efficiency and function.

(8) Collaboration with Related Organizations

It is quite important to maintain good relationship between MARN and other institutions and agencies such as MAPAS, AMSA, EMPAGUA and INFOM as well, and it is advisable to exchange information with them periodically. The information collected as such will be certainly useful for the enhancement of environmental administration.

4.2.2 Recommendations for Improvement of the Wastewater Monitoring Activities

Recommendations are also made for the improvement of the wastewater monitoring activities that was one of the most important project activities, as follows:

(1) Promotion of Technical Study

MARN is required to take every possible measure to the industry sector for the enhancement of the technical study. The regulation clearly describes that the technical study should be revised every five years so that it is also important to keep careful watch on industries that have once conducted it. From the above considerations, evaluation program should be properly prepared.

(2) Improvement of Absorption Well

As one of the wastewater discharge systems, absorption well is installed in many industries. This system is generally composed of underground structure that will cause difficulties for sampling and flow measurement. Such system should be improved to facilitate monitoring inspection as described in the regulation. In this case, industries are required to provide an open section for sampling and measurement before the wastewater flows into the absorption well. MARN is expected to take strong leadership to the industries in this regard.

(3) Placement of Competent Person for Managing Monitoring Process

It is desirable to place one competent person in URHC, who is specifically in charge of managing and supervising monitoring activities for sustainable development. In addition to data collection, quality assurance and control are inevitable for smooth operation of monitoring so that one more person will be required to dedicate himself to the task of data input.

(4) Data Interpretation and Feedback

Data interpretation is required at least once a year. It should be comprehensively analyzed from all available data and information, and feedback will be required from the result in a bid to upgrade monitoring system. In this regard, monitoring program should be discussed to judge suitability and relevancy for better performance in next year.

All available data that have been assembled to date will be analyzed to help improve data quality. However, it is also important to conduct yearly-based wastewater analysis based on data collected in a year so that it is expected to provide information on the variation of water characteristics by year.

(5) Outsourcing of Quality Analysis of Wastewater and Sludge

If MARN establishes its own laboratory in future, it is desirable to be minimum size. In fact outsourcing will be better option for quality analysis of wastewater and sludge because MARN will have to shoulder heavy burden for operation and maintenance. Under the present circumstances, it seems to be unrealistic for MARN to cover all necessary costs with its annual budget.

4.3 Conclusions

The Project is concluded as follows:

- The Project has been supporting MARN for 46 months, through joint activities with the counter personnel, especially for the implementation of the Wastewater Regulation that was enacted shortly after the commencement of the Project.
- The Project proposed four strategies for the effective enforcement of the Wastewater Regulation, and in accordance with one of them, an incentive project for industries, the MIMEDE Project was designed and implemented.
- In collaboration with LBNS of MSPAS the wastewater monitoring was carried out for 400 industries, and its results were compiled in a wastewater monitoring report.
- As a management tool for information of wastewater dischargers and water quality of rivers and lakes, an water environmental data base system was developed, and its operation was commenced.
- In collaboration with MINEDUC water environment education materials (a manual and a video) for secondary schools were developed. In order to spread the materials, more than 500 teachers were trained.
- Through the above activities, MARN, which used to have almost zero capacity in terms of wastewater management at the very beginning of the Project, was strengthened as much as the project purpose “MARN’s implementation capacity of the Wastewater Regulation for water environment conservation was reinforced” was achieved.
- Since the Project made efforts to approach and involve industrial sectors, the Project won understandings and cooperation from them, for the implementation of the wastewater monitoring in particular.
- The JICA Project team hopes that the overall goal “The policy of conservation of water resources in the metropolitan area is reinforced.” will be attained through the effective implementation of the Wastewater Regulation.