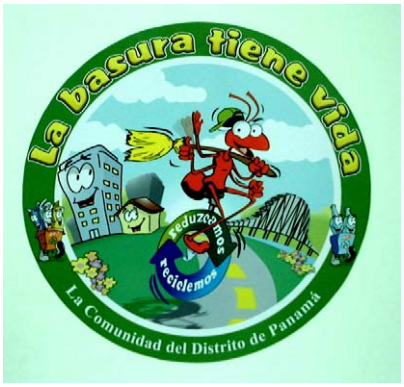
Environmental Education



Symbol mark of the environment education, which was chosen from the public

A contest of drawings and poems about waste was held, and excellent works were awarded.

Workshop for teachers:
24 teachers from three schools participated in the workshops

Environmental education at schools
Model classes of environmental education were held at three schools in order to raise children's awareness on recycling

Plate 9: Pilot Project (4) Environmental Education and Public Relations Enhancement

Technology Transfer: Counterpart Meetings and Seminars

Workshops were held in some communities to carry out environmental education

Cleansing activities were held at communities following the workshops

Various activities were held together with the workshops to encourage participation of residents

Public Relations Enhancement

800ASEO, telephone information service, was strengthened through the pilot project

Counterpart Meetings

Counterpart meetings, which were important opportunities of technology transfer from the Study Team to the counterpart and vice versa

Technology Transfer Seminars

Technology transfer seminars were held involving participation from various organizations concerned to Solid Waste Management

Plate 10: Present and Future Landscape of the New Landfill (Etapa III) (1)

Present

Phase 1 (before filling)

Phase 2 (before filling)

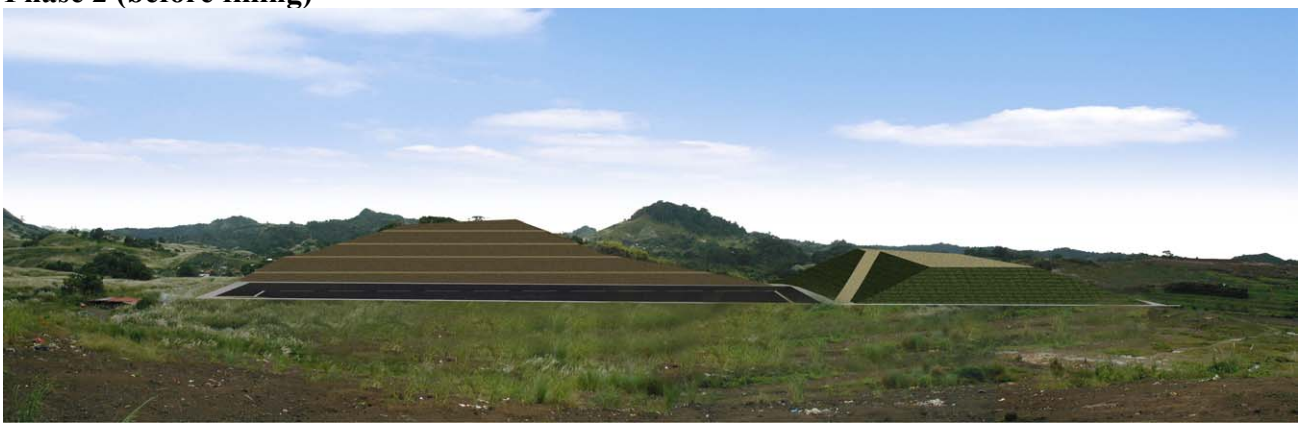


Plate 11: Present and Future Landscape of the New Landfill (Etapa III) (2)

Phase 3 (before filling)

Phase 4 (after filling)

After Closure

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Abbreviations

ANAM	National Environmental Authority
ATP	Ability To Pay
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
C/P	Counterpart
DF/R	Draft Final Report
DIMAUD	Municipal Bureau for Urban and Household Cleansing
EIA	Environmental Impact Assessment
F/S	Feasibility Study
GTZ	German Technical Cooperation
HW	Hazardous Waste
ICB	Institutional Capacity Building
IC/R	Inception Report
IEE	Initial Environmental Examination
IDAAN	National Waterworks and Sewerage Institute
IDB	Inter-American Development Bank
IPAT	Panamanian Institute of Tourism
IT/R	Interim Report
IW	Industrial Waste
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
MEF	Ministry of Economy and Finances
MICI	Ministry of Trade and Industry
MIDA	Ministry of Agricultural Development
MINSA	Ministry of Health
MIVI	Ministry of Housing
M/M	Minutes of Meeting
MOP	Ministry of Public Works
M/P	Master Plan
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MW	Medical Waste
O&M	Operation and Maintenance
PAHO	Pan-American Health Organization
POS	Public Opinion Survey
P/P	Pilot Project
PPP	Polluter Pay Principle
P/R	Progress Report
PRTR	Pollutant Release and Transfer Register
S/W	Scope of Work
SWM	Solid Waste Management
TDS	Total Dissolved Solids
T&M	Time and Motion Survey
T/S	Transfer Station
WACS	Waste Amount and Composition Survey
WTP	Willingness to Pay

1 Introduction

1.1 Background

Panama District in the republic of Panama has a population of about 700 thousand and covers an area of about 2,500 square kilometers as of year 2000.

Solid waste management (SWM) in Panama District was under the jurisdiction of the Panamanian government and transferred to Municipality of Panama in 1999. However, the municipality had not formulated a concrete basic plan for SWM due to lack of human resources. Thus, **the waste management system had still to be established.**

The present SWM in the Municipality of Panama stresses only on daily collection of mixed waste from the urban area. As economy grows and society changes in the future, the following concepts will become more important:

- Reduction of waste amount and resource conservation
- Efficient operation of Municipal Solid Waste Management (MSWM)

At present, there is no intermediate treatment system established such as material recovery and incineration in the municipality of Panama. The waste generated from the municipality is collected and transported to Cerro Patacon, a sanitary landfill located in the same municipality, as well as waste from the municipality of San Miguelito (population 300 thousand) and the neighboring areas.

However, there are problems. Industrial and medical waste is also disposed in this landfill without treatment and around four hundred waste pickers live on the waste. Besides, some wastes that are not collected are often dumped besides roads and into rivers that finally flow into Panama Gulf, which is causing serious environmental problems.

Under these circumstances, recognizing the necessity of overall waste management including enlightenment of community people's consciousness, the Panama municipality requested 'the Study on Solid Waste Management Plan for Municipality of Panama in the Republic of Panama' (hereinafter referred to as "the Study") to the government of Japan in August 2000.

In response to the request, the government of Japan dispatched the Preparatory Study Team in August 2001 and the team signed and exchanged the scope of work.

JICA appointed Kokusai Kogyo Co., Ltd. as the consultant of the Study.

1.2 Objectives of the Study

1.2.1 Objectives of the Study

The Study has the following three objectives:

- Formulation of a Master Plan on solid waste management in the municipality of Panama targeting the year 2015
- Implementation of Feasibility Study for selected priority project(s)
- Technology transfer to the counterpart personnel in the course of the Study

1.2.2 Study Area

The study covers the area under the jurisdiction of the municipality of Panama, but not covers the municipality of San Miguelito and other municipal areas that avail themselves of Cerro Patacon Final Disposal Site. However, it was carried out to collect data and to estimate waste amount of those municipalities, in order to attain the objectives mentioned above.

1.2.3 Solid Waste to be Covered Under the Study

This study covers municipal solid waste, industrial waste and medical waste. However, the study on industrial and medical waste were carried out **NO** further than grasp of present condition and suggestion to find and handle problems in the master plan.

Municipal solid waste consists of:

- Household waste
- Commercial waste
- Institutional waste
- Market waste
- Road sweeping waste

1.2.4 Target Years

Target years set in the Study are as follows.

i) Master Plan 2015

ii) Selected Priority Projects

The Final Disposal Project

- Phase I 2006 to 2008(operation)
- Phase II 2008 to 2010(ditto)
- Phase III 2010 to 2011 (ditto)
- Phase IV 2012 to 2015 (ditto)

The Transfer and Transport Project

- Phase I 2005 to 2007
- Phase II from 2008

1.3 Key Assumptions

The following assumptions are used in this Study.

a. Population

Table 1-1: Population Forecast

Year / Corregimiento	2000	2001	2002	2005	2010	2015
Distrito de Panam	**708,438**	**725,866**	**744,448**	**807,868**	**944,573**	**1,132,726**
San Felipe	6,928	6,660	6,402	5,687	4,668	3,832
El Chorrillo	22,632	22,858	23,087	23,787	25,000	26,276
Santa Ana	21,098	20,535	19,986	18,427	16,095	14,057
La Exposición o Calidonia	19,729	19,348	18,975	17,897	16,236	14,728
Curundú	19,019	19,131	19,244	19,586	20,171	20,773
Betania	44,409	44,195	43,981	43,347	42,311	41,300
Bella Vista	28,421	28,789	29,163	30,312	32,328	34,479
Pueblo Nuevo	18,161	17,875	17,593	16,774	15,493	14,309
San Francisco	35,751	35,903	36,056	36,520	37,305	38,107
Parque Lefevre	37,136	37,035	36,934	36,633	36,137	35,647
Río Abajo	28,714	28,304	27,900	26,722	24,868	23,143
Juan Díaz	88,165	89,746	91,355	96,358	105,313	115,100
Pedregal	45,801	46,323	46,850	48,470	51,294	54,283
Ancón	11,169	11,135	11,100	10,998	10,831	10,665
Chilibre	40,475	42,126	43,845	49,433	60,373	73,735
Las Cumbres	92,519	97,188	102,093	118,343	151,374	193,626
Pacora	61,549	66,939	72,800	93,648	142,486	216,795
San Martín	3,575	3,708	3,847	4,293	5,156	6,191
Tocumen	83,187	88,069	93,237	110,633	147,136	195,681
Distrito de San Miguelito	**293,745**	**299,366**	**305,095**	**322,946**	**355,050**	**390,346**
Arraijan	**149,918**	**163,797**	**178,961**	**233,407**	**363,392**	**565,764**

b. Economic Growth

Table 1-2: Projection of GDP Growth Rate

Data Source	Forecast Base	Year	GDP Growth Rate (%)	Assumed GDP Growth Rate (%)
Real data		1996	2.8	
Real data		1997	4.5	
Real data		1998	4.1	
Real data		1999	3.2	
Real data		2000	2.9	
Preliminary		2001	1.8	
Official expectation		2002	1.5	
Forecast	1996-2000	2003	2.9	2.5
Forecast	2001-2003	2004	3.3	3.0
Forecast	2001-2004	2005	3.9	3.5
Forecast	2002-2005	2006	4.7	4.5
Forecast	2002-2006	2007	5.3	4.5
Forecast	1996-2007	2008	4.1	3.0
Forecast	1996-2008	2009	4.2	3.0
Forecast	1996-2009	2010	4.3	3.0
Forecast	1996-2010	2011	4.4	3.0
Forecast	1996-2011	2012	4.5	3.0
Forecast	1996-2012	2013	4.6	3.0
Forecast	1996-2013	2014	4.7	3.0
Forecast	1996-2014	2015	4.8	3.0

c. Waste Amount

Table 1-3: Forecast of Waste Generation Amount

unit : ton/day

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Household waste	439.2	450.9	463.4	476.6	490.8	505.9	521.9	539.1	557.3	576.7	597.5	619.6	643.2	668.3
Restaurant waste	106.3	109	112.1	115.8	120.5	125.2	128.3	131.5	134.6	137.8	140.9	144.1	147.2	150.4
Commercial waste	115.6	118.5	121.9	125.9	131	136.1	139.5	143	146.4	149.8	153.2	156.6	160	163.5
Institutional waste	29.4	30.1	30.9	32	33.3	34.6	35.4	36.3	37.2	38	38.9	39.8	40.6	41.5
Industrial waste	169.7	173.9	179	185	192.6	200.2	205.3	210.4	215.5	220.6	225.7	230.8	235.9	241
Market waste	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
Bulky waste	11.7	12.2	13.4	13.7	15.0	16.3	16.8	18.3	18.9	20.5	21.3	23.1	24.0	26.1
Street sweeping waste	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Hospital waste	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1
Demolition waste	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3
Sewage	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Panama total	**1,024.9**	**1,047.6**	**1,073.7**	**1,102.0**	**1,136.2**	**1,171.3**	**1,200.2**	**1,231.6**	**1,262.9**	**1,296.4**	**1,330.5**	**1,367.0**	**1,403.9**	**1,443.8**
San Miguelito	216.6	226.4	237.3	250.0	265.3	281.1	293.6	306.6	320.3	334.0	348.1	363.0	378.0	393.5
Arraijan	27.4	30.7	34.4	39.0	44.4	50.4	56.3	63.2	70.5	79.0	88.1	98.6	110.3	122.8
Sub-total	**244.0**	**257.1**	**271.7**	**289.0**	**309.7**	**331.5**	**349.9**	**369.8**	**390.8**	**413.0**	**436.2**	**461.6**	**488.3**	**516.3**
Total	**1,268.9**	**1,304.7**	**1,345.4**	**1,391.0**	**1,445.9**	**1,502.8**	**1,550.1**	**1,601.4**	**1,653.7**	**1,709.4**	**1,766.7**	**1,828.6**	**1,892.2**	**1,960.1**

d. Waste Composition

Table 1-4: Waste Composition of Panama Municipality

Composition / Area	Paper and cardboard (%)	Plastics (%)	Glass (%)	Metal (%)	Food & garden waste, etc. (%)	Other (%)
Panama	25	17	6	4	46	2

Source: Results of WACS in this study

1.4 Work Schedule of the Study

The Study consisted of the following two phases.

Phase I: Formulation of Master Plan

Phase II: Feasibility Study on Priority Project(s) and implementation of Pilot Project(s)

Figure 1-1 shows overall study workflow.

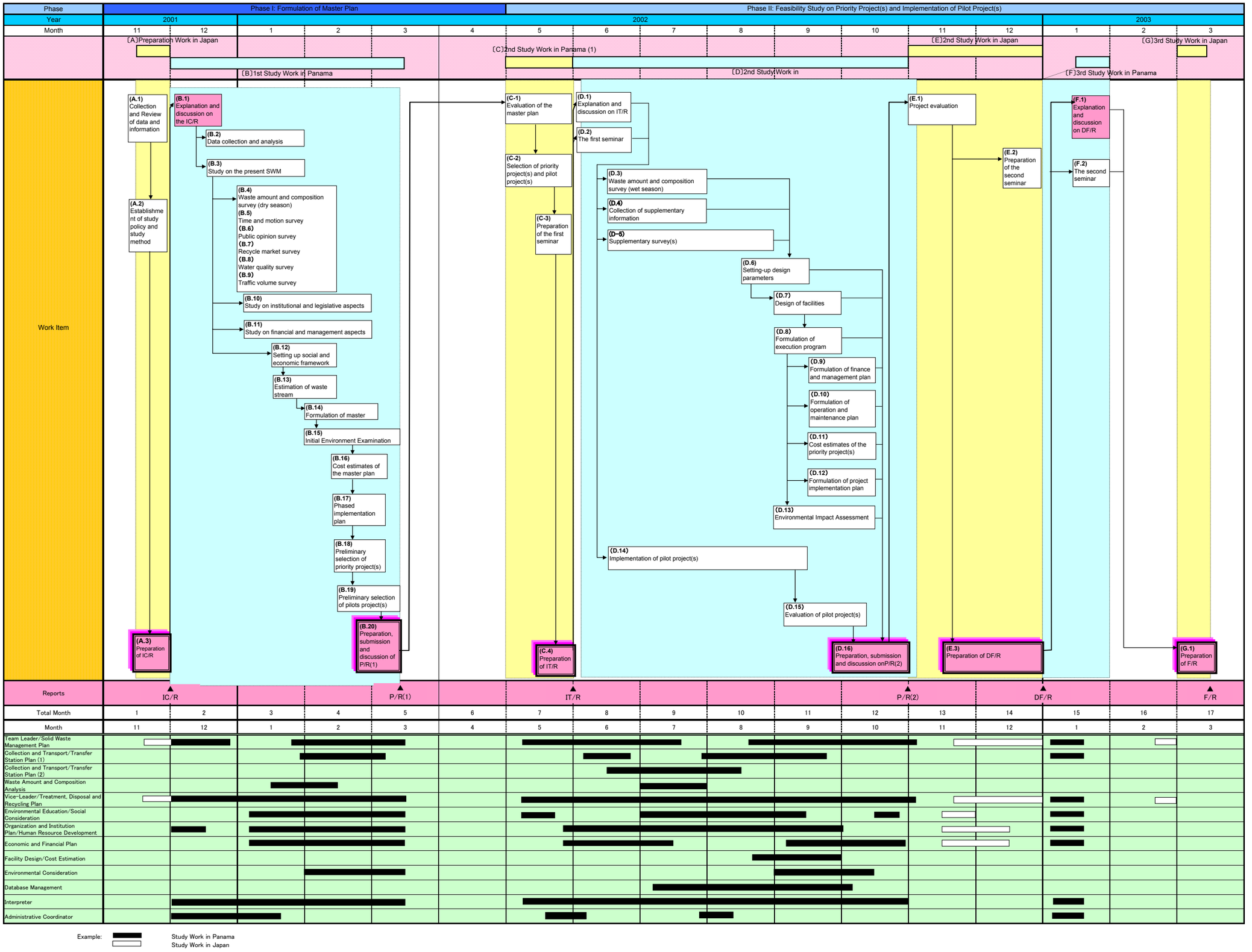

Figure 1-1: Overall Study Work Flow

1.5 Organization of the Study and the Assignment of the Study Team

On the basis of the Scope of Work and the Minutes of Meeting signed by both the Panamanian side and the Japanese side in the course of the Preparatory Study; the Municipality of Panama is the counterpart agency and the coordinating body in relation with other governmental and non-governmental organizations, it organized a counterpart team consisting of appropriate role and number of personnel corresponding to the experts of the Study Team, and it arranged the Steering Committee on the times of submissions of IC/R, P/R(1), IT/R, P/R(2) and DF/R.

The Advisory Committee organized by JICA provided JICA with the necessary advice.

1.5.1 Organizational Structure of the Study

The figure below schematizes the organizational structure of the Study.

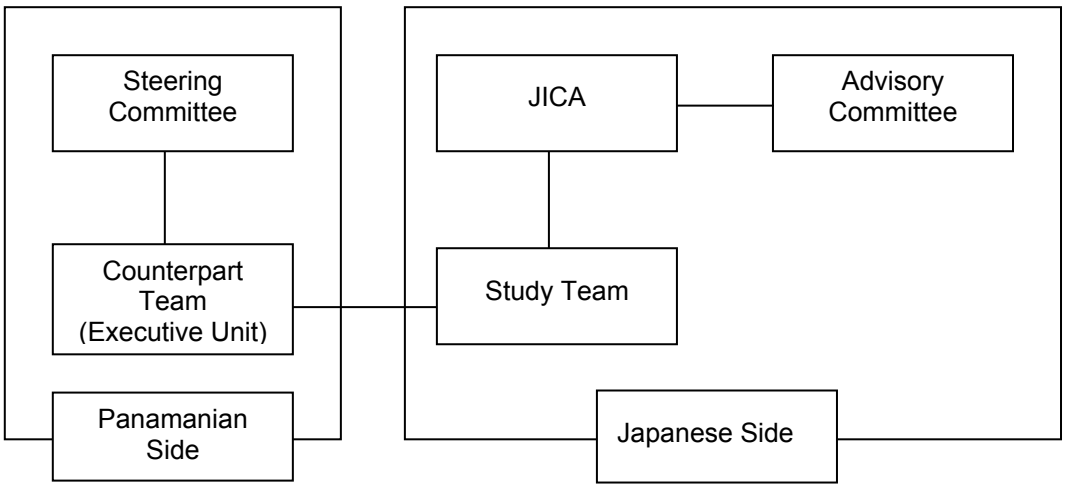

Figure 1-2: Organizational Structure of the Study

1.5.2 Members of the Study Team

The following are the members of the Study Team.

Assignment	Expert	Nationality
Team Leader /Solid Waste Management Plan	Hiroshi Kato	Japanese
Collection and Transport /Transfer Station Plan (1)	Ana Ximena Alegria Olivos	Chilean
Collection and Transport /Transfer Station Plan (2)	Carlos Eduardo Melendez Avalos	Salvadorian
Waste Amount Composition Analysis	Ken Kashima	Japanese
Vice-Leader /Treatment, Disposal and Recycling Plan	Ikuo Mori	Japanese
Environment Education /Social Consideration	Masaharu Kina	Japanses
Organization and Institution Plan /Human Resource Development	Victor Ojeda Rodriguez	Costa Rican
Economic and Financial Plan	Masaru Obara	Japanese
Facility Design/Cost Estimation	Osamu Nahata	Japanese
Environmental Consideration	Hortensia I. Broce	Panamanian
Database Management	Kunito Ishibasi	Paraguayan
Interpreter	Mario Valle	Salvadorian
Administrative Coordinator	Yumiko Asari	Japanese
Administrative Coordinator	Masahiko Takahasi	Japanese
Administrative Coordinator	Tomomi Kitajima	Japanese
Administrative Coordinator	Ryoichi Ogawa	Japanese

1.5.3 Member of the JICA Advisory Committee

The following are the members of the JICA Advisory Committee.

Assignment	Member	Position
Chairman	Hidetoshi Kitawaki	Toyo University
Member	Hiroto Komoda	Municipality of Fukuoka
	Ryoji Ijima	Municipality of Fukuoka

1.5.4 Members of the Counterpart Personnel

The following are the member of the counterpart personnel.

Assignment	Member
Leader	Mr. Eric Prado
Collection/Transport	Mr. Alvis Morales
Waste Amount/Waste Composition	Mr. Alonso Filós
Treatment/Disposal	Mr. Ricardo Garay
Recycling	Mr. Lorenzo Tejeira
Education/Public Communication	Mr. Frank Quintero
Sociology	Ms. Patsy Arcia
Organization Management	Mr. Amado Cantoral
Institution/Legislation	Mr. Erick Prado
Financial Management/Accounting	Mr. Franklin Alba
Environment	Mrs. Bethzaida Valverde
Urban Planning	Ms. Berta Donoso de Velasquez

1.5.5 Members of the Steering Committee

The following members participated the steering committee meetings during the Study.

Ministry of Economy and Finance
- Dr. Aurelio A. Mejía R. (Economic Assessor for the Minister)
- Ms. Daría Cohen de Ruiz (Chief of Department of Technical Cooperation, DCTI)
- Ms. Eira Rosas (Coordinator of Bilateral Cooperation, DCTI)

Ministry of Health
- Dr. José Alberto Arrocha (Advisor to the Minister)
- Mr. Raúl de Saint Malo Arias (National Director of International Affairs)
- Dr. Elda Velarde (Environmental Health General Sub-director)
- Mr. Felipe Castillo (Chief of External Cooperation)
- Ms. María Inés Esquivel (Chief of Department of Environmental Sanitary Quality)
- Ms. María E. Ulloa (Chief of Section of Non-hazardous Waste)

National Environmental Authority
- Ms. Rosario de Icaza (Chief of Direction of International Technical Cooperation)
- Mr. Rodolfo E. Batista S. (Chief of the Department of Environmental Control and Quality)
- Ms. Regina Logreira (Coordinator of Technical Cooperation, Direction of External Affairs)
- Mr. Denis González (National Direction for Environmental Evaluation and Regulation)
- Ms. Carmen Lay (Official for the Department of Environmental Control and Quality)

Municipality of Panama (Chairman)
- Mr. Juan Carlos Navarro (Mayor)
- Dr. Edgard Spence (Assessor for the Mayor on International Affairs)
- Mr. Pedro Castillo (Assistant for International Relations)
- Mr. Jorge Saenz (Director of DIMAUD)
- Mr. Emilio Palomeras (General Sub-director for DIMAUD)

Municipality of San Miguelito

Mr. Heraclio Barahona	(Vice-mayor)
Mr. Hernan Quintero	(Engineering)
Mr. Roberto García Fuentes	(Planning)
Mr. Javier Rodriguez	(Legal Department)
Mrs. Anielka Adames	Institutional Image)

1.6 Technology Transfer

During the Study, the Study Team endeavored to transfer technology to the Panamanian side through the following activities.

Opportunities	Target	Contents	Frequency
On the Job Training	Counterpart	• Survey method • Analysis and evaluation method of survey results • Extraction of problems • Countermeasures • Planning and implementation of surveys • Planning, implementation and evaluation of pilot project(s)	Throughout the study.
Technology discussion	Counterpart	• Survey method, procedure, progress and results • Planning method • Formulation of alternative plans • Selection of a suitable plan • Project evaluation method • Introduction of Japan's and other countries' technology on solid waste management	Every two weeks
Report explanation meeting	Counterpart Steering committee member	• Planning, analysis of survey results and countermeasures at each stage.	At IC/R, P/R(1), IT/R, P/R(2), DF/R
Technology transfer seminar	Counterpart Steering committee member Community representative	• Raising recognition about present situation of solid waste management in Panama municipality and implementation of concrete countermeasures.	During the explanation of IT/R and DF/R
Counterpart training	Counterpart	• Visit to the institutions concerned with priority project(s) in Japan in order to raise recognition about effective institution management and its problems.	Once

2 Profile of the Study Area

2.1 Natural Conditions

2.1.1 Location

Panama is located in the northern hemisphere, between Latitude north 7° 12' 07" and 9° 38' 46" between Longitude west 77° 09' 24" and 83° 03' 07". Panama limits to the west with Costa Rica, to the east with Colombia, to the south with the Pacific Ocean, and to the north with the Atlantic Ocean. Panama has extensive coastlines of around 2,988.3 km long.[1].

2.1.2 Topography

The Panama Republic presents three morphostructural regions which are clearly defined from the perspective of topography, structure, and their geological history. These regions are a) Mountainous region, b) Hilly region, c) Lowlands and littoral plains[2].

The study area also shows the three main morphostructural regions, mentioned previously, that shape its topography. The highest elevations are found in the north-northeast direction and descend to the Pacific coast; the urban area does not present sharp topographical contrast with elevations that range between 80 and 5 meters above sea level.

2.1.3 Climate

Table 2-1 shows the monthly average precipitation, temperature, wind velocity, and relative humidity during the last 5 years (1996-2000) in the area of Panama city, according to records from the meteorological station at Tocumen Airport.

Table 2-1: Climatic Parameters recorded at Tocumen Meteorological Station (1996-2000)

Concept/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (Ave.)
Average Monthly Rainfall (mm)	45.8	10.6	10.8	45.7	206.7	188.8	151.1	206	272.9	229.3	300.2	205.2	1,873.1
Average Monthly Temperature (°C)	27.2	27.8	27.5	28.0	29.1	28.8	32.2	29.2	28.0	28.7	27.7	27.4	28.5
Average Monthly Wind Velocity (Knots)	8	10	9	8	7	7	6	7	7	6	7	9	8
Average Monthly Relative Humidity (%)	70	69	67	69	77	75	76	77	79	77	79	74	74

Source: Panamá en Cifras, Dirección de Estadísticas y Censo

[1] Panamá en cifras, Department of Statistics and Census
[2] Mapa Hidrogeológico de Panamá, Department of Hidrometeorology, 1999

2.1.4 Geological Conditions

The Republic of Panama is part of the geologic and geographic region called Costa Rica-Panama Isthmus. This region has limits to the west with the El Salvador-Nicaragua volcanic region and to the east with the Colombian Andes geological province.

Panama does not show as much seismic activity as Guatemala, El Salvador, Nicaragua, and Costa Rica. However, it has two zones of differentiated seismic activity; they are located in the southwestern part of Chiriqui province and the southwestern part of Darien

2.2 Socioeconomic Conditions

2.2.1 Macro-economy of the Country

The Census of 2000 indicated a total population of 2,839,177 in the country, of which 1,161,612 as economically active population (EAP). The corresponding figures for Panama District were a total population of 708,438 and an EAP of 326,561.

Table 2-2: Economically Active Population (EAP)

Population	Country	Panama District
Total	2,839,177	708,438
Over 10 years old	2,216,191	578,700
EAP	1,161,612	326,561
Employed	1,010,837	282,601
Unemployed	150,775	43,960
Unemployment rate	13.0%	13.5%

Source: Censos Nacionales de Poblacion y Vivienda, 14 de mayo de 2000, Direccion de Estadistica y Censo, Panama

During the 1995-1999 five-year period, total GDP of Panama measured in 1982 USD grew 2.92% per year from 6,198 Million USD in 1995 to 7,157.7 Million USD in 1999.

Table 2-3: Gross Domestic Product (GDP) Million USD

Economic Activity	1997	1998	1999
Primary sector	514.9	545.1	546.7
Secondary sector	1,230.4	1,263.6	1,326.5
Tertiary sector	4,912.2	5,124.2	5,284.5
GDP	6,657.5	6,932.9	7,157.7
GDP growth rate	4.5%	4.1%	3.2%
Per capita GDP	2,449.0	2,509.0	2,548.0
Per capita GDP growth rate	2.8%	2.4%	1.6%

Source: Informe del Contralor General de la Republica, 1 marzo 2000; Cuentas Nacionales 1989-1999, Direccion de Estadistica y Censo, Setiembre 2001, Panama

CPI grew less than 1.5% per year during the last half of the 1990s. Sectors where CPI grew faster than the average growth rate were health care (more than 5%), education and public utilities (more than 3%).

Table 2-4: Consumer Price Index (CPI) (%)

Goods and Services	1997	1998	1999
Total	1.2	0.6	1.4
Food & beverage	0.7	0.4	0.2
Clothing	-2.0	1.3	0.4
Housing & public utilities	2.1	1.6	3.5
Furniture & house care	2.4	0.2	1.3
Health care	2.3	3.0	5.6
Transport & communication	2.2	-1.8	0.8
Entertainment & education	1.2	2.9	3.1
Others	1.2	0.4	-0.1

Source: Informe del Contralor General de la Republica, 1 marzo 2000

Public sector debt in 1999 amounted to U$7,770 Million, of which 70% foreign debt and 30% domestic debt.

Table 2-5: Public Sector Debt in 1999 (Million USD)

Sources	Total Public Sector	Central Government	Decentralized Sector
Total debt	7,770.9	7,566.6	204.3
Foreign debt	5,559.5	5,459.3	100.2
Multilateral organizations	1,157.0	1,097.6	59.4
Bilateral organizations	452.8	413.2	39.6
Private sources	3,949.7	3,948.5	1.2
Domestic debt	2,211.4	2,107.3	104.1
Private sources	653.9	651.7	2.2
Public sources	1,557.5	1,455.6	101.9

Source: Informe del Contralor General de la Republica, 1 marzo 2000

2.2.2 Regional Economy

The per capita production value of the EAP would be around U$13,500 in Panama District and U$3,500 in the rest of the country, based on following assumptions.

- 10% of primary sector GDP is produced in Panama District.
- 60% of secondary sector GDP is concentrated in Panama District.
- 70% of tertiary sector GDP is concentrated in Panama District.

2.2.3 Administration

The Public Power is exercised by the State through its three branches: the Legislative, Executive and Judicial powers, which act separately and with limitations, yet in harmonic collaboration.

It also has five independent bodies with the following duties:

- *Contraloría General de la República* [Comptrollership General's Office of the Republic; auditing of public funds],
- *Ministerio Público* [Prosecutor's Office; defense of the state's, municipalities and citizens' interests],
- *Ente Regulador de los Servicios Públicos* [Regulating Entity of Public Services; proper rendering of public services]
- *Tribunal Electoral* [Electoral Court]
- *Fiscalía Electoral* [Electoral Auditors' Office] (oversee the liberty, integrity and efficacy of the people's suffrage).

2.2.4 Population

The last population census for Panama Republic was conducted in the year 2000. Table 2-6 shows comparatively the results with census made in 1960, 1970, 1980, 1990, and 2000.

Table 2-6: Comparative Population Results from 1960, 1970, 1980, 1990, and 2000 Census

	Years				
	1960	1970	1980	1990	2000
PANAMA DISTRICT	248,369	368,112	477,107	584,803	708,438
Southwestern Corregimientos					
San Felipe	12,466	14,145	11,696	10,282	6,928
El Chorrillo	28,577	27,834	25,145	20,488	22,632
Santa Ana	34,097	32,023	27,806	27,657	21,098
La Exposicion o Calidonia	51,395	44,875	28,602	23,974	19,729
Curundu	-	12,753	16,947	17,933	19,019
Ancon			6,401	11,518	11,169
Central Corregimientos					
Betania	15,615	37,271	43,981	46,611	44,409
Bella Vista	13,293	26,659	28,136	24,986	28,421
Pueblo Nuevo	16,832	19,376	21,105	21,289	18,161
San Francisco	24,068	35,995	34,962	34,262	35,751
Parque Lefevre	18,449	31,165	34,128	38,163	37,136
Rio Abajo	18,862	27,353	31,989	33,155	28,714
Northern and Eastern Corregimientos					
Juan Diaz	7,553	24,719	51,944	73,809	88,165
Pedregal	7,162	14,536	32,731	40,896	45,801
Chilibre			18,168	27,135	40,475
Las Cumbres		13,238	31,495	56,547	92,519

	Years				
	1960	1970	1980	1990	2000
Pacora			8,184	26,587	61,549
San Martin			1,925	2,479	3,575
Tocumen		6,170	21,762	47,032	83,187
SAN MIGUELITO DISTRICT	12,927	68,400	156,611	243,025	293,745
Amelia D. de Icaza					38,522
Belisario Porras					49,802
Jose Espinar					35,301
Mateo Iturralde					12,607
Victoriano Lorenzo					17,328
Arnulfo Arias (1)					30,502
Belisario Frias (1)					46,794
Omar Torrijos (1)					37,650
Rufina Alfaro (1)					25,239
ARRAIJAN DISTRICT		19,347	37,186	61,849	149,918
Arraijan (Cabecera)		8,432	16,272	24,665	64,772
Juan Demostenes Arosemena		3,440	8,525	13,418	24,792
Nuevo Emperador		1,688	1,926	2,319	2,765
Santa Clara		1,109	1,169	1,422	1,744
Veracruz		2,358	5,287	8,224	16,748
Vista Alegre		2,320	4,007	11,801	39,097

Note: The results from census´60, ´70, ´80, and ´90 are not broken down by corregimientos for San Miguelito because those corregimientos marked as (1) are corregimientos recently created by the Law 21 of June 27th, 2000.

2.2.5 Poverty Conditions

According to the survey carried out by Social Political Bureau of the Ministry of Economy and Finances there are in Panama two poverty lines: extreme poverty and general poverty.

Extreme poverty level is defined as consumption level or annual per capita food expenses to satisfy the necessary daily minimum calories estimated at an average of 2,280 calories.

General poverty level is defined as per capita food expenses to satisfy the daily minimum calories requirements (extreme poverty level) including an additional amount to cover service consumption and essential non food goods The general poverty value was estimated at a consumption level of U$905 per person/year, that is to say U$75 a month per person.

Table 2-7: Poverty Main Indicators of Panama District

Corregimiento	General poverty (%)	Extreme poverty (%)
Distrito	18.10	7.81
Casco Viejo	28.05	14.48
San Felipe	11.76	5.88
El Chorrillo	41.76	20.00
Santa Ana	16.92	6.15
Calidonia o La Exposición	15.56	8.89
Curundú	50.00	32.35
Centro	5.57	2.30
Betania	0.00	0.00
Bella Vista	8.11	2,70
Pueblo Nuevo	2.86	0.00
San Francisco	5.00	1.67
Parque Lefevre	16.67	9.26
Río Abajo	1.67	0.00
Este	17.79	6.27
Juan Díaz	2.84	0.71
Pedregal	14.47	7.89
Tocumen	30.95	11.90
Pacora	31.82	7.95
San Martín	20.00	10.00
Noreste	26.49	11.89
Las Cumbres	21.97	9.85
Chilibre	37.74	16.98
Area Revertida	29.41	11.76
Ancón	29.41	11.76

Source: Living Level Survey, 1997 and National Censuses of Population and Housing. Prepared by Social Policy Department of the Ministry of Economy and Finance, 1999.

2.3 Urban Structure

The Study area has three development plans:

- Regional Plan for Land Use: it focuses on the environmental resources of the Panama Canal watershed which are critical for its development
- General Plan for Land Use: it guides the development and maintenance of reverted areas, including its equipment
- Metropolitan Plan (Dames & Moore): it guides the growth of urban areas in the Atlantic and Pacific with the purpose to reach a sustainable use of land through the integrated use of the resources and controls of Panama canal and its watershed

The following table shows the investments foreseen in the Metropolitan Plan in the area of Solid Waste Management.

Table 2-8: Matrix of Key Projects for Solid Waste Management in the Study Area foreseen in the Metropolitan Plan

Area of Influence	Sector/ Sub-sector	Project	Justification	Investment (millions of USD)	Estimated execution Time (years)	Priority of Execution		
						1995 -2000	2001 -2005	2006 -2020
Coregimiento José Domingo Espinar, Belisario Porras, Integrated zone 4	Infrastruc./ Solid Waste	Transfer Station Las Cumbres (TELC)	Low capacity of DIMA* to service the area; to prevent illegal disposal	14.7	1		A	B
Corregimiento Pacora, San Martín, and Tocumen	Infrastruc./ Solid Waste	Transfer Station Tocumen (ETT)	DIMA* can not service area appropriately; too much distance to Cerro Patacon	17.3	1	A	A	B
Corregimiento Veracruz, western part of Ancón	Infrastruc./ Solid Waste	Transfer Station Howard (ETH)	Current system is adapted to Veracruz generation. Development projections in Howard and Kobbe indicate that the system should be reinforced.	14.3	1		A	B
Corregimiento Arraiján Cabecera, Juan Demóstenes Arosemena, Nuevo Emperador	Infrastruc./ Solid Waste	Transfer Station Arraiján (ETA)	A significant growth is projected in the area which would deteriorate the current situation .	10.0	1	A	A	B
Integrated zone 1, 2, 4, 5, Pacora, San Martín, Tocumen	Infrastruc./ Solid Waste	Cerro Patacón (Expansion)	It is the only Final Disp. Site in the metropolitan area. The development in the area creates a strong pressure on the landfill capacity.	149.6	2	A	A	B
Corregimiento Juan Díaz, José Domingo Espinar, 30% of Las Cumbres, Pedregal, Pacora, San Martín and Tocumen	Infrastruc./ Solid Waste	Sanitary landfill José D. Espinar (RSJDE)	The projection for 2020 shows that this area will have a high SW generation which should be serviced with appropriate technology	20.8	2			B
National level	Infrastruc./ Solid Waste	Sanitary education program	It is necessary to raise conciousness level of the residents regarding good cleansing habits	1.1	1	A	A	B
Metropolitan area	Infrastruc./ Solid Waste	Facility for separation and recycling program	Large quantity of waste can be recycled; additionally, there is great potential for employment generation	7.0	1		A	B

Source: Plan Metropolitano, Dames & Moore

* The service was provided by DIMA when the study was conducted

Note: The project priorities are shown as A, B, and C. Letter A represent essential projects which require to be executed in the corresponding execution phase. Priority B projects are important, but its execution in the proposed phase is not critical in the Plan. Priority C represents complementary projects to the Plan implementation. The investment amount is based on the assumption that there is an average generation of 0.7 kg./pers./day and proceeds mostly from residential areas.

2.3.1 Land Use

The categories established for land use and their representative Corregimientos are the following:

Table 2-9: Present Land Use

Category	Sub-category	Corregimientos
Urban Use	Low density residential	San Francisco, Pueblo Nuevo, Betania, Parque Lefevre, Rio Abajo; and parts of Juan Diaz, Tocumen, Pedregal, Pacora, Chilibre, and Las Cumbres.
	High and medium density residential	• Bella Vista, Curundú, San Felipe, Chorrillo, and Santa Ana
	Commercial/Services	Bella Vista, Betania, and mostly along corregimientos bordering Via Domingo Díaz, Jose Arango, and Via Simón Bolivar.
	Mixed	Calidonia, and Bella Vista
	Institutional	parts of Parque Lefevre, Bella Vista, and Betania
	Industrial	: parts of Betania, Pedregal, and Chilibre
	Transport and communications	: parts of Ancon and Tocumen; especially areas for national airport Marco A. Gelabert and Tocumen International airport
	Recreational and Green Areas	most of Ancon, parts of San Francisco and Juan Diaz.
Non-urban Use		Corregimientos Ancon, Chilibre, Las Cumbres, Pacora, Tocumen, Pedregal, and parts of Juan Diaz are included in this category.
Overlapping areas		Corregimientos Ancon (tourist and protected areas are found) and Parque Lefevre (mostly where Panama Viejo is found as a tourist attraction) are included in this category.

2.4 Financial Conditions

2.4.1 Central Government

The Panamanian Public Sector encompasses General Government and Decentralized Institutions.

The budget of the Central Government amounted to some U$2,500 Million in 1999, with a surplus of some U$60 Million. Income of the Central Government originated 75% as current income and 25% as capital income. On the expenditure side, 86% was current expenses and 12% investment, as shown below.

Table 2-10: Executed 1999 Budget of the Central Government

Income and Expenditures	Million USD	Composition (%)
Income		
Current Income	1,925.7	74.9
Tax Income	1,211.2	
Non-tax income	538.2	
Other current income	176.3	
Capital Income	644.5	25.1
Equity	32.3	

Income and Expenditures	Million USD	Composition (%)
Domestic credit	220.4	
Foreign credit	384.8	
International organizations	70.0	
Bilateral agreements	14.2	
Foreign bonds	300.6	
Other capital income	7.0	
Total Current and Capital Income	2,570.2	100.0
Expenditures		
Working expenses	2,173.4	86.6
Operating expenses	821.7	
Personnel expenses	631.4	
Non-personnel expenses	113.6	
Materials & supplies	59.8	
Machinery & equipment	4.0	
Other expenses	12.8	
Transfer & subsidy	416.2	
Debt service	935.5	
Investment	303.6	12.1
Education insurance	32.4	1.3
Total Current and Capital Expenditures	2,509.4	100.0
Surplus	60.9	

Source: Informe del Contralor General de la Republica, 1 marzo 2000

2.4.2 Budget of Municipal Government

The budget of all 68 municipalities in the country in 1999 amounted to U$69.9 Million, the municipalities in Panama Province comprising U$45.8 Million (65.5% of total). Within Panama Province, the municipal budget of Panama City was the biggest with U$34.6 Million.

Table 2-11: Municipal Budget of 1999 (Million USD)

Municipality	Authorized Budget
All Municipalities	69.9
Municipalities in Panama Province	45.8
Municipality of Panama	34.6
Municipality of San Miguelito	4.8
Municipality of Arraijan	1.6

Source: Informe del Contralor General de la Republica, 1 marzo 2000

The 1999 authorized budget of Panama City was U$34.6Million, equivalent to 75.5% of the budget of municipalities in Panama Province, and 49.5% of the budget of all municipalities in the country.

Table 2-12: Income Statement 1999 of Panama City

Income and Expenditures	1999
Income	
Tax income	30,183,000
Non-tax income	7,915,000
Total Income	**38,098,000**
Expenditures	
Personnel	18,106,000
Operating expenses	3,654,000
Service by third party	2,339,000
Reserves	2,275,000
Total Expenditures	**26,374,000**
Other Income and Expenditures	-148,000
Operation Result before Contribution	11,576,000
Income from Previous Years	14,000
Contribution	-5,276,000
Surplus or Deficit	6,314,000

Source: Informe del Contralor General de la Republica, 1 marzo 2000

2.4.3 Taxation System and Public Utilities

a. Taxation System

Taxes are divided into direct tax and indirect tax. In Panama, the most important direct tax is income tax, comprising around 40% of tax revenues, and the most important indirect tax is import tax, comprising around 30% of tax revenues.

b. Public Utilities

The Census of 2000 indicates that there were 681,799 dwellings in the country, out of which 63,002 (9.2%) without water supply and 126,805 (18.6%) without electricity. The corresponding figures for Panama District were 187,729 dwellings, of which 2,558 (1.4%) without water supply and 4,343 (2.3%) without electricity.

Table 2-13: Houses without Electricity and without Water Supply

Dwellings	Country		Panama District	
	Number	%	Number	%
Total dwellings	681,799	100.0	187,729	100.0
Dwellings without electricity	126,805	18.6	4,343	2.3
Dwellings without water supply	63,002	9.2	2,558	1.4

Source: Censos Nacionales de Poblacion y Vivienda, 14 de mayo de 2000, Volumen I, Tomo I, Direccion de Estadistica y Censo, Diciembre 2001

b.1 Electricity

Three stages are clearly defined in electricity: generation, transmission, and distribution. There can be any number of electricity generators, as long as they are licensed by the Regulatory Entity of Public Services (ERSP). Transmission is monopolized by ETESA, a government corporation. Distribution is provided by regulated private companies: EDEMET and ELEKTRA in Panama District, and EDECHI.

In the year 2000, the number of clients was 513,638, of which 504,025 were served by the companies with concession for distribution.

Electricity consumption in the country in the year 2000 showed the following distribution: 42% commercial, 29% residential, 16% public sector, and 13% industrial

b.2 Water

Water consumption in the country in the year 2000 amounted to 62,807 million gallon, distributed in 73% residential, 15% commercial, 10% public sector and 2% industrial. Panama District accounted for nearly 70% of water consumption of the country.

Table 2-14: IDAAN Fixed Charges by Customer Type

User Type	Charges	Monthly Water Consumption	Monthly Tariff
Residential Panama-Colon –**Arraijan Tariff 20**	Minimum	8,000 gal	U$ 6.40
	Basic	10,000 gal	U$ 8.00
Residential other urban areas **Tariff 22**	Minimum	8,000 gal	U$ 5.68
	Basic	10,000 gal	U$ 7.10
Special residential at national level **Tariff 21**	Minimum	6,000 gal	U$ 4.26
	Basic	10,000 gal	U$ 7.10
Commercial-Industrial **Tariff 23-24**	Basic	10,000 gal	U$11.50
Government **Tariff 25-26**	Basic	10,000 gal	U$ 8.00

Source: Ente Regulador de los Servicios Publicos

2.5 Environmental Policy

Title IV of Law 41 assigns ANAM the duty of directing and coordinating the process for elaborating environmental quality standards with the participation of pertinent entities and the community. These standards are to be established by executive decrees, which shall include attainment schedules.

Fundamental public environmental policies are based on sustainable development principles as follows: valuation and conservation of the environmental patrimony, restoration of

environmental resources, promotion of environmental education and development and strengthening of institutional environment management capacity.

2.5.1 Organizations Concerned

a. ANAM

National Authority on the Environment (ANAM) was created by Law 41 of 1998, under Title III, which deals with the administrative organization of the State to manage the environment.

b. ACP

The Panama Canal Authority (ACP) is also responsible for managing and safeguarding the water resources of the Canal watershed.

c. ARI

The Interoceanic Region Authority (ARI) was instructed to prepare a land use plan, which establishes the zonification of the Canal Area and its watershed.

d. Non-Government Organizations

Non-government organizations (NGOs) with environmental concerns can be divided into two types, conservation groups and social interest societies. The major active ones are described below.

Table 2-15: Environmental Conservation Group

NAME	SINOPSIS
Asociación Nacional para la Protección de la Naturaleza	Founded in 1985. Conducts environmental education, agro-forestry projects, and park protection. It has several demonstration farms and education centers.
Sociedad Audubon de Panamá	Established in 1963 as a naturalist society in the former Canal Zone. Holds regular meetings and field trips, promoting environmental education.
Fundación Natura	Established in 1990 to administer an ecological trust fund created by the Government of Panama, the USAID and The Nature Conservancy. It finances and oversees conservation projects, both public and private.

Table 2-16: Social Interest Group

NAME	SINOPSIS
Centro de Estudios y Acción Social --CEASPA	Conducts rural environmental social studies, with emphasis on women´s participation in community projects.
Fundación para el Desarrollo de la Libertad Ciudadana	Created in 1995 to promote public participation in development projects. Main areas of interest include the Bay of Panama and the Canal Watershed.
Centro de Estudios de Acción Social	Mainly a social research organization, actively participates in the review of proposed projects and legislation.
SONDEAR	Formerly Technoserve, provides technical assistance to rural communities, primarily in the Canal Watershed.

2.5.2 Environmental Impact Evaluation Process in the Country

The guidelines detail methodologies based on a list of projects that require environmental impact studies and five criteria to consider in the determination of categories a given project might fall into.

1. When the project generates or presents a risk to the health of the population, flora and fauna and on the environment in general
2. When the project generates alterations to the quantity and quality of natural resources (soil, water, flora, fauna)
3. When a project presents significant alterations to the qualities of an area that had justified its protection
4. When the project causes resettlements and alterations to human groups
5. When the project affects monuments, archaeological, or historic sites

Projects that must enter the environmental impact process are listed under Title II of the regulations and this list also identifies the government agency that must receive the EIS.

Table 2-17: EIS Required Projects

Sector	Contents
Mining Sector and Hydrocarbon exploration and production	• Metallic and non-metallic mineral exploration • Oil refining plants
Forestry Sector	• Forest harvesting in natural forests of more than 50 hectares • Forest plantations of more than 10 hectares • Forest industries • Furniture industries
Agriculture Sector	• Sugar factories • Alcoholic beverages production industries • Industrial animal processing activities • Pig raising plants • Food processing plants • Cattle raising facilities with more than 100 heads • Industrial sea food processing plants

Sector	Contents
Fisheries and aquaculture Sector	• Industrial harvest of fisheries • Shrimp farms larger than 1 hectare • Fish farms larger than 1 hectare • Frog farms larger 1 hectare • Other aquatic animal (turtles, crabs, snails) farms larger than 1 hectare
Energy and Industry Sector	• Electrical energy generating plants larger than 1.0 MW • Hydroelectric generating plants larger than 1.5 • Nuclear plants • Iron and steel industries • Cement plants • Transmission lines • Battery factories • Cement block factories • Industrial coffee processing
Transport Sector	• Road construction projects • Railroad line construction projects • Commercial ports • Bridge construction projects • Bus and train terminals
Waste Disposal Projects	• Construction and operation of solid waste management, treatment and final disposal systems • Sanitary Landfills • Installations for the final treatment of common wastes • Safe disposal of hazardous wastes • Sewage systems • Depuration plants and systems • Sludge treatment plants • Septic tanks and treatment lagoons
Development of infrastructure	• Urban development projects • Tourist development projects in protected areas • Telecommunication cables • Construction of buildings, galleys and shopping centers • Oil pipes • Flood prevention or irrigation reservoirs • Marine, fluvial or coastal filling for construction
Development Plans	• Urban renewal development programs • Forestry development plans • Tourist development plans • Agricultural development plans • Industrial development plans • Fishery development plans • Electrical energy plans

According to the guidelines issued by ANAM on the Environmental Impact Evaluation Process, for the three Categories of projects, EIS must include the following discussions:

Table 2-18: Categories of EIS

Category	Required information and activities
Category I	• Description of project area, landscape, geographic location • Project description through different stages • Identification of impacts, risks • A sworn statement that project does not pose significant environmental impacts and does not generate environmental risks according to the 5 environmental protection criteria.
Category II	• Summary of results and findings with description of area and citizen participation plan • Project description – objectives, location, justification, stages, operation, closure, costs • Description of negative and positive impacts • Citizen participation plan • Environmental Management Plan – measures to mitigate impacts, surveillance and control program, risk prevention plan, contingency plan • Citizen Participation Plan -- observations made by affected communities during information exchange • Staff – professionals in the EIS team • Annexes
Category III	• Summary of results and findings • Project Description – objectives, justification, location, design, stages, construction, operation, closure, costs, • Description of Area of Influence – land use, value, property rights, potential uses, protected areas, fauna, flora, quality of the environment, scenery, climate, geology, geomorphology, hydrology, population, demography and sociology • Identification of Impacts – positive and negative consequences of all project activities and stages, transformations of the environment, impacts (direct, indirect, cumulative, synergistic), duration of occurrence, extent • Environmental Management Plan – measures to mitigate impacts, surveillance and control program, risk prevention plan, contingency plan • Citizen Participation Plan -- observations made by affected communities during information exchange • Staff – professionals in the EIS team • Annexes – cartography and other related information

2.6 Other Infrastructure

2.6.1 Water Supply

Water in Panama District is served by National Waterworks and Sewerage Institute (IDAAN). 97.2% of the housings in the urban areas has drinking water and 85.5% in the rural areas. The rest of the district receives water from cistern trucks.

2.6.2 Sewage and Drainage

The sanitary system for drinking water and sewerage system are in charge of IDAAN for population of more than 1,500 people and in charge of MINSA in smaller settlements. The covering indexes are high, in relation to the Central American countries. There is insufficient treatment for sewer waters, causing serious pollution problems in the receiving bodies, especially in Panama Bay. 60% of drainage system of the Panama City is connected to the system.