

c. Project Design Matrix

Table 7-42 shows the Project Design Matrix (PDM) of DIMAUD Management Improvement Pilot Project.

Table 7-42: Project Design Matrix of DIMAUD Management Improvement

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Collection works are improved through analysis and evaluation of indicators.	Improvement in indicators	Results of calculated indicators	Facilities to receive relevant data, input the data, compute the selected indicators, and submit the indicators to the top management and the offices involved, so as to serve as an instrument for management improvement.
Project Purpose Indicators regarding collection works are established and monitored.	1. Ton per trip 2. Ton per hour 3. Ton per worker 4. Fuel efficiency	Results of selected indicators, computed periodically	Collection and input of relevant data
Outputs 1. Preparation of database on indicators 2. Training of counterpart personnel to collect and input data, and to verify indicators	Set up of database program and input of collected data	Ability of counterpart personnel to effectively use the database	Continued support from the top management for the effective operation of the system
Activities 1.1 Analysis of the newly designed form for work order 1.2 Analysis of performance indicators to calculate 1.3 Design of the general database scheme 1.4 Set up, testing and operation of hardware 1.5 Training of necessary personnel 1.6 Data collection and input 1.7 Analysis and evaluation	Inputs JICA Personnel DIMAUD Personnel Equipment PC 1 unit PC software 1 set Printer 1 unit	Pre-conditions The necessary budget is secured for personnel and other necessary expenses	

7.4.2 Implementation

a. Schedule

The Pilot Project was implemented between August 19, 2002 and September 18, 2002.

b. Implementation Method

b.1. Analysis of the new form for work order

For the implementation of the database on performance of SW collection service, analysis was conducted on the new form for work order, which was specifically designed for data collection in the Collection Improvement Pilot Project.

b.2. Analysis of performance indicators to calculate

Analysis was also conducted on the performance indicators to be computed, on the basis of data that could be collected in the Collection Improvement Pilot Project. The conclusion was that it would not be possible to compute performance indicators based on kilometer run by the collection truck, because odometers in most DIMAUD collection trucks do not work properly.

b.3. General scheme of the database

As shown in the following figure, the Collection Department is connected through a network with other DIMAUD Departments in Carrasquilla. Two computers were at the disposal of Collection Department, the first one owned by DIMAUD, while the other was set up for the Collection Improvement Pilot Project. The SW collection database was installed in the second computer, where the Department personnel could input all work orders every day, and then could verify the collection indicators.

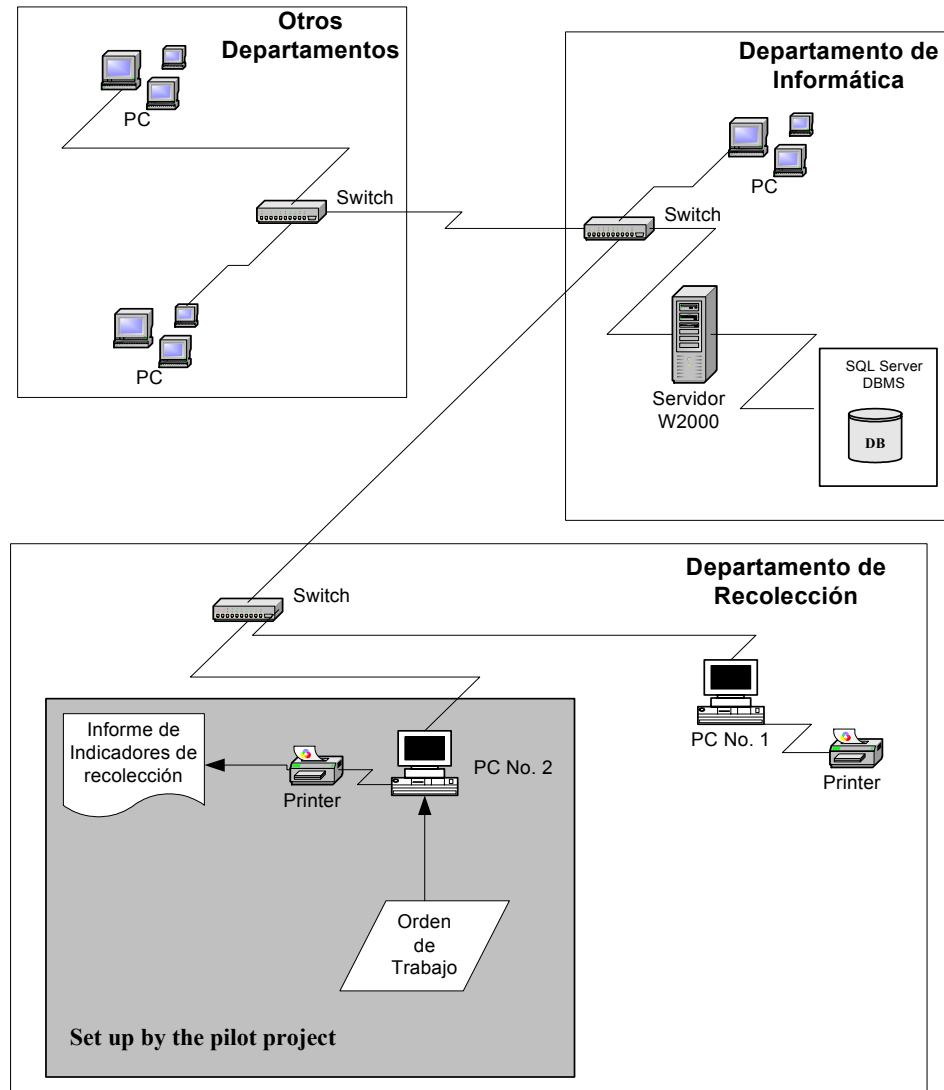
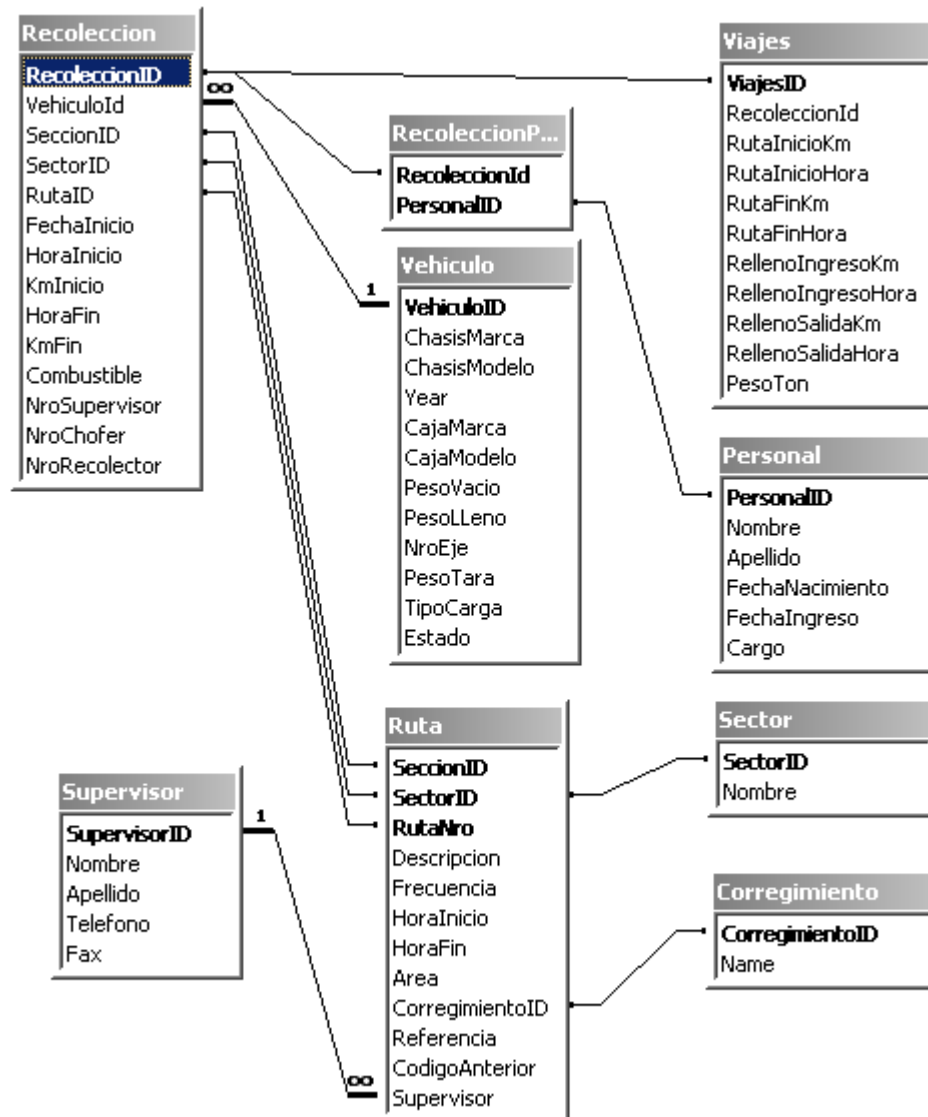


Figure 7-9: General Scheme to Implement DB on Indicators

b.4. Structure of tables

The following figure shows the database tables, to be described later on.



b.5. Database on indicators

The database on collection indicators was developed with Microsoft Access, a well known and easy to use application. The database on collection indicators is installed in the second computer of the Collection Department, and the first page would be the following [Main Menu].



The program controls the following aspects.

c. Collection routes

In the [Main Menu], *click* the [Rutas] option, the screen will change, and data on collection route can be modified, eliminated or updated. The routes are defined on the basis of current DIMAUD routes, but with a little change in their coding. Based on Collection Improvement Pilot Project, and in agreement with the counterpart, the coding of routes was defined with the following criteria.

D	001	01
D=Day, N=Night	Sector number	Route number within a sector

The screenshot shows a software window titled 'Rutas' with a menu bar containing 'Rutas', 'Sectores', 'Corregimientos', 'Supervisor', and 'Referencia'. The main area displays a table with the following data:

	Sec	SectorID	RutaID	Descripción	Frecuencia	Horalnicio	HoraFin	Area	Corre	Corregimiento	Refi
▶	D	001	01	Chase	Día por Medio	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	002	01	Loceria	Día por Medio	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	003	01	La Alameda	Día por Medio	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	004	01	Villa La Fuente	Diaria	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	005	01	Curundu	Diaria	6:00 AM	2:00 PM	A	5	Curundu	Resid
	D	006	01	Los Angeles	Diaria	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	007	01	Miraflores	Diaria	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	008	01	Bethania	Diaria	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	009	01	Santa Maria	Diaria	6:00 AM	2:00 PM	A	6	Bethania	Resid
	D	010	01	El Chorrillo 1	Diaria	6:00 AM	2:00 PM	A	2	El Chorrillo	Resid
	D	011	01	San Felipe	Diaria	6:00 AM	2:00 PM	A	1	San Felipe	Resid
	D	012	01	Mercado	Diaria	6:00 AM	2:00 PM	A	1	San Felipe	Resid
	D	013	01	Ancón	Día por Medio	6:00 AM	2:00 PM	A	14	Ancon	Resid
	D	014	01	Balboa	Día por Medio	6:00 AM	2:00 PM	A	14	Ancon	Resid
	D	015	01	Diablo	Día por Medio	6:00 AM	2:00 PM	A	14	Ancon	Resid
	D	016	01	Amador	Día por Medio	6:00 AM	2:00 PM	A	14	Ancon	Resid
	D	017	01	Los Ríos	Día por Medio	6:00 AM	2:00 PM	A	14	Ancon	Resid

Record: 1 of 104

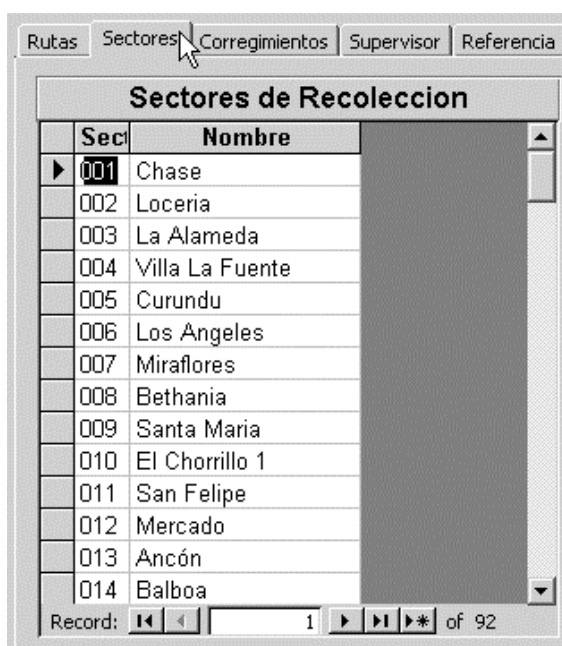
Each route has the following details.

Sector*	Sectors are defined according to sectors currently used by DIMAUD, but changes will have to be made depending on improvements that can be introduced in the current routes.
Description	Brief description of the route
Frequency	Collection frequency of the route
Starting time	The time collection starts in the route
End time	The time collection ends in the route
Area	The corresponding area, [Sector Pacifico=Area A], [Sector Carrasquilla=Area B]
Corregimiento*	Corregimiento in which the route is located
Reference*	Reference of the route according to the type of waste collected, household, commercial, market, etc.
Supervisor*	Name of the route supervisor

*Codified as detailed below

Sectors

Sectors are coded sequentially from 001. To see the details, click on the sheet [Sectores] in the [Rutas] window, and the following screen pops up.



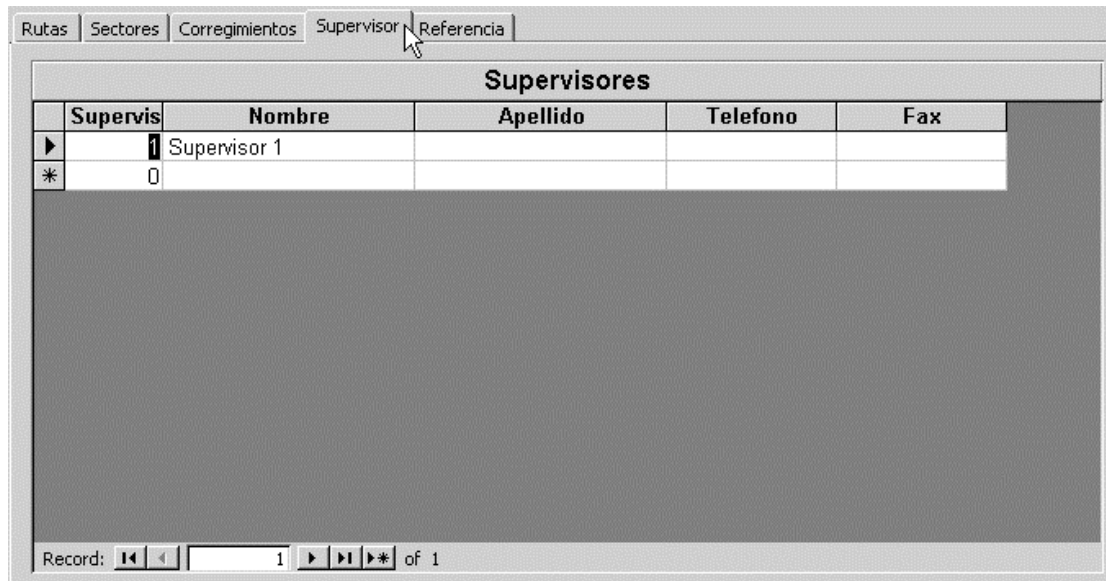
Corregimientos

Corregimiento is coded from 1 to 19, corresponding to all Corregimientos in Panama District, according to the numbering system of the Comptroller of the Republic. To see the details, *click* the sheet [Corregimiento] in the [Rutas] window, and the following screen pops up.



Supervisors

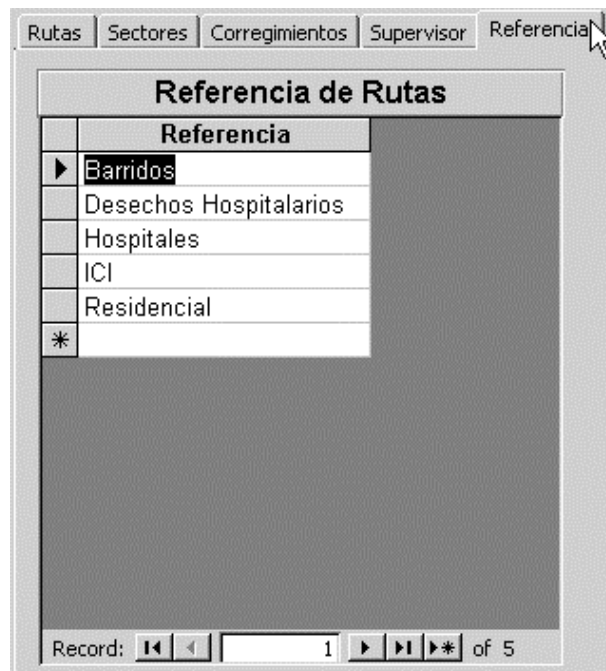
To see the details on supervisors, *click* the sheet [Supervisores] in the [Rutas] window and the following screen pops up.



Coding of all supervisors is made in this sheet, to be used in the routes sheet.

References

To see the details on references, *click* the sheet [Referencia] in the [Rutas] window, and the following screen pops up.



Each of the previously described sheets has the following bars to facilitate movement to the record to modify: . Click to go to the first record, to go to the last one, to go to the previous one, to go to the following one, and to add a new record.

d. Collection vehicles

In the [Main Menu], *click* the option [Vehiculos], and the following screen appears. Here, data on collection vehicles used in each work order can be modified, eliminated or updated. Vehicles are coded according to the number assigned by DIMAUD.

VehiculoID	ChasisMarca	ChasisModelo	Year	CajaMarca	CajaModelo	PesoVacio	PesoLeno	HroEje	PesoTara	TipoCarga
200	Ford	RD600	1234							
1701	N/D	N/D	1982	N/D	N/D	N/D	N/D			Volquete
1704	N/D	N/D	2000	N/D	N/D	N/D	N/D			Volquete
1705		VWX64	2000	N/D	N/D	N/D	N/D			Volquete
1707		MR6885	1995	N/D	N/D	N/D	N/D			Volquete
1708		N/D	1997	N/D	N/D	N/D	N/D			Volquete
1709	Ford	N/D	1997	N/D	N/D	N/D	N/D			Volquete
1710		N/D	1995	N/D	N/D	N/D	N/D			Volquete
1711		N/D	1995	N/D	N/D	N/D	N/D			Volquete
1712		N/D	1995	N/D	N/D	N/D	N/D			Volquete
1713		N/D	1997	N/D	N/D	N/D	N/D			Volquete
1714		N/D	1997	N/D	N/D	N/D	N/D			Volquete
1901	Internacional	4700	1998	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero
1902	Internacional	4700	1999	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero
1903	Internacional	4700	2001	Heil	F-4000	16000 lbs	35000 lbs	2	4.65	Carguio Trasero
1904	Internacional	4700	1998	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero
1905	Internacional	4700	1999	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero
1906	Internacional	4700	1999	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero
1907	Internacional	4700	1998	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero
1908	Internacional	4700	1999	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero
1909	Internacional	4700	1998	Heil	F-4000	16000 lbs	35000 lbs	2	6.73	Carguio Trasero

Vehicles have the following details.

Vehicle ID	Number identifying each vehicle
Chassis manufacturer*	Manufacturer of the vehicle
Chassis model*	Model of the vehicle
Year	Year the vehicle was manufactured
Compactor manufacturer*	Manufacturer of the compactor
Compactor model*	Model of the compactor
Empty weight	Empty weight at the factory
Loaded weight	Maximum weight at the factory
Number of axel	Number of axels of the vehicle
Tare weight	Tare weight of the vehicle weighed at the scale
Type of load*	Type of load of the vehicle
Status (condition)*	Status or condition of the vehicle

*Fields are coded as detailed below

Chassis manufacturer and model

To add, modify, eliminate or to see the details of vehicles, *click* the sheet [Chasis] in the [Vehiculos] window and the following screen pops up.

The screenshot shows a software window with tabs for 'General', 'Chasis', 'Caja', and 'Otros'. The 'Caja' tab is active. It contains two side-by-side list boxes. The left list box is titled 'Marca' and has a sub-header 'ChasisMarca'. It lists: Ford (selected), Internacional, Mack, Volvo, N/D, and an asterisk (*). The right list box is titled 'Modelo' and has a sub-header 'ChasisModelo'. It lists: RD600 (selected), MR6885, F-800, WX64, 4700, and 4900. Both lists have record navigation controls at the bottom, showing 'Record: 1 of 5' and 'Record: 1 of 7' respectively.

Compactor manufacturer and model

To add, modify, eliminate, or see the details on manufacturers and models of compactors, *click* the sheet [Caja] in the [Vehículos] window, and the following screen pops up.

The screenshot shows the same software window with the 'Caja' tab active. The left list box is titled 'Marca' and has a sub-header 'CajaMarca'. It lists: E-Z Pack (selected), Demspster, Heil, N/D, and an asterisk (*). The right list box is titled 'Modelo' and has a sub-header 'CajaModelo'. It lists: Front Loader (selected), Peabody, F-4000, N/D, and an asterisk (*). Record navigation controls show 'Record: 1 of 4' for both lists.

Others

To add, modify, eliminate, or see the details on types of load, and the status or condition of the vehicle, *click* the sheet [Otros] in the [Vehículos] window, and the following screen pops up.

The screenshot shows the software window with the 'Otros' tab active. It contains two side-by-side list boxes. The left list box is titled 'Tipo de Carga' and has a sub-header 'TipoCarga'. It lists: Carguio Frontal (selected), Carguio Trasero, Volquete, N/D, and an asterisk (*). The right list box is titled 'Estado del Vehiculo' and has a sub-header 'Estado'. It lists: Operativo (selected), En reparación, Dañado, Fuera de servicio, Alquilado, and an asterisk (*). Record navigation controls show 'Record: 1 of 4' and 'Record: 1 of 5' respectively.

e. Collection data

In the [Main Menu], click the option [Datos de recolección] and the following screen pops up. Here, data on daily work order can be modified, eliminated or updated.

Input of data on each work order is done in this sheet. Each work order consists of three sections, as described below.

General Data on Work Order:	
Collection ID	Sequential number of work order
Vehicle ID	Number identifying the vehicle, as defined in the vehicle sheet
Route ID	Code identifying the route
Date	Date of the work order
Time going out	Time the vehicle leaves the base
Km leaving base*	Odometer reading when leaving the base
Time of return	Time the vehicle returns to base
Km returning to base*	Odometer reading upon return to base
Fuel	Fuel consumption in gallon
Number of drivers	Number of drivers who did the work
Number of collectors	Number of collecting-loading laborers who did the work
Data on trips made to Sanitary Landfill: A work order can require more than one trip to the landfill, and data on all trips for each work order should be input here.	
Route start Km*	Odometer reading at the start of the route
Route start time	Time at the start of the route
Route end Km*	Odometer reading at the end of the route
Route end time	Time at the end of the route
Landfill entering Km*	Odometer reading when entering landfill
Landfill entering time	Time when entering landfill
Landfill exit Km*	Odometer reading when leaving landfill
Landfill exit time	Time when leaving landfill

General Data on Work Order:	
Weight Ton	Tonnage collected in the trip
Data on personnel who did the work: Input of coded data on persons who did the work is made here. Generally required data are the code for one driver and 3 helpers or collector loaders.	
Personnel ID	Input of identifying codes for the persons who did the work

*For trucks with working odometers

Personnel

To add, modify, eliminate, or see the details on persons who do the collection work, *click* the sheet [Personales] in the [Orden de trabajo] window, and the following screen pops up.

Personal	Nombre	Apellido	FechaNacimiento	FechaIngreso	Cargo
1	Personal 1	Personal1	09/23/02	9/23/2002	Chofer
2	Personal 2	Personal 2	03/18/70		Recolector
*	0				

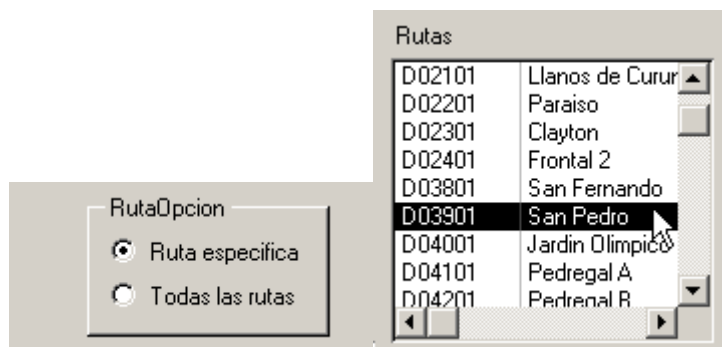
Input of data on all drivers and helpers or collector-loaders is done in this sheet, using their respective codes.

f. Reports

To obtain different reports on performance indicators of collection service, *click* the option [Informes] in the [Main Menu] and the following screen pops up.

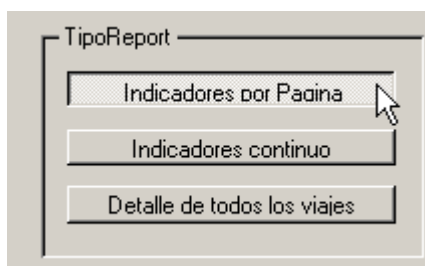
To obtain reports, follow the steps described below.

- Input the start date and end date of the desired report, that is, the period for which the report is needed.
- Click the option [Ruta especifica] to obtain the report on a specific route. All routes are listed and the desired route can be chosen to get the corresponding report.



[Todas las rutas] option gives the report on all routes.

- Choose the type of report desired and click . Reports presented later is based on data from Collection Improvement Pilot Project.



Click [Indicadores por Pagina] to obtain the following report.

DIMAUD Indicadores de Servicio de Recoleccion			
Ruta	D03901	San Pedro	
		Desde 19-Aug-02	Hasta 18-Sep-02
Indicadores	Resultados	Rango Aceptable	
Dias Trabajados	25.00	Dias	
Toneladas Recolectadas	283.32	Ton	
Total Nro De Viajes	36.00	Viajes	
Km Recoleccion	296.00	Km	
Km Recorrido	1,562.40	Km	
Horas Recoleccion	109.92	Horas	
Horas Reales Trabajadas	170.15	Horas	
Horas Pagada Conductor	203.78	Horas	
Horas Pagada Recolector	600.00	Horas	
Consumo Combustible	269.00	Galones	
Ton Vs Hora Recoleccion	2.58	Ton/Hora	2.3 A 2.6 Recoleccion Puerta a Puerta 2.8 a 3.2 Recoleccion punto a punto
Ton vs Horas Pagadas	0.35	Ton/Hora	0.30 a 0.35
Ton Vs Horas Trabajadas	1.67	Ton/Hora	
Ton/Viaje	7.87	Ton/Viaje	
Ton/Ayudante/Dia	4.40	Ton/Ayudante/dia	4.5 a 5.0
Kg/Km Sector	957.16	Kg/Km	
Kg/Km Total Recorrido	181.34	Kg/Km	
Rendimiento Combustible	5.81	Km/Galones	
Rendimiento Combustible	1.58	Galon/hora	1.2 a 2.0 galon/hora

This report shows all indicators in one sheet for each route.

Click [Indicadores continuo] to obtain the following report.

DIMAUD Indicadores de Servicio de Recoleccion																				
Rutas		Desde 19-Aug-02 Hasta 18-Sep-02																		
Dias Trabajados	Ton Recolectados	Total Nro De Viajes	Km Recoleccion	Km Recorrido	Horas Recoleccion	Horas Reales Trabajadas	Horas Pagado Conductor	Horas Pagada Recolector	Consumo Combustible	Ton Vs Horas Recoleccion	Ton vs Horas Pagadas	Ton Vs Horas Trabajadas	Ton/Viaje	Ton/Ayudante/Dia	Kg/Km Sector	Kg/Km Total Recorrido	Rendimiento Combustible Km/Galones	Rendimiento Combustible Galon/hora		
D03901	San Pedro	25	283.32	36	296	1,562	170.15	109.92	203.78	600.00	269.00	2.58	0.35	1.67	7.87	4.40	957.16	181.34	5.81	1.58

This report shows all indicators continuously by line.

Click [Detalles de todos los viajes] to obtain the following report.

DIMAUD Indicadores de Servicio de Recoleccion Desde 19-Aug-02 Hasta 18-Sep-02																				
D03901 San Pedro																				
Veh.No	Fecha	Km.Salida	Km.Llegada	Km.	H.Salida	H.Llegada	Hc	H.Trab	H.Llegada	DF	Consumible	No.Chofar	No.Recolector	Rolleno	Km.Salida	Km.	H.Salida	Hc	Ton	Ton/Hora
1981	8/19/2002	17712	17743	31	6:00 AM	1:43 AM	5:93	4:99	8:00	3:07	12	1	3							
1981	8/20/2002	17794	17872	78	6:00 AM	12:24 PM	6:25	5:59	8:00	2:07	14	1	3							
1981	8/21/2002	17948	17843	95	6:00 AM	1:30 AM	5:50	4:50	8:00	3:50	8	1	3							
1981	8/21/2002	17948	17800	48	6:00 AM	1:03 AM	5:50	4:50	8:00	3:50	8	1	3							
1981	8/22/2002	18133	18180	47	6:00 AM	1:19 PM	7:48	7:48	8:00	0:52	12	1	3							
1981	8/23/2002	18213	18243	30	6:00 AM	1:02 AM	5:43	4:43	8:00	3:37	10	1	3							
1981	8/24/2002	18243	18270	27	6:00 AM	1:02 AM	5:43	4:43	8:00	3:37	10	1	3							
1981	8/24/2002	18243	18270	27	6:00 AM	1:02 AM	5:43	4:43	8:00	3:37	10	1	3							
1981	8/24/2002	18340	18390	50	6:00 AM	2:04 PM	8:43	7:43	8:00	0:37	12	1	3							
1981	8/24/2002	18340	18310	30	6:00 AM	1:02 AM	5:43	4:43	8:00	3:37	10	1	3							

This report shows the details of each trip made by route.

7.4.3 Results and Evaluation

The different types of reports presented above resulted from the data collected in the Experiment on Collection Improvement between August 19 and September 18, 2002. One of the reports showed all indicators in one sheet for the whole duration of the experiment, but the same one-sheet report can be obtained daily or for any length of time and for any route. On any specific collection route, weekly report can serve to monitor performance through changes in the appropriate indicators. More detailed discussion on interpretation of indicators was presented in the Experiment on Collection Improvement.

Once all data is input, indicators can be obtained very flexibly for any length of time, daily, weekly or monthly, without being tied to the one-year analysis time-frame of COSEPRE. And when the operation indicators become available, cost indicators can be obtained by applying the price actually paid by DIMAUD for the different resources used.

The Collection Improvement Pilot Project trained the counterpart personnel to collect the required data and verify the performance indicators by collection route. Therefore, the counterpart personnel is capable of evaluating the results of performance indicators, and introduce the indicated improvement measures.

7.4.4 Recommendations

Information technology is quickly and constantly changing. Therefore, Collection Department with the support of the Computing Department will have to change the operating system, in order to update the database system.

The database was developed with Microsoft Access, and the Computing Department is capable of modifying the program when the need arises. Probably, information types will need to be modified or added, in order to obtain more specific reports to help implement constant monitoring and improvements.

The establishment of the database on indicators is expected to facilitate the effective utilization of COSEPRE, already installed in DIMAUD computer, when the COSEPRE requirement of annual data from all collection routes are input in the database.

7.5 Environmental Education

7.5.1 Outline

a. Objectives

The project pilot for environmental education within the framework of the Study has the following objectives.

- to raise public awareness concerning solid waste management
- to encourage public participation in solid waste minimization activities
- to reduce the load on the environment and to conserve natural resources

The ultimate goal of environmental education is to develop an environmentally conscious society that has the knowledge, ability, attitude, motivation, and commitment to work individually and collectively towards the minimization of waste and the conservation of natural resources.

To achieve the mentioned objectives, a training program for facilitators of the Municipality and educational programs targeting students and the community in the pilot project areas were conducted.

b. Selection of Target Group and Pilot Project Area

b.1. Selection of target group

It is very important that children acquire correct knowledge, as they are the main actors of the next generation who will change the present society and formulate the next society. Schools carry out the principal role to provide education to children. However, there are no environmental education programs related to SWM in Panama District on a formal level or even an informal level. Therefore, the Study intends to introduce programs and projects of environmental education primarily focusing on students.

Other citizens than students also need to be raised their awareness on SWM and the environment and to be encouraged to participate in waste minimization activities. Therefore, the education program also targeted communities.

The pilot project approached those target groups through teachers and the counterparts with taking into account sustainability of the fruits brought by the pilot project. That is, combination of trainers' training and trainees' training were applied in various manners.

Consensus on main topics of the pilot project had been established among people and groups concerned through the Project Cycle Management (PCM) workshop carried out in March 2002.

Table 7-43: Target Groups

Target Group	Description
Students	The environmental education program focused on 4th and 6th graders (9 to 12 years old) in primary school. However, it was not limited to these grades, but included students of all levels.
Communities	Residents in selected communities In order to deliver messages to residents and make the program sustainable, the participation of communal juntas, local juntas, a health center, residents, etc. (those are social capitals in communities) were encouraged.
Schoolteachers	Schoolteachers were target of the trainers' training. Once they obtained ideas and skills of the environmental education, in turn, they provide the education to their children.
C/P Team	The education program was designed initially for facilitators of the Municipality of Panama (Community Relation Office and Public Relation Office) so that they carry out the training of schoolteachers and community residents.

b.2. Selection of schools

As it was expected that synergy effect would be brought by education at school and community, communities and schools were looked for in parallel. That is, target schools should be in target communities.

Site reconnaissance over 19 corregimientos was carried out with the C/P. Initially, two schools, i.e., Carmen Sole Bosch School in San Pedro in Juan Diaz, Arabe de Libia School in Victoriano Lorenzo in Rio Abajo, were selected. Besides, Ricardo Miro in Vista Hermosa in Bella Vista was added to the target schools, as the C/P insisted to conduct the environmental education by themselves based on the experiences obtained in the previous two schools. Number of schools targeted by the pilot project was three in total.

b.3. Selection of communities

As mentioned in the previous section, San Pedro in Juan Diaz and Victoriano Lorenzo in Rio Abajo were selected as target communities of the pilot project. Characteristics of the communities are summarized in Table 7-44.

In order to assure the success of the experiment, meetings and workshops were carried out in the pilot project areas to verify the problems of and the communities' interest in environmental improvement and the willingness to participate actively in the proposed experiments.

Table 7-44: Profile of Pilot Project Areas

Pilot Project Area	San Pedro No.1 and No.2	Victoriano Lorenzo
Corregimiento	Juan Díaz	Río Abajo
Location	Northwestern sector of the corregimiento between Vía Domingo Díaz and Avenida José Agustín Arango.	Northwestern sector of the corregimiento.
Population	Approximately 1,300 inhabitants in multi-family apartment buildings (San Pedro No.2) and 5,000 inhabitants in single story housing (San Pedro No.1)	Approximately 2,000 people
Housing types	San Pedro No.2 area, where the pilot project for environmental education will be concentrated, consists of residential housing complexes of 5 to 6 stories. Single story housing is concentrated mainly in San Pedro No. 1 and some parts in San Pedro No.2.	This area consists of a series of apartment housing complexes of 5 four-story buildings and hundreds of single one-story structures made from masonry material to precarious wooden structures.
Social stratum	Low and middle income levels	Low income level
Community organization	None	None
Justification	This place is representative of residential multi-family complexes. Currently, San Pedro No.1 has regular collection services including door-to-door and container system collection. The multi-family complexes in the residential area of San Pedro No.2 count on only the container system. In spite of the collection service offered, waste scattered in the streets and surroundings is observed.	In general, the residential areas of Panama District are in acceptable environmental condition. However, there are some barrios in several corregimientos, where the accumulation of waste and inappropriate waste disposal and other environmental problems are observed. Among the areas identified, Victoriano Lorenzo was selected due to deficiencies in sanitary and environmental conditions.
	In both communities waste scattered near the containers and their surroundings due to inappropriate SWM and lack of residents' awareness are observed.	

The following figure shows the selected pilot project areas: 1) community of San Pedro (Carmen Sole Bosch School) in the corregimiento of Juan Díaz, 2) community of Victoriano Lorenzo (Arabe de Libia School) in the corregimiento of Rio Abajo, and 3) location of Ricardo Miro School in Vista Hermosa in the corregimiento of Bella Vista.

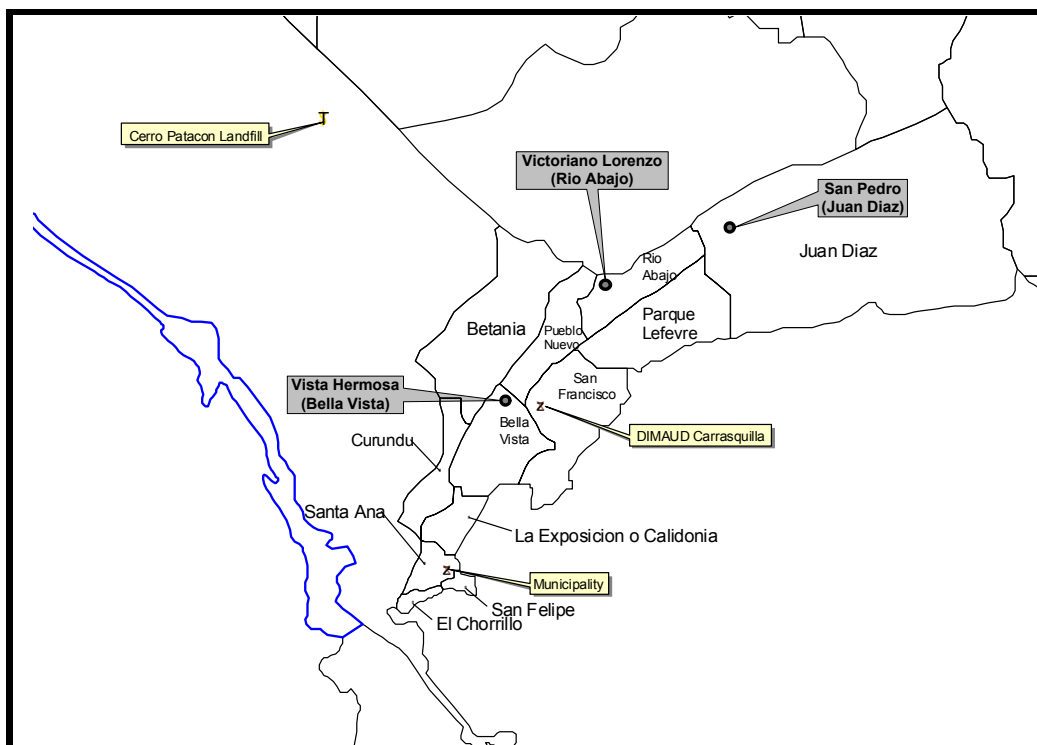


Figure 7-10: Pilot Project Areas

c. Project Design Matrix

A project Design Matrix was made in order to clarify purposes, inputs, expected outcomes, and activities of the pilot project. It is shown in the following Table

Table 7-45: Project Design Matrix for Environmental Education Pilot Project

Narrative summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall goal 1. Viable M/P is formulated. 2. Solid waste minimization. 3. Conservation of natural resources.	Knowledge and interest about solid waste minimization aspects among students and residents of pilot project areas are increased.	-	-
Project purpose 1. To promote public participation in waste	1. Environmental activities in the community, public	1. Report of this Study	• Revision of the M/P based on the results of the Pilot Project.

Narrative summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>minimization activities.</p> <p>2. The pilot project becomes an origin of solid waste minimization activities through recycling.</p>	<p>opinions, analysis and evaluation.</p> <p>2. Environmental education program planned and continued by the C/P.</p>	<p>2. Program and record prepared by DIMAUD.</p>	<ul style="list-style-type: none"> • DIMAUD establishes a unit to expand this pilot project to other schools and communities in Panama District. • Schools and communities understand the necessity of solid waste minimization.
<p>Outputs</p> <p>1. Communication between concerned institutions and offices within the Municipality for environmental education activities is improved.</p> <p>2. Knowledge and skills regarding environmental education given to the C/P, teachers, and persons concerned are transferred.</p> <p>3. Persons concerned are encouraged to conduct environmental education and recycling activities.</p> <p>4. Enforcement of school curriculum regarding environmental education on solid waste issues in the formal education.</p>	<p>1. Community Relations and Public Relation offices of DIMAUD will jointly work with other municipal offices and relevant institutions.</p> <p>2. A large number of persons understand the benefits of waste minimization.</p> <p>3. A large number of persons understand the proper concept of recycling.</p> <p>4. A large number of persons are encouraged to continue environmental education</p>	<p>1 Future programs of environmental education.</p> <p>2 Results of public opinion.</p> <p>3. Results of public opinion.</p> <p>4. Evaluation results.</p>	<ul style="list-style-type: none"> • Decision-makers in the Municipality and DIMAUD will assure the continuation of the program.
<p>Activities</p> <p>1. Environmental education program.</p> <p>1.1 Formulate the program and train facilitators of the Municipality.</p> <p>1.2 Formulate a training program to teachers and residents.</p> <p>1.3 Prepare training tools and complementary materials.</p>	<p>Inputs</p> <p>Human resources</p> <ul style="list-style-type: none"> • One member of the S/T • Members of the C/P • NGO 	<ul style="list-style-type: none"> • The C/P of DIMAUD commits to carrying out the environmental education project pilot in schools and communities and to following-up the undertaken activities. 	
<p>2. Implement the environmental education pilot project.</p> <p>2.1 Carry out meetings and mini-workshops with the community.</p> <p>2.2 Hold workshops with teachers.</p> <p>3. Start waste minimization activities through recycling.</p>	<p>Materials</p> <ul style="list-style-type: none"> • Educational guide • Educational panels • Educational video • OHP • Posters, leaflets, stickers, etc. 	<p>Preconditions</p> <p>JICA and the Panamanian side agree to conduct the pilot project.</p>	

7.5.2 Implementation Plan for the Pilot Project

a. General

This pilot project was designed to make it possible to verify if activities employed would be appropriate and/or suitable, in order to feed back the results to modification of the M/P. It was planned so that the C/P would take the initiative to carry out it with support of the Study Team (S/T). Meanwhile, changes in the SWM system directly impact the residents who are

the generators of solid waste. The minimization of solid waste and the conservation of resources cannot be carried out without residents' consensus and cooperation. Therefore, encouragement of their participation from an early stage was planned. With taking into account these issues, activities of the pilot project was eventually designed as shown in Table 7-46.

Table 7-46: Activities of the Pilot Project

No	Item	Activity	Remarks	Responsibility
1	Design of tools for environmental education	Design of campaign mascot	Selection through public competition inviting all residents of Panama.	C/P
		<ul style="list-style-type: none"> Environmental education guide for students and communities Educational panels 	Design by the C/P and the S/T. Production and material supply by the S/T.	C/P S/T
		<ul style="list-style-type: none"> Educational video 	Planning by the C/P and the S/T. Production by the S/T.	C/P S/T
		<ul style="list-style-type: none"> Others: stickers, posters, leaflets, etc. 	Design by the C/P and the S/T. Production and material supply by the S/T	C/P S/T
2	Student participation	<ul style="list-style-type: none"> Writing of essays and making of illustrations by students 	19 schools in Panama District selected by the C/P.	C/P, with the support of S/T
3	Environmental education program	<ul style="list-style-type: none"> Training of C/P through workshops 	Organized and implemented by the S/T.	S/T
		<ul style="list-style-type: none"> Training of teachers through workshops 	Organized and implemented by the C/P with the support of the S/T.	C/P S/T
	Training	<ul style="list-style-type: none"> Trial lessons in schools by teachers 	Organized by schools with the support of the C/P and the S/T.	C/P S/T
		<ul style="list-style-type: none"> Training of community residents through workshops 	Organized and implemented by the C/P with the support of the S/T.	C/P S/T
4	Meetings	<ul style="list-style-type: none"> Meetings with community leaders and residents 	Conducted by the C/P with the support of the S/T.	C/P S/T
5	Environmental Day	<ul style="list-style-type: none"> Clean-up activity 	Participation of residents and students	C/P, with the support of S/T
		Health care <ul style="list-style-type: none"> Vaccination General hygiene and dental care Blood pressure 	By Health Center personnel of the corregimiento	C/P, with the support of S/T
		Recreational /cultural activity <ul style="list-style-type: none"> Marathon Typical dances, music, etc. 	Participation of communal juntas, schools, etc.	C/P, with the support of S/T

No	Item	Activity	Remarks	Respon- sibility
6	Visit to pilot project sites	<ul style="list-style-type: none"> Visits to and sharing impressions of community areas and schools where the pilot project has been carried out. 	Invitation to community leaders, residents, institutions and municipal officials, teachers, etc.	C/P, with the support of S/T
7	Evaluation	Evaluation of the pilot project		C/P S/T

b. Methodology Applied in Workshops

Several workshops were held in the pilot project chiefly to deliver ideas, knowledge and skills regarding the environmental education. The principal policy for carrying out such workshops was to take participatory approach where the participants would share their knowledge and experiences each other and would become both lecturers and audiences, in order to encourage their ownership to the pilot project. Furthermore, much value was placed on trainers' training, as it is known that the manner strengthens sustainability. The workshops were carried out as follows.

Step	Trainer	Trainee
1st	Study Team (S/T)	Counterpart (C/P)
2nd	C/P	Teachers
	C/P	Residents (Communities)
3rd	Teachers	Students Other teachers Administrative staffs

c. Implementation Procedure for Pilot Project

The pilot project consisted of the following four stages. Figure 7-11 schematizes the procedure.

- Preparation (Preparation Stage)
- Planning (Activity Plan)
- Implementation (Implementation and Verification Stage)
- Analysis and evaluation (Evaluation)

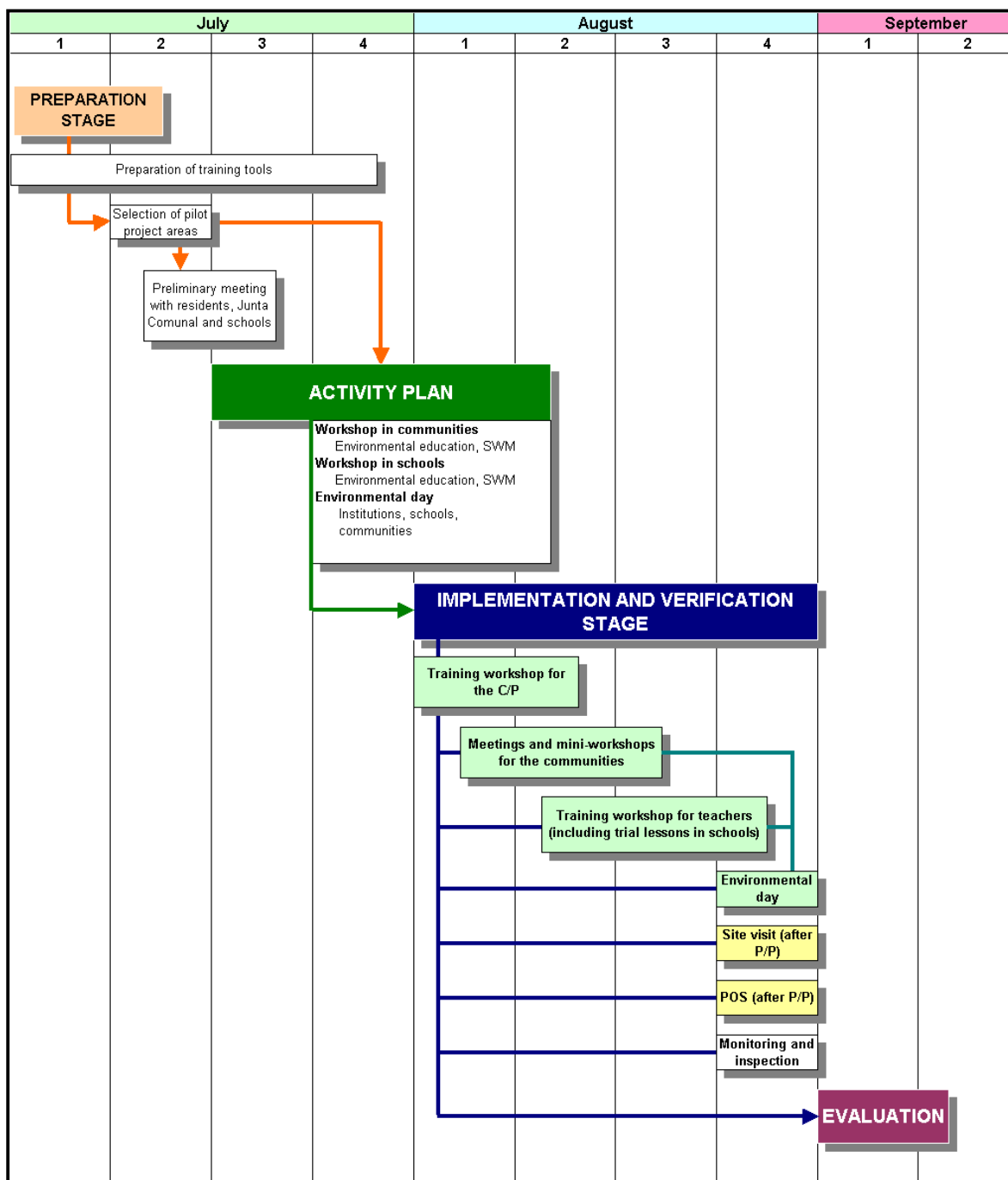


Figure 7-11: Implementation Procedure for Environmental Education Pilot Project

c.1. Preparation stage

From March to July 2002, the following preparations were carried out.

- Explanation of objectives and particulars of the pilot project to the C/P
- Launching of a public competition to select a campaign mascot
- Student participation in essay writing and illustration making
- Planning and preparation of training instruments: environmental action guide for students and communities, educational panels, videos and other complementary materials such as booklets with students' works, posters, stickers, leaflets, etc.
- Selection of pilot project areas
- Preliminary meetings with community residents and schools in the selected
- Explanation of objectives and particulars of the pilot project plan to residents and communal juntas.

c.1.1 Design of campaign mascot

The C/P, recognizing the importance of active participation, held a public participation campaign in February 2002. They invited the population of the 19 corregimientos of Panama District to participate in a competition to choose a mascot that symbolizes the pilot project in order to promote public participation. The selected mascot was used for stickers and posters, as well as in publications, leaflets, and other information materials. The public participation in the competition was a great step towards motivating the residents and raising their awareness on the problems related with SWM.

c.1.2 Student participation

As part of the education program, it was proposed that the students of the 19 corregimientos of Panama District were to be encouraged to participate in various activities. These activities consisted of essay writing and illustration making on SW and environmental issues of the District.

c.1.3 Plan and elaboration of materials for the environmental education

For the implementation of the educational programs it is necessary to select the appropriate materials to achieve the joint participation of the whole community. Production of

educational materials and complementary tools were proposed as shown in the following table.

Table 7-47: Environmental Education Materials and other Complementary Tools

Tool	Remarks
Environmental education guide for students and communities	Education tool for use in environmental programs, workshops and chats/lectures in schools and community lectures.
Educational panels	Education panels on environmental issues for use in workshops, seminars, and other educational or cultural events to enhance public awareness through knowledge on environmental issues.
Educational video	Production of an education video on SWM and environmental issues for use in workshops, seminars, conferences, and education programs targeting school communities.
Booklet with students' works	Edition of student works consisting of essays and illustrations prepared by students through school competition within the framework of environmental education and promotion of the school community participation.
Posters	Posters were distributed to institutions, schools, and community associations to promote public participation. The poster was designed based on illustrations presented by schoolchildren.
Stickers	Preparation of stickers using the campaign logo. The stickers are a very effective means of promoting the campaign because they can be easily distributed to a large segment of the population.
Others	Leaflets pamphlets, etc. for dissemination of information

d. Activities Plan

d.1. Training workshop for the Counterpart

Considering the sustainability of the environmental education program, the S/T with the support of an NGO developed a training workshop for personnel of the Municipality/DIMAUD, who later on would transfer the knowledge and experiences acquired in the training to the teachers and residents of the communities.

d.2. Implementation plan for environmental education program in schools

Within the environmental education program, an experimental project on SWM at schools was contemplated with the purpose of promoting public participation in waste minimization activities to reduce the load on the environment and conserve natural resources. For that purpose, training was to be given to teachers, who would transfer the knowledge on environmental issues and SWM to the students.

The training of primary school teachers in the pilot project areas was to be carried out by the C/P with the support of the S/T through workshops.

After the training, the teachers were to develop trial lessons to transfer the knowledge and practice acquired in the workshops to their students with the participatory approach.

The educational program for primary schools was to focus on the following aspects:

- Importance of environmental education
- Importance of solid waste minimization and conservation of resources
- Generation and composition of SW
- How to dispose of waste
- Understanding the importance and meaning of reduce, reuse and recycle
- Reflections and responsibilities
- Others

d.3. Implementation plan for environmental education program in the community

d.3.1 Meetings and mini-workshops

Training programs for community residents are considered as an effective means to transfer information to the population. Therefore, this important training was to be carried out in pilot project areas.

The training program was to consist of the following:

- Meetings with leaders and residents of selected communities.
- Training of community leaders and residents through mini-workshops.
- Participatory activities (environmental days, clean-up operations, etc.).

The main purpose of the meetings with the community was to explain the objectives of the pilot project, to give basic instructions and to obtain their support and cooperation in order to achieve the aforementioned objectives of the pilot project.

The mini-workshops were to consist of group discussions related to appropriate waste management where all the participants discuss and develop actions to reach the objectives of the study: minimization of waste by preventing waste generation and promoting recycling. Essentially, the workshops were to consist of carrying out practical activities with the community concerned. Consequently, all the participants including facilitators and receivers were expected to participate actively in the development of the workshop.

The C/P with the support of the S/T were to carry out the meetings and training.

The mini-workshops for the community were to focus on the following points:

- Environmental education on SWM and appropriate methods of SWM in the vicinity (practices of appropriate waste management)
- Minimization of waste and conservation of resources
- Storing, collection frequency, and scheduling of waste discharge
- Improvement of community participation regarding SWM
- Understanding the importance and meaning of reduce, reuse and recycle
- Reflections and individual responsibilities
- Others

d.3.2 Community participation in the clean-up activity on “environmental day”

This activity was to be carried out in joint cooperation with all the institutions, residents and school communities of the pilot project areas. The selection of clean-up areas was to be made considering the negative impact incurred in the community and surroundings, where contamination and environmental problems are found.

The public participation campaign was to reinforce the clean-up activities through the followings:

- Promotion of cooperation and participation of the community in the clean-up activity through the Community Relations Office, Public Relations Office, Communal Juntas, etc., before and during the “environmental day”.
- The active participation of residents, Communal Juntas, DIMAUD, and institutions concerned with the support of the S/T.

A series of recreational, cultural and health activities were proposed for the “environmental day”. These activities were to consist of basic health care by the Health Center personnel of MINSA in the respective corregimientos and other recreational and cultural attractions by the Municipality personnel and students, etc.

e. Work Schedule

The implementation plan for the pilot project of environmental education was formulated jointly by the C/P and the S/T. The pilot project was to be carried out over a period of approximately one month, from July 31st to August 31st, 2002, followed by the analysis and evaluation of the pilot project.

Table 7-48: Work Schedule for Environmental Education Pilot Project

Period	Activity
May~July May~Jun	Preparation Stage <ul style="list-style-type: none"> • Selection of pilot project mascot • Student participation on essay writing and illustration making contest
Jun~July	Preparation <ul style="list-style-type: none"> • Preparation of training tools: Environmental Action Guide for students and communities, educational panels, a video, and other supporting materials such as a booklet with student works, posters, stickers, leaflets, etc.
Beginning of July	Preparation <ul style="list-style-type: none"> • Selection of pilot project areas • Preliminary meetings with community residents and school teachers of areas selected for the pilot project
July~August 15 July~30 August	Planning Stage <ul style="list-style-type: none"> • Meetings with C/P • Program for C/P training workshop • Program for teachers training workshop • Program for trial lessons in schools • Program for meetings and workshops in communities • Program for implementation of environmental days • Preparation of evaluation format • Preparation of public opinion surveys
17 July ~ 26 July	Planning <ul style="list-style-type: none"> • Meetings in schools • Preliminary meeting for C/P workshop • Contacts with community residents (San Pedro 2 and Victoriano Lorenzo)
31 July~31 August 31 July	Implementation Stage <ul style="list-style-type: none"> • Implementation of C/P training workshop
3 August~17 August	Implementation <ul style="list-style-type: none"> • Meetings with community residents (San Pedro 2 and Victoriano Lorenzo) • Workshop for the community (San Pedro and Victoriano Lorenzo)
7 August	Implementation <ul style="list-style-type: none"> • Prizes delivery to participant schools in the essay and illustration making contest
9 August ~10 August	Implementation <ul style="list-style-type: none"> • Implementation of workshops with teachers and invited persons
14 August ~27 August	Implementation <ul style="list-style-type: none"> • Implementation of trial lessons in schools <ul style="list-style-type: none"> - Carmen Solé Bosch School - Arabe de Libia School - Ricardo Miró School
24 August ~31 August	Implementation <ul style="list-style-type: none"> • Implementation of “Environmental Day” in San Pedro 2 and Victoriano Lorenzo <ul style="list-style-type: none"> - Marathon - Clean-up activity with resident participation - Health care activity with the cooperation of the corregimiento’s Health Center (MINSA) - Cultural activities (Municipality, schools, etc.)
2 Sept.~4 Sept.	Implementation <ul style="list-style-type: none"> • Public opinion survey • Site visit • Data processing and analysis
29 August ~10 Sept.	Implementation <ul style="list-style-type: none"> • Distribution of educational materials to participant schools and related institutions.
September	Evaluation <ul style="list-style-type: none"> • Preparation of the report

7.5.3 Results

a. Training Workshop for the Counterpart

Participants of the training workshop carried out by the S/T included 14 people from the Community Relations Office, Public Relations Office, and Collection Department of DIMAUD, and personnel from Public Relations and Human Resources of the Municipality (EDEM).

All the participants were extremely motivated during the whole course of the workshop, indicating their interest in sharing knowledge and learning to improve their skills in their professional and personal lives. Participants actively took part in all workshop activities through the participatory approach of sharing knowledge and experiences. Both the C/P and S/T showed complete and absolute satisfaction with the results of this workshop.

b. Training Workshop for Teachers and Invited Personnel

The training workshop organized for two days by the C/P facilitators for teachers from Carmen Sole Bosch, Arabia de Libia and Ricardo Miro schools, including invited personnel of MEDUC and ANAM. The participants were very enthusiastic from the beginning due to nature of the interactive program and elaborated approaches applied by the C/P facilitators.

The results obtained in this workshop were very satisfactory and greatly accepted by the participant side. The participants valued the effort of the C/P facilitators and the S/T.

It is of great importance to follow-up the C/P's commitment to enforce the environmental education in the three participant schools and in the rest of the schools of the capital district. The program should apply the same methodology used, that is to say, form multiplier agents (teachers), so that these teachers in turn transfer the knowledge to the rest of the teachers and students.

c. Experimental Classes or Trial Lessons

After the training workshop, teachers of Carmen Sole Bosch, Arabe de Libia and Ricardo Miro schools continued with the program activities, preparing experimental classes in their respective schools. Each school, with the support of the C/P and the S/T, planned an activity program with students, especially of grades 4, 5, and 6. Ricardo Miro School also included an activity with kindergarten children and the participation of parents.

The participation of teachers and students were excellent in the three schools. In all three cases the teachers used participatory techniques that involved the students. Some of these techniques were round-table discussions, competitions, a waste classification workshop, mini-theater presentations, and songs. The program in two of the schools (Arabe de Libia and

Ricardo Miro) also included activities conducted by the students themselves. In Ricardo Miro School, a mother participated in the round-table discussion conducted by the students.

In general, the teacher team of the three schools demonstrated a great enthusiasm and interest in the development and execution of the trial lessons, raising equally the interest in the students and motivating them to be an essential part in the changes required to improve SWM in the community.

The participation of schoolteachers in the three trial lesson programs allowed them to share methodologies and techniques that enriched their methodological tools. However, to be more effective, trained teachers should continue the program with the rest of the students and administrative personnel of the school. Parents can also be incorporated in the program. It is recommendable that issues of SW and environmental conservation are to be approached from the first teaching years.

d. Results the student's opinion on the video

d.1. Objectives of the video

The video was planned and produced targeting the general public (community residents) and especially the young public (schoolchildren from 9 to 12 years old but not limited to them) of the capital district.

The main objective of producing the video was to raise awareness on environmental and SWM topics among the student population and the community, and to encourage public participation in waste minimization and the conservation of the natural resources. It also aims at arousing feelings so strong that individuals are motivated to take immediate action, turning into multiplier agents of a real change of attitude.

It was expected to capture the children's attention through the creation of a magical world where the excessive generation of waste and inappropriate SWM causes environmental degradation in Panama District. Besides, it was expected that the utility of the video, i.e., to make people understand the problem in an interesting way, would also attract adults. Consequently, The video was anticipated encourage public participation in solving the problem.

d.2. Conclusion

The goal of environmental education is to raise awareness and promote values and changes in attitude to form citizens who can make responsible decisions regarding their environment. These changes require a certain amount of time and their results cannot be seen in the short term. However, the video has achieved very satisfactorily all the proposed initial objectives.

This is shown in the answers given by the interviewed children who expressed concern for the future of Panama District. At the same time the students were motivated to participate in activities of appropriate waste management applying the 3 R's to minimize waste in Panama District.

e. Site visit to Pilot Project Areas

e.1. Objectives of the visit

More than 30 persons participated in the visit to all 6 pilot project areas of the Study including community residents of San Pedro and Victoriano Lorenzo, the personnel of Communal Junta and the Health Center in Juan Diaz and Rio Abajo, teachers of the three pilot project schools, officials of MINSA, MEDUC, ANAM and the JICA Office in Panama, the C/P, the S/T and a journalist.

The objective of the visit was to observe the effects and results of the pilot projects after implementation. In the case of the pilot project areas for environmental education, the visit consisted of observing neighborhoods in San Pedro No.2 and Victoriano Lorenzo and the schools where the pilot programs were implemented, especially the areas where clean-up activities were carried out during "environmental day", and detecting any fundamental changes in the place as well as a change in the sensitivity of the inhabitants of the communities involved. It also involved hearing the experiences of the schools.

e.2. Monitoring items of the pilot project and results

At the end of the site visit to pilot project areas (experiment of environmental education) questionnaires were distributed to the participants considering the following items:

- General aspects of the pilot project areas after the "environmental day" and clean-up activities in both communities.
- Participant's impression regarding raising the awareness and motivation of the community residents (results of workshops).
- Results of trial lessons or experimental classes in schools.
- General impressions.

Twenty-two of the thirty people who participated in the visit answered the questionnaire. The results are shown below:

Table 7-49: Questionnaire for Site Visit to Pilot Project Areas

No.	Question	Yes	No	N/A	Total
1	Do you think that the environmental education program implemented in San Pedro and Victoriano Lorenzo contributed to improving the environmental conditions of those communities?	96%	0%	4%	100%
2	Have you noticed any positive change in the attitude of the residents of communities visited with relationship to solid waste management?	100%	0%	0%	100%
3	Do you think that the environmental education pilot project carried out in the communities and schools contributed to an increase in public awareness?	100%	0%	0%	100%
4	Do you think that the environmental education program implemented in the communities and schools on waste minimization, recycling and conservation of resources should be continued?	100%	0%	0%	100%

Except for the 4% (one person) who gave no answer to question No.1, 100% of the participants responded affirmatively to the four main questions of the questionnaire, demonstrating the effectiveness of the implementation of the pilot project for environmental education.

The site visit was a good way for the participants to verify the effectiveness of the pilot project. It can be mentioned that the visit has been very important for the participants, as it has given them the opportunity to see the effect of the pilot project and to listen to the residents and teachers talk about their experiences.

f. Public Opinion Survey (POS)

The C/P carried out the public opinion survey with the support of an NGO, with the following objectives:

- To compare the change in the residents' opinions on environmental issues and SWM in the community, and
- To determine the level of understanding and the residents' cooperation in implementing the environmental education pilot project.

f.1. Schedule of the survey

The POS was carried out in pilot project areas according to the following schedule:

Pilot Project areas	Date	Time
Victoriano Lorenzo (Río Abajo)	September 2, 2002	Morning hours
San Pedro No. 2 (Juan Díaz)	September 2, 2002	Afternoon hours

f.2. Public opinion survey

The results of the opinion survey are presented in the following table.

Table 7-50: POS on Environmental Education Pilot Project

No.	Question	San Pedro No. 2		Victoriano Lorenzo	
		Number of persons	(%)	Number of persons	(%)
Q1	How much is your total family income per month?				
a.	Less than 250 USD	18	40.0	42	84.0
b.	251 USD to 480 USD	20	44.4	6	12.0
c.	481 to 800 USD	3	6.7	1	2.0
d.	801 to 1200 USD	1	2.2	0	0.0
e.	More than 1200	0	0.0	0	0.0
f.	N/A	3	6.7	1	2.0
	Total	45 persons	100%	50 persons	100%

No.	Question	San Pedro No. 2						Victoriano Lorenzo					
		YES	NO	N/A	YES (%)	NO (%)	N/A (%)	YES	NO	N/A	YES (%)	NO (%)	N/A (%)
Q2	Are there any environmental problems related to SW in your community?	31	14		68.9	31.1		42	6	2	84.0	12.0	4.0
In your community a series of meetings, mini-workshops and a clean-up activity were carried out with the objective of promoting public participation in SW minimization, and therefore, to contribute to the protection of the environment and the conservation of natural resources.													
Q3	Did you participate in some of those activities?	34	11		75.6	24.4		44	6		88.0	12.0	
Q4	If your answer to the previous question is YES, please indicate which one(s)? (If your answer is NO, please go to Question 8).												
a.	Meetings		14			31.1			19				38.0
b.	Mini-workshops		14			31.1			6				12.0
c.	Clean-up activity		31			68.9			42				84.0
d.	None		11			24.4			6				12.0
Q5	After having participated in the previous activities, do you think that there is enough public awareness of environmental problems related to SW in your community?	21	13		61.8	38.2		31	12	1	70.5	27.3	2.3
Q6	Do you think that the "Environmental Day" carried out in your community contributed to increasing public awareness of waste problems and environmental pollution?	27	7		79.4	20.6		39	5	0	88.6	11.4	0.0
Q7	What is your attitude with regard to the SW problem after participating in the previous activities? Please choose one of the followings:												
a.	Positive, people can change		14			41.2			15				34.1
b.	Optimistic, people's attitudes will improve with time.		8			23.5			5				11.4
c.	Pessimistic, people don't care what they do, they don't participate		1			2.9			3				6.8
d.	Pro-active, people who participate can motivate other people to join in and		10			29.4			20				45.5

No.	Question	San Pedro No. 2						Victoriano Lorenzo					
		YES	NO	N/A	YES (%)	NO (%)	N/A (%)	YES	NO	N/A	YES (%)	NO (%)	N/A (%)
	take care to improve our community environment.												
e.	Other		1			2.9			1			2.3	
Q8	If you did not participate in those meetings and mini-workshops, would you like to receive chats on SWM and to reduce environmental pollution?	8	2	1	72.7	18.2	9.1	5	0	1	83.3	0.0	16.7
Q9	Do you think that a follow-up should be given to the environmental education program carried out for the improvement of the environment and people's health?	45	0		100	0.0		50	0		100	0.0	
Q10	Do you think that clean-up activities and creating an aesthetic community is the responsibility of:												
a.	Communal Junta		1			2.2			5			10.0	
b.	Municipality/DIMAUD		9			20.0			5			10.0	
c.	Community		8			17.8			9			18.0	
d.	Private companies		0			0.0			0			0.0	
e.	All (CJ, M/D, Com, PC)		25			55.6			30			60.0	
f.	Other		1			2.2			0			0.0	
g.	N/A		1			2.2			1			2.0	
P11	Do you think that clean-up activities with community participation are necessary?	45	0		100	0.0		50	0		100	0.0	
Q12	After knowing and/or participating in this pilot project, would you like to participate in programs for SW minimization such as reduction, reuse, and recycling activities?	43	2		95.6	4.4		49	0	1	98.0	0.0	2.0
Q13	If you answered affirmatively, what kind of actions would you take to begin with regarding the recycling activities?												
a.	Making to the Municipality		21			46.7			31			62.0	
b.	Making to the recycling companies		4			8.9			1			2.0	
c.	Mobilizing the community		14			31.1			15			30.0	
d.	All		2			4.4							
e.	Others		1			2.2			2			4.0	
f.	N/A		3			6.7			1			2.0	

g. Newspaper Recycling Program

The implementation of workshop training and trial lessons at the three schools have motivated the teachers to be involved in a recycling activity. Meanwhile, there was a company (Moldeados Panameños, S.A.) that was looking for a manner to collect papers for recycling in Panama District.

Therefore, DIMAUD and the S/T set up the first meeting for principals of the schools and the company. Then, it was confirmed that the company would buy newspapers from the schools for recycling.

Some issues and conditions to be considered are the following.

- Each delivery of newspaper should be identified with the name of the school.
- Newspapers would be collected by DIMAUD periodically (i.e. twice a week) to prevent deterioration resulting from keeping them in storage for a long time.
- The DIMAUD should control the amount and source of the newspaper and provide a receipt indicating the amount collected.

This newspaper recycling program would begin with the slogan “Assume your role”, and the following leaflet requesting cooperation would be distributed.

Newspaper Recycling Program

“Assume your role”

Our school is contributing to conserving the environment and our resources through a **newspaper-recycling program**.

Instead of throwing away the newspaper after it has been read, you can bring it to the school container.

We can collect money through recycling activities in order to improve the physical conditions of the school and meet other needs of our school.

Through recycling activities, we not only improve our school, but most importantly, we contribute to conserving the environment and our resources.

7.5.4 Evaluation and Conclusion

The pilot project of environmental education was executed over one month. The period is too short to evaluate significant changes in people's attitude. However, it was clear that the people showed their interests and enthusiasm through participation in the pilot project.

It is clear that the communities want to participate more actively in decision making to improve the community environment and they would like to be consulted in matters like changes that promote improvement of the waste collection service and environmental education in schools.

In the pilot project, the participatory approach was the principal method in the activities for promoting positive participation of the target groups. Besides, trainers' training was placed value in order to efficiently use limited human resources. It can be evaluated that the both methods effectively functioned and their application was appropriate.

From now on, what the Municipality/DIMAUD should do is to continue the environmental education program, to incorporate new schools and communities, and little by little to cover the entire district with the tools and the methodology that had been developed through the pilot project.

Besides, it is expected that the schools and the communities targeted by the pilot project should be visited by other schools and communities, and should support them rather than waiting for their request.

Consequently, through the pilot project the environmental education is appreciated as vital and effective to bring about the changes of people's attitude for the environmentally sound SWM. All the sectors of the society should take actively part in the changes.

a. Evaluation of the Workshop by the Counterpart

All workshops and activities carried out had the active participation of the C/P. The S/T showed complete and absolute satisfaction with the results of this training workshop and with the performance of the C/P.

The results of the evaluation of the training workshop, "Waste minimization, a step toward the conservation of our resources", by the C/P are shown in the table below:

Table 7-51: Results of Evaluation of the Workshop (C/P)

1	Excellent A lot	2	Good Something	3	Regular Little	4	Insufficient Nothing	N/A (no answer)		
No.	Question				Satisfactory level					
					Number of participants					
					(%)					
No.	Regarding the workshop				A	S	L	N	S/R	Total
Q1	In line with the Panamanian reality				13					13
					100					100%
Q2	With the appropriate topics and necessary information to achieve the proposed objectives				13					13
					100					100%
					E	G	R	I		
Q3	Clear and comprehensible				12	1				13
					92.4	7.6				100%
Q4	With a teaching level in line with the participants				6	6			1	13
					46.2	46.2			7.6	100%
Q5	The use of audiovisual was:				10	3				13
					76.9	23.1				100%
Q6	The established time for the training was:				7	2	2		2	13
					53.9	15.4	15.4		15.3	100%
Q7	The practical exercises were:				9	4				13
					69.2	30.8				100%
No.	Regarding the material distributed				A	S	L	N		Total
Q8	Useful for activities to be used in communities and schools				10	2			1	13
					77.0	15.4			7.6	100%
					E	G	R	I		
Q9	The quality and content of the material is:				7	4			2	13
					53.9	30.8			15.3	100%
Q10	Language used to convey the message				10	2			1	13
					77.0	15.4			7.6	100%
Q11	Illustrations and representations				7	6				13
					53.9	46.1				100%
No.	Regarding the facilitators				E	G	R	I		Total
Q12	Clear exposition				12	1				13
					92.4	7.6				100%
Q13	Methodology applied				8	5				13
					61.5	38.5				100%
Q14	Management of items				12	1				13
					92.4	7.6				100%
No.	Regarding your participation				A	S	L	N		Total
Q15	Could you transfer this knowledge and tool management to other people?				11	2				13
					84.6	15.4				100%

b. Evaluation of the Workshop by Teachers and Invited Personnel

The participant teachers valued the effort of the C/P facilitators and the S/T, which can be appreciated in the results of the evaluation and the commitment acquired by the teachers. The evaluation format was divided in 5 general parameters. The results are shown in the table below. Generally, most of the participants, 84% evaluated the workshop, the facilitators and the organization as excellent, 12.8% as good and 3.2% as regular.

Table 7-52: Results of Evaluation of the Workshop (T)

1	Excellent A lot	2	Good Something	3	Regular Little	4	Insufficient Nothing	N/A (no answer)		
No.	Question				Satisfactory level					
					Number of participants					
					($\%$)					
No.	Regarding the workshop				A	S	L	N	S/R	Total
Q1	In line with the Panamanian reality				14	2		1		17
					82.4	11.8		5.8		100%
Q2	With the appropriate topics and necessary information to achieve the proposed objectives				16	1				17
					94.2	5.8				100%
					E	G	R	I		
Q3	Clear and comprehensible				17					17
					100					100%
Q4	With a teaching level in line with the participants				17					17
					100					100%
Q5	The use of audiovisual was:				12	5				17
					70.6	29.4				100%
Q6	The established time for the training was:				6	5	5	1		17
					35.4	29.4	29.4	5.8		100%
Q7	The practical exercises were:				10	6	1			17
					58.8	35.4	5.8			100%
No.	Regarding the material distributed				A	S	L	N		Total
Q8	Useful for activities to be used in communities and schools				17					17
					100					100%
					E	G	R	I		
Q9	The quality and content of the material is:				14	3				17
					82.4	17.6				100%
Q10	Language used to convey the message				14	3				17
					82.4	17.6				100%
Q11	Illustrations and representations				14	3				17
					82.4	17.6				100%
No.	Regarding the facilitators				E	G	R	I		Total
Q12	Clear exposition				15	2				17
					88.2	11.8				100%
Q13	Methodology applied				17					17
					100					100%
Q14	Management of items				16	1				17
					94.2	5.8				100%
No.	Regarding your participation				A	S	L	N		Total
Q15	Could you transfer these knowledge and tool management to other people?				14	3				17
					82.4	17.6				100%

c. Evaluation of Trial Lessons in Schools

The teachers and the students themselves had developed several techniques regarding environmental education through the pilot project. Such trial must raise their awareness on the issues delivered by the pilot project. Furthermore, those techniques will be beneficial for the C/P to expand the pilot project.

Consequently, the trial lessons can be evaluated that those are not only opportunities to deliver the information and knowledge informed at the workshops held by the C/P, but also opportunities where teachers and children demonstrate their creativity that may bring about innovation in the methodology of environmental education applied in the pilot project.

7.5.5 Recommendation

a. Improvement of Social-Community Behavior

Community participation is one of key components to achieve a sound SWM. Appropriate and positive participation will result from adequate education, such as formal education at school, informal education at communities and other related various events.

When delivering the education, roles and abilities of women and children in communities should be appreciated. Women's opinion generally influences on their families, and children will make the future society. Therefore, it is recommendable to focus the efforts on women and children.

b. Participation of All the Sectors in SWM

To achieve the waste minimization and resource conservation, it is necessary to meditate the lifestyle of people, to change peoples' habits and attitudes, to alter the socio-economic systems, and to look for alternative solutions to limit the waste generation, then, to build a society of sustainable development that imposes less environmental impact. This can be achieved by promoting an alternative model of consumption and reducing the quantity of waste through separation at the source, reuse and recycling, which requires the mutual cooperation of the government, local authorities, citizens and the private sector.

7.6 Public Relations Enhancement

7.6.1 Outline

a. Background

The management of solid wastes conveys a whole array of both positive and negative issues. A clean city, achievable through the provision of a sustainable and manageable service will have a positive impact upon the population's living quality. A low-grade service will impair public health and thus deteriorate the environment, the city's aesthetics and the dwellers' self-esteem.

The adequate management of solid wastes requires the joint participation by the actors: customers and suppliers of the service. Such liaison is achieved when both parties are aware in advance of the rules of the game and when the appropriate communication devices are available.

The provider of the service will be the active subject in this very vital society, and for such purpose it is to keep the best correlations with its customers by means of diverse "public

relations” programs: information, promotion, marketing, community organization, training, service quality follow-up, attention and solution of claims, and so on.

Keeping the public informed on the efforts to provide the best available service. Information is the bottom line behind every activity.

Within its functional structure, the DIMAUD has three administrative units in charge of the relationships with the customers and the communities. At the same time, the municipality has a customer attention telephone number (800ASEO) to receive and attend claims as regards to the provision of the collection service, as well as the Communal Boards that foster the community’s actions and organization to promote their social, economic, political and cultural development.

Being aware of the importance of public participation and the support by the users of the solid waste management, consolidation of actions from DIMAUD’s administrative units (greater synergies) and expansion of the 800ASEO service to become a communications instrument between the users and the Municipality is sought, in order to achieve a cleaner and healthier city. The Communal Boards will set up a Cleansing and Ornate Committee within their structure as a response of civil society.

b. Objective

The purpose of this pilot project is as follows:

- To establish a communications system for the solid waste management

The pilot project has two components to be tested:

- Use of the existing administrative arrangement
- Strengthening and expansion of the 800ASEO service.

c. Selection of Target Group and Scope Area

For the purposes of using the actual administrative organization, the Public Relations and Communal Relations offices would be considered, and they would also be studied and restructured; likewise, the creation of Cleaning and Ornate Committees at Communal Boards of Río Abajo and Juan Díaz *corregimientos* would be promoted.

In order to verify the strength and expansion of the 800ASEO service, DIMAUD customers at the zones of San Pedro and surrounding neighborhoods of Juan Díaz *corregimiento* were chosen. Within this zone the Collection Improvement pilot project was also being developed.

d. Project Design Matrix

Table 7-53 and Table 7-54 display the Project Design Matrixes of the two components for the pilot project.

Table 7-53: Project Design Matrix of Use of the Existing Administrative Organization

Summary	Verification indicators	Means of verification	Important assumptions
<p>Overall Goal</p> <p>Responsible participation from users in the rendering of the service, as well as a smooth and sustainable interaction among the mayor's office and the DIMAUD are achieved.</p>	<p>Percentage of houses that discharged their SW within the frequency and schedule programmed for the collection</p>	<p>Reports from DIMAUD's Customer Attention Unit and from the Cleansing and Ornate Committee.</p>	
<p>Project Purpose</p> <p>A communications system between the users of the service, the Mayor's office and the DIMAUD is established.</p>	<p>Percentage of total houses whose inhabitants are aware of and use the new communications system</p>	<p>Reports from the DIMAUD's Customer Attention unit and from the Cleansing and Ornate Committee</p>	<p>The Cleansing and Ornate Committee, the Mayor's Office and the DIMAUD are convinced that success in rendering the service relies on mutual participation and collaboration.</p>
<p>Output</p> <p>1. The Cleansing and Ornate Committee of Juan Diaz's Communal Board is organized 2. Customer Attention Unit within DIMAUD's structure is organized.</p>	<p>1. Existence of the Cleaning and Ornate Committee of Juan Diaz's Communal Board 2. The Customer Attention unit is created within the DIMAUD's organizational structure.</p>	<p>1. Minutes of the meeting from the Communal Board of the <i>corregimiento</i>, which states the creation of the Cleaning and Ornate Committee 2. Note from DIMAUD's General manager which confirms approval of the Customer Attention Unit.</p>	<p>The members of the Communal Board accept to establish the Cleansing and Ornate Committee.</p>
<p>Activities</p> <p>1. Within the project zone 1.1 Introduction of the project to the Communal Board 1.2 Creation of the Cleansing and Ornate Committee of the Communal Board 1.3 Organization of the Cleansing and Ornate Committees at a neighborhood level 2. At the DIMAUD 2.1 to set Customer Attention policies 2.2 Organization and training of the Customer Attention personnel 2.3 Organization of the Regional Network of Cleansing and Ornate</p>	<p>Input</p> <p>JICA Staff DIMAUD Staff Public Relations Community relations</p>		<p>There is the political will to involve the civil society to organize them for the improvement of the service</p> <hr/> <p>Assumption</p> <p>The Communal Board is committed to organizing the Cleansing and Ornate Committee</p> <p>DIMAUD's top management agrees on the necessity of modifying the administrative structure</p>

Table 7-54: Project Design Matrix of Improvement of the 800 ASEO Service

Summary	Verification indicators	Means of verification	Important assumptions
<p>Overall Goal</p> <p>1. The municipality of Panama and the users of the collection service interact between each other by utilizing the 800ASEO service</p> <p>2. The DIMAUD uses the 800ASEO service to support the marketing of the new Special Collection service for ICI customers.</p>	<p>1. Number of people surveyed on the quality of the service.</p> <p>2. Number of ICI customers contacted through the 800 ASEO service.</p>	<p>1. Monthly report on the control of activities of the 800 ASEO service for the Mayor's Communications Office (D.C.A.) and for the DIMAUD's Customer Attention unit.</p> <p>2. Report from the Commercialization Department on the status of ICI customers.</p>	
<p>Project Purpose</p> <p>The 800ASEO service is expanded to a communications service that can be used to monitor and assess the collection service and for promotion</p>	<p>Percentage of users of the collection service contacted through the 800ASEO communication system.</p>	<p>Monthly report on the control of activities of the 800ASEO service.</p>	<p>Users exercise their right to receive an adequate and good quality of collection service.</p>
<p>Output</p> <p>1. The 800ASEO system has been adequately enhanced and expanded and functions properly.</p>	<p>1. Number and reasons of the calls received and percentage of users at the target area that have used the 800ASEO system.</p>	<p>1. Daily report on the activities of the 800ASEO service to the Mayor's Communications Office (DCA) and to the chieftainship of the Customer Attention unit.</p>	<p>Sustainable support from top management for the efficient functioning of the system</p>
<p>Activities</p> <p>1. With the 800ASEO staff for the pilot project</p> <p>1.1 Elaboration of a customer database with telephone service at the target area</p> <p>1.2 Design of the telephone opinion survey</p> <p>1.3 Expose the 800ASEO system to the users at the target area.</p> <p>1.4 Conduct the opinion survey along with the pilot project of collection</p> <p>2 With the DIMAUD</p> <p>2.1 Rent and outfitting of the new premises for the 800ASEO system</p> <p>2.2. Personnel training</p>	<p>Input</p> <p>JICA Staff PC 1 unit Software 1 set Printer 1 unit</p> <p>Office furniture</p> <p>DIMAUD Staff 1 operator of the Informatics system 3 telephone operators/promoters Telephone accessories 40 m² area of office</p>	<p>The Commercialization Department collaborates in the preparation of the customers' database for target area</p> <p>Assumptions</p> <p>The Mayor's Communications Office (DCA) and the DIMAUD agree to restructure the 800ASEO service to a communications system. The required budget to pay the staff, outfitting of premises and telephone lines is allocated.</p>	

7.6.2 Implementation Method

a. Work Schedule

The pilot project was implemented for about two month, between July and September 2002, including preparation and evaluation.

b. Implementation Method

A diagnosis on the current functional and organizational structure of DIMAUD's administrative units linked with customer and community relations was carried out along with the Counterpart, as well as an analysis of the toll-free 800ASEO call service.

Likewise, the structure of civil society participation through Communal Boards of the *Corregimientos* was analyzed at meetings with the honorable Representatives of Juan Díaz and Río Abajo *corregimientos*.

Conclusions were reached and recommendations were outlined for each of the two components of the project, along with the Counterpart.

Recommendations were implemented during August and September. At the end of September the pilot project was assessed.

b.1. Use of the existing administrative organization (component)

b.1.1 Structure

Within DIMAUD's organizational structure there exist three administrative with their functions associated to customer and community relations: Public Relations, Community Relations and Customer Attention (within the Commercialization Department).

The current functions of these units are the following:

Public Relations

It has the objective of strengthening the institutional image; its functions are focused on creation a positive image, presence upon mass media, evaluation of news, organization of activities, issuance of newsletters and orientate the user.

Community Relations

To raise awareness and mechanisms of citizen organization to attend, process and suggest on cleansing issues, using children and teenagers as the axis to achieve such goals.

It has three fields of action:

- 1) Community Promotion of Cleanliness: Organization and Awareness programs are developed at schools; training, conferences and lectures are conducted along with local governments.
- 2) Community training: Communities are incorporated into the cleansing programs
- 3) Recycling: Recycling practices are promoted

b.1.2 Performance

The organization lacks a defined policy regarding attention to the customer. It is deprived from organizational objectives and, therefore, activities are scheduled and carried out as per on-time requests or initiatives that respond to circumstantial situations.

Lack of communication and coordination between these administrative units undoubtedly reduces the synergies that might achieve that programs and activities would be coordinated, common objectives would be devoted to enhance the links and the sustainable relations with social organizations in general and customers would be outlined.

Horizontal and diagonal communication (inside the DIMAUD) with other operative units, specially with the Collection and Commercialization Department, are rather weak and insufficient. Coordination and follow-up of activities is low or incomplete.

The staff is in need of an specialized coaching and of the resources required to achieve public participation in the provision of the service. These expenditures should be regarded as a profitable and necessary investment with the purpose of improving relations with the customers, thus trimming down operating costs and raising collection.

Expanding the information on both household and ICI customers (exact address, lot number, telephone numbers, line of business, recording of complaints, contract number, and so on) is required. The recorded information should be sufficient to clearly identify the customer, its profile, etc., and to maintain a top-level customer/municipality relationship through a permanent and smooth information between each other.

b.1.3 Community organization of the Solid Waste Management

The Communal Boards do not regard a committee linked with cleansing and ornate within its organizational structure.

b.1.4 Conclusions of the Diagnosis

- 1) There is an institutional void caused by the lack of regulations on solid waste management.

- 2) A customer attention policy or relations with the organized civil society are inexistent.
- 3) DIMAUD's administrative units related to customer attention and the communities are working independently and without organizational objectives.
- 4) There is no database that encompasses all the users of the service with the required and sufficient information to conduct a program that promotes participation in the provision of the service.

b.1.5 Recommendations

- 1) Approval of the Municipal Ordinance, which sets forth and regulates the Urban and Household Cleansing Service. The parties will acknowledge the quality of the services to be rendered, as well as their rights, responsibilities and obligations. Undoubtedly, the latter will enhance the relations and will allow a clear understanding on the joint participation to achieve common objectives.
- 2) Establishment of a customer attention policy by Top Management.
- 3) It is necessary to combine the duties from the Public Relations, Community Relations, and Customer Attention units (from the Commercialization Department) and the 800ASEO service, so as to achieve a greater synergy and enhance the liaisons with the communities and organized groups in general and the customers by means of a personalized attention.
- 4) A change in the DIMAUD's functional structure is proposed with the creation of the Customer Attention Administrative Unit, which will fuse the current functions of the above units.
- 5) Improvement and expansion of the customer database. The JICA Study regards a pilot project for the improvement of the institutional, commercial and industrial customers' database.
- 6) Promotion of Cleansing and Ornate Committees throughout the entire district, using neighborhoods, urbanizations and housing complexes as the foundation. The municipality will record the creation of such committees and sets up a Regional Network of Cleansing and Ornate. Communication is carried out through the enhanced and expanded 800ASEO service.

b.2. Strengthening and expansion of the 800ASEO service (component)

b.2.1 Structure

With the purpose of offering a better attention to the public, the 800ASEO (800-2736) telephone line has been created for the citizen to make suggestions and claims on the service; thus, the citizen has become an important ally to the Mayor's office in the city's cleanliness.

This service attends all the complaints regarding the collection of solid wastes (vacant property, junk cars, stoves, fridges, and so on). This administrative unit belongs to the organic structure of the Mayor's Communications Office.

Its also attends claims and suggestions from other services:

- 800-IDEA line (800-4332). It receives all the ideas and suggestions on how to improve and optimize the service for the contributors.
- 800-ALTO line (800-2586). It receives and processes claims of alleged corruption within the municipality's system.
- 800-TALA line (800-8252). It receives the claims and complaints regarding indiscriminate and unlawful felling of trees and pruning conducted within the capital city's area.
- 800-IDEM line (800-4336). It receives the complaints and remarks on gender, race, ethnic intolerance and discrimination, and so on.

b.2.2 Performance

The 800ASEO service operated in its office at the municipality of Panama, located on Avenida B and Calle Colón, 5to. Piso. The physical space allocated for such office was extremely reduced. It was run by two operators in two shifts: 06:00/14:00 and 10:00/18:00 hours.

By means of a toll-free call, they receive the claims and suggestions from the public in general. Claims are processed and channeled to the DIMAUD, which in turn attends them and resolves them through its Immediate Attention administrative unit. After confirming the attention to the claim, the petitioner is informed that his/her claims has been attended.

An average of 30 calls per day were received, specially between 07:30 and 13:00. Calls were classified as per the following type of complaints:

- Garbage collection
- Garbage collection - Gardening
- Collection of offal

- Change of schedule
- Collection of junk
- Requisition of containers
- Speed, noise and truck clashes
- Gratitude calls

Table 7-55 shows the summary of calls for the first semester of 2002. A total of 1,682 complaints were received between January/June 2002. Taking 122,040 as the number of billed customers, the accrued percentage of claims in the period is of 1.38%. The average complaints per month is 0.23% over the billing total, for a global average of 13 complaints per day (22 working days per month). The *corregimientos* with the lowest percentage of claims accrued are El Chorrillo, Tocúmen, Curundú and Chilibre (low-income, low telephone service concentration area). Those with the higher percentage of complaints are Parque Lefevre, Ancón and Bellavista, as well as Pacora.

Table 7-55: Numbers of Calls to 800 ASEO

Total calls received (800Aseo), period January-June 2002 per <i>Corregimiento</i>								June '02 billing		% of total claims
<i>Corregimiento</i>	Jan	Feb	March	April	May	June	Total	No. of customers	Amount	
Alcalde Diaz	21	16	19	23	9	21	109	11,401	80,847.2	0.96%
Ancon	9	15	10	11	11	9	65	2,625	80,847.2	2.48%
Bella Vista	20	20	17	24	36	27	144	6,130	190,363.0	2.35%
Bethania	37	24	28	41	53	56	239	13,975	174,269.5	1.71%
Calidonia	2	2	6	4	6	9	29	3,136	97,610.1	0.92%
Chilibre	-	-	5	2	2	2	11	1,713	10,020.9	0.64%
Curundu	2	1	1	5	3		12	2,054	22,061.2	0.58%
Depuracion	-	-	-	-	-	-	-	923	10,458.9	0.00%
El Chorrillo	-	-	-	-	4	2	6	5,231	41,451.3	0.11%
Juan Diaz	40	26	43	45	55	55	264	21,598	200,518.7	1.22%
Pacora	5	2	6	10	16	10	49	1,987	7,853.3	2.47%
Parque Lefevre	52	46	33	52	46	52	281	8,787	102,687.7	3.20%
Pedregal	11	6	8	5	4	5	39	5,992	57,372.8	0.65%
Pueblo Nuevo	21	9	13	17	21	21	102	5,218	78,643.1	1.95%
Rio Abajo	18	10	21	18	12	19	98	5,936	67,771.7	1.65%
San Felipe	-	-	3	1	1	1	6	472	16,711.7	1.27%
San Francisco	11	24	20	25	29	21	130	8,388	139,985.3	1.55%
Santa Ana	1	4	6	9	6	6	32	2,472	55,007.2	1.29%
Tocumen	14	4	2	12	19	15	66	14,002	85,669.4	0.47%
Grand total	264	209	241	304	333	331	1,682	122,040	1,520,150.2	1.38%
No. claims/day	12	10	11	14	15	15			Average	13
% claims/month	0.22	0.17	0.2	0.25	0.27	0.27			Average	0.23%

Table 7-56 displays the calls placed to the 800ASEO service with respect to type of calls between January and June, 2002. Out of 1,682 calls, 1,486 belong to collection complaints (88% of grand total). Out of 1,682 calls, section A of collection generated 20% of the calls (331) and section B 80% (1,351).

Table 7-56: Total Calls Received (800Aseo), Period January-June 2002 per Type of Complaint

Section	Group	Details	Jan	Feb	Mar	Apr	May	Jun	Total		
A	1. Collection	Garbage	8	19	32	42	58	63	222		
		Garden waste	-	-	5	5	9	6	25		
		Junk	-	-	1	-	1	3	5		
		Offal	6	5	2	17	9	7	46		
		Total	14	24	40	64	77	79	298		
	3. Containers	Move	-	-	-	-	-	2	2		
		Container requisition	2	4	3	2	3		14		
		Total	2	4	3	2	3	2	16		
	4. Other	Gratitude	-	-	1	1	-	1	3		
		Bribes	-	-	1	-	-	-	1		
		Clashes	-	-	1	3	1	-	5		
		Damages	-	-	-	-	-	2	2		
		Furious odor	-	-	-	1	-	-	1		
		Noise damage	-	-	2	-	-	-	2		
		Speeding	-	-	-	1	-	1	2		
		Speeding, noise and truck clash	1	-	-	-	-	-	1		
		Total	1	-	5	6	1	4	17		
Section A Total			17	28	48	72	81	85	331		
B	1. Collection	Garbage	198	112	118	148	186	152	914		
		Garden waste	-	-	10	16	16	19	61		
		Junk	4	4	9	10	10	14	51		
		Offal	19	19	35	34	20	35	162		
		Total	221	135	172	208	232	220	1,188		
	2. Change of schedule	Change of schedule	2	5	1	1	-	1	10		
		Total	2	5	1	1	-	1	10		
	3. Containers	Move	-	-	3	-	-	-	3		
		Remove	-	-	1	-	-	-	1		
		Container requisition	8	10	4	8	5	9	44		
		Total	8	10	8	8	5	9	48		
	4. Other	Gratitude	-	-	4	1	6	3	14		
		Bribe	6	2	2	1	2	1	14		
		Clash	-	1	-	-	1	-	2		
		Driver	-	1	-	-	-	-	1		
		Damages	-	-	1	4	-	3	8		
		Drugs	1	-	-	-	-	-	1		
		Rudeness	-	-	1	-	2	-	3		
		Furious odor	-	-	1	2	3	2	8		
		Noise damage	-	-	-	1	1	3	5		
		Services	8	21	-	-	-	-	29		
		Speeding	1	1	3	6	-	4	15		
		Speeding, noise and truck clash	-	5	-	-	-	-	5		
		Total	16	31	12	15	15	16	105		
		Section B Total			247	181	193	232	252	246	1,351
		Grand total			264	209	241	304	333	331	1,682

b.2.3 Conclusions of the diagnosis

- 1) The current function of the 800ASEO service was to channel the users' complaints to the DIMAUD on the deficiencies of the collection service.
- 2) The daily average of 13 claims and the monthly level of 280 complaints (0.27% of total billing of the month) were low.

$$\frac{\text{Number of complaints per month}}{\text{Number of users}}$$

- 3) Most of the complaints received by the 800ASEO service are related to the collection and account for 88% of total calls received. The main claim: the truck did not pass.
- 4) Although the level of satisfaction is low, the total number of calls per complaints is also low. All this can lead to the conclusion that the 800ASEO line is not very acquainted or the users do not trust its effectiveness to solve their issues on the collection quality.
- 5) The expansion of the service on a two-way basis becomes necessary; i.e., provide a personalized attention to the user, call him, request his/her opinion of the service, convince him/her to collaborate and not just wait for the complaint call.

b.2.4 Recommendations

- 1) Strengthening and expansion of the current 800ASEO service to a communications system with the features of a Call Center. An interactive communication with the customers is set: complaints on the quality of the services are received and attended to, public participation on the provision of those services and marketing and promotion of the services supplied by the DIMAUD are also fostered.
- 2) In community action: It is expected that each Communal Board of the districts' *corregimientos* have a Cleansing and Ornate Committee within their structure, beginning with Juan Díaz and Río Abajo *corregimientos*. The 800 ASEO service (Call Center) can provide backup for the creation of Cleansing and Ornate Committees at a neighborhood level, and then link the entity to communicate with the Regional Network of Cleansing and Ornate.
- 3) Claims and immediate attention: All DIMAUD customers have the right to expose their complaints and suggestions and be attended in the shortest time possible. The 800ASEO service (Call Center) will transfer the request to the corresponding administrative unit and will verify that the request has been attended to. Later on, it will inform the petitioner on the results achieved.

The 800ASEO service will have a complete and updated log of the calls and arrangements conducted and the results obtained. This information will be processed on a daily basis and monthly reports to be analyzed and assessed will be generated, along with the corresponding feedback to improve attention for the customer.

- 4) Opinion surveys: Public opinion surveys over the telephone, both on site and mobile ones, will be carried out by using the infrastructure of the 800ASEO service (Call Center).
- 5) Telephone marketing: The DIMAUD will use the 800ASEO service (Call Center) to outline and improve the relations with its customers, to commercialize its services and pass on messages and information.

7.6.3 Results

a. Use of the existing administrative organization (component)

The following are the results and output during the development of the pilot project for the use of the existing organization (component), for its improvement and enhancement.

The elaboration of a draft of the Municipal Ordinance is highlighted, by means of which the urban and domiciliary cleansing service at the district of Panama is created and regulated. This set of laws fill in the existing institutional void left by the provision of the service. With its approval, participation of the public and the sustainable management of solid wastes with efficiency, quality and affordable prices is sought. The document is under review by the Municipal Council.

The above document outlines the relationship policy with the audience; in order to make such policy more efficient, the Customer Attention Administrative Unit has been created within DIMAUD's structure.

Likewise, public participation in rendering the service is secured through the organization of Cleansing and Ornate Committees at a neighborhood level in all of the *corregimientos*. The Communal Boards will actively participate to reach this goal by organizing the civil society for the sake of improving the quality of life of the population and for the creation of the Regional Network of Cleansing and Ornate.

a.1. Regulation of the urban and household cleansing service

The legislative branch of the Municipal Council is currently reviewing the agreed draft of a Municipal Ordinance, by means of which the urban and household cleansing service is established and regulated.

Officials from the municipality, the DIMAUD and all the members of the JICA Study Team took part in the preparation of such document.

This set of laws has the purpose of regulating the relationships among the Municipality, its customers and the particular providers of the solid waste management service and cleanliness in the district of Panama.

It can be said that this set of laws defines the “rules of the game” through which the activities, obligations and rights between the customers and the DIMAUD are outlined, as well as public behavior on preserving public roads and places clean.

Approval and validity of this regulation will represent the beginning of a sustainable positive and transparent relationship among the actors that take part in the provision of the service and it will make possible to set up a customer attention policy by the DIMAUD.

Outline and editing (of this regulation) started in February 2002, and it was enhanced with the participation by Municipality and DIMAUD officials and by service customers.

DIMAUD’s General Management Office, through the letter dated July 24th, 2002, submitted the final draft to the consideration of the Mayor and his final comments.

a.2. Establishment of the Customer Attention Policy

The policy foundations on the rendering of non-hazardous solid waste management services in the district of Panama are outlined in the Municipal Ordinance.

The responsibilities, rights and obligations of the parties and the procedures to be followed and observed by them in order to maintain these relations are considered as follows:

- Importance of the active and responsible participation by the organized civil society to achieve a clean and healthy city.
- The exclusivity in the management of solid wastes in the district by the Municipality of Panama.
- The solid waste collection and disposal are compulsory for every inhabitable property, commercial and industrial stall and public and official premises.
- The Municipality is responsible for rendering the collection, haulage, sweeping, transfer, treatment and final disposal services.
- Natural or artificial, public or private persons, dwellers or pedestrians, have the obligation to maintain the district clean, to discharge their solid wastes in the manner and schedule provided for such purpose and to pay for the service rendered on time.

- Participation from the private sector to render the storage, collection or haulage services of non-hazardous, institutional, commercial or industrial wastes is contemplated, with the previous obtaining of an Operating Permit issued by the Municipality of Panama.
- Regulations on the quality of the services to be provided.
- Customers' rights and obligations.
- Procedures on the delivery and diffusion of the information.
- The mechanisms to determine and set the rates and fares of the services rendered.
- Obligatoriness on the payment of the services provided and collection and interruption of the same.
- Prohibitions, sanctions and sanctioning procedure.

a.3. Customer Attention Administrative Unit

The process of organizational change begins when some elements work together to stand out the necessity of transforming one or several units of the organization.

It is so that, in a coordinated effort, officials identify and clear out the attitude, behavior, procedural, political and structural barriers that hinder the smooth performance of the system; the latter in return generates a growing awareness on the system's internal and external dynamics to make some adaptations in the future and allow for changes that will eventually lead to its improvement.

The proposed Customer Attention Unit merges the functions of Public Relations and Community Relations units.

DIMAUD's General Management office, by means of the letter dated September 6th, 2002, and addressed to the JICA Study Team, expresses the approval of the Customer Attention Administrative Unit.

Figure 7-12 shows the recommended structure of the Customer Attention Administrative Unit.

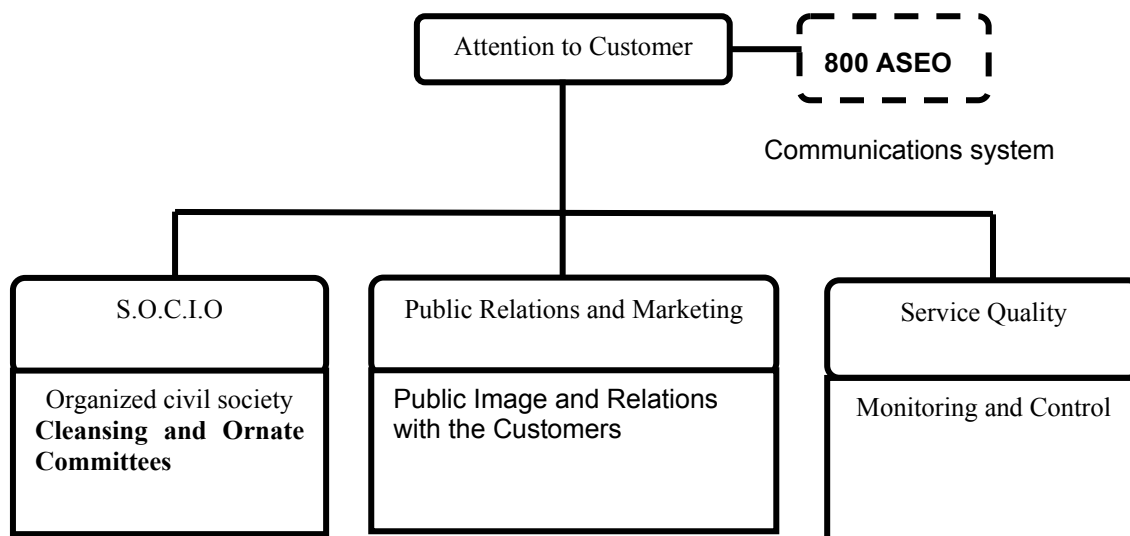


Figure 7-12: Structure of Customer Attention Administrative Unit

This Customer Attention Unit will be structured as attached in the flow chart herein. Its functional activities will be the following:

Chieftainship of the Customer Attention Unit

- To enforce the policies, scope of the objectives and materialize the entity's strategic plan as regards to Customer Attention.
- To lead and coordinate the activities of the sections.
- To assess the performance of the sections and the quality of the service on the basis of annual and monthly targets dictated by DIMAUD's top management.
- To feedback and adjust the activities.

SO.CI.O (Organized Civil Society)

It is in charge of the relationship with the Cleansing and Ornate Committees within the district and promoting the solid waste management. Its main functions are the following:

- To organize the Cleansing and Ornate Committees on the foundations of the existing social bodies at neighborhoods, urbanizations and housing complexes
- To integrate the above committees into a Regional Network of Cleansing and Ornate.

- It is in charge of planning and conducting the educational programs and activities at schools, colleges, universities, public and private entities and with the communities through their respective Cleansing and Ornate Committee.
- To provide the required coaching for the improved management of solid wastes at residential areas and for institutional, commercial and industrial wastes.
- To take part in cleaning operations.
- To design and create the educational and support material to promote the management of solid wastes.

Public Relations and Marketing

It is in charge of the relations with the customers and the entity's public image. Its main functions are the following:

- To achieve a positive image of the entity on the basis of accomplishing its mission before the society and attainment of organizational objectives.
- To lay out and lead the entity's relationships with its customers.
- To design and lead the marketing for the services being offered.
- To lead the relations with the State and private entities.
- To handle information with social communication media.

Quality of the Service

It is in charge of monitoring and controlling the quality of the service rendered by the entity and the infractions committed by customers of the regulations. Its principal functions are as follows:

- To check the strict compliance with the service quality regulations provided by the entity: collection, sweeping and cleaning of public areas, haulage, transfer and final disposal.
- To set the infractions committed against the quality of the service and immediately report such to the entity's top management.
- To generate information on the service rendered on a daily, weekly, monthly and yearly basis for the acknowledgement of the operative units and the entity's top management.

- To propose the required adjustments to the operative activities, so as to enhance the quality of the service permanently.
- To verify and fine public infractions to the regulations.
- To receive and attend the claims and complaints by the public on the quality of the service.

a.4. Cleansing and Ornate Committees and the Regional Network of Cleansing and Ornate

The Communal Board of the *corregimientos* create a Cleansing and Ornate Committee within their structure. The Municipality of Panama will facilitate the creation of Cleansing and Ornate Committees at a neighborhood level, urbanizations and housing complexes, as set forth in the proposed cleansing regulation.

The Municipality of Panama will provide the backup and facilitate whatever is required to comply with the objectives of the Cleansing and Ornate Committees. It will advise on the organization, didactic material for educational purposes and on the importance of a good solid waste management, and will also provide specialized attention through the 800ASEO service (Call Center) and inspect the Service Quality Unit.

The committees that are gradually and eventually created will be integrated to the Regional Network of Cleansing and Ornate. This network will ease coordination to improve the collection as per the frequency and schedules and the global and permanent quality of the service.

The following are main objectives for the Cleansing and Ornate Committees:

- To actively participate on the provision of collection and sweeping services and on keeping ornate and cleanliness of public areas.
- To collaborate in cleaning operations.
- To verify and evaluate the quality of the service rendered and inform the community and the DIMAUD's Service Quality inspection unit in person or via the 800ASEO service (Call Center).
- To encourage the neighbors to control their discharge of solid wastes in accordance with the regulations.
- To promote cleanliness in front of the properties and public roads and areas at the corresponding community.

- To control, prevent and report the clandestine dumping of solid wastes and/or liquids at public or private areas, water currents, ravines, vacant lots, sewerage or rainwater drainage systems or other unauthorized places.
- To encourage the payment of invoices for the services provided, taking into account that such payment will ensure the sustainability and the quality of the service.
- To organize groups in charge of the scheduled activities.
- To keep a close relation with the DIMAUD's Service Quality unit.

The project to organize such committees at a communal board level was presented to the Representatives of Juan Díaz and Río Abajo *corregimientos*.

Dated September 25, the Communal Board of Juan Díaz *corregimiento* constituted the Cleansing and Ornate Committee consisting of Mrs. Vilma de Ortega, Mr. Bernardo Lazo and Mrs. Maribel Bustamente.

Dated September 30, the Communal Board of Río Abajo *corregimiento* constituted the Cleansing and Ornate Committee consisting of Mr. Leocadio Rios, Mr. Edgardo Alegria and Mr. Toribio Calvo.

The Environmental Education pilot project was conducted at both *corregimientos* in order to promote minimization of solid wastes.

As a first result of the new administrative entity, a newspaper recycling program was structured with the participation of students from schools of both *corregimientos*. The DIMAUD collaborates by carrying the collected paper from the schools to the facilities of the purchasing company.

b. Strengthening and expansion of the 800ASEO service (component)

The results and output obtained from the strengthening and expansion of the 800ASEO service are associated to the establishment of a telephone communication system for the community in general and for DIMAUD customers, as well as to the support to provide the services by the entity.

Improvement and modernization of the 800ASEO service infrastructure was achieved. A new stall was made available by the DIMAUD, whereas JICA donated the telephone and computer equipment.

Expansion of the services provided was oriented to a two-way communication system, which will allow the public to interact with the entity; therefore, the old scheme of just receiving complaints to solve them is left behind. Likewise, it will provide support to obtain data and

prepare the information that will improve both the customers' database and execution of opinion surveys about the service.

In the same manner, the information on the attention to complaints about deficiencies in the service has been systematized, with the purpose of facilitating their immediate solution and recording their occurrence to improve the service.

The communications system for the Cleansing and Ornate Network has also been arranged and the initial activities to organize the Special Collection System and Telephone Marketing Program were carried out.

b.1. Strengthening of the service

The strategy to strengthen the service was aimed at four objectives:

- i. Transfer of operations to a place with better space and working conditions.
- ii. Furnishing of new telephone lines, furniture and equipment.
- iii. Training of the staff.
- iv. Attention to the users' complaints should be maintained.

A document was elaborated on the new scope of the 800ASEO service, which worked initially inside the structure of the Communication Office of the municipality. This office deemed the improvement of the services provided by the DIMAUD as important and necessary, by promoting a greater participation from the public through the modernization of the system and by approving the change of premises.

The DIMAUD facilitated an adequate space within the offices of the Commercialization and proceeded to outfit it. The first two additional telephone lines were installed, as well as the furniture and the new telephone equipment. JICA donated the computer system (PC, printer and software).

The claim attention service has been working uninterruptedly since middle of August.

b.2. Expansion of the service

The Counterpart requested that the expansion of the 800ASEO service had the features of a Call Center and to be kicked off immediately, so as to collaborate with the Commercialization Department and with the Collection administrative unit.

A strategy aimed at the following objectives was designed along with the Counterpart:

- i. Enhancement of the customers' database.

- ii. Designing and execution opinion surveys.
- iii. Systematization of the complaint attention service.
- iv. Setting up of a communications network between the Cleansing and Ornate Committees and the customers.
- v. Telephone marketing program.

In order to achieve the expected objectives the following activities were carried out:

b.2.1 Enhancement of the customers' database

The target customers are those attended within the area of the pilot project for Collection Improvement: 2,402 houses and ICI customers. The procedure followed is shown next:

- Preparation of the customers' database with telephone
- Training of the telephone lady operators
- Communication process with the customers
- Data verification and updating
- Data systematization
- Information assessment

Outcome: an updated customer database and the operators' staff trained (customers' database)

b.2.2 Designing and execution of opinion surveys

The opinion survey form with the activities and results of the Collection Improvement pilot project was designed along with the Counterpart. One hundred and eighty six people were interviewed over the telephone to know their opinion on the changes conducted and the quality of the service.

- Preparation of the opinion survey
- Operators' training
- Telephone survey process
- Data systematization
- Preparation of the Report

- Assessment of results along with the Counterpart

Outcome: the customers' opinion on the improvement of the collection service. The operators' headcount got trained.

b.2.3 Systematization of the Claim Attention Service

A system that facilitates the transmittal of information on the complaints received has been designed. The procedure is as follows:

- The complaint is received through the 800ASEO line
- The above is recorded in a database of the 800ASEO computer
- Information is automatically transmitted via a telephone devoted to a database inside the collection computer
- The Immediate Attention to the Collection Service section receives the information and solves the claim
- The Immediate Attention section, after solving the claim, informs the 800ASEO service on the result through the same via
- 800ASEO gets in touch with the petitioner on the action carried out
- All this information is recorded in both databases for statistical and service enhancement purposes

Outcome: the purpose of this systematization is to expedite the attention to complaints, to keep a permanent and updated registry, to cross-compare information and assessments among the Customer Attention, Collection, Sweeping and Cadastre administrative units.

b.2.4 Organizing a communications network with the Cleansing and Ornate Committees

The Customer Attention unit has promoted the organization of Cleansing and Ornate Committees both at a Communal Board and at a neighborhood level.

Information related to the members of the above committees appears on the 800ASEO database. A communications network is braided with the by means of the 800ASEO service. (Table 7-57: Information Format on the Cleansing and Ornate Committees)

Outcome: The DIMAUD and the Cleansing and Ornate Committees interact and communicate to each other via the 800ASEO system.

Table 7-57: Information Format on the Cleansing and Ornate Committees

MUNICIPALITY OF DE PANAMA			
Urban and Domiciliary Cleansing Office (DIMAUD)			
Cleansing and Ornate Committee			
1	Corregimiento:		
2	Cleansing and Ornate Committee:		
3	Date of creation:		
4	Route No. Neighborhoods covered: Frequency: Time:		
5	Route No. Neighborhoods covered: Frequency: Time:		
6	Chairman of the Committee: Mr(s)		
7	Address:	8	Tel.
9	First Council Member: Mr(s)		
10	Address:	11	Tel.
12	Second Council Member: Mr(s)		
13	Address:	14	Tel.
15	Day of meeting:		
Technical data			
16	No. of one-family houses:	17	Population served:
18	No. of multi-family houses:	19	Population served:
20	Total population served with containers:	21	Total number of containers:
22	Average persons per house:	23	Ppc/average:
24	Average weight/housing/month/kg:	25	Total weight/total area/month/tm:
26	No. of billed residential customers:	27	Payment delay ratio:
28	No. of ICI customers:	29	No. of containers delivered:
30	Total of ICI customers with a contract:	31	Payment delay ratio:
Mobile survey			
32	Period of survey:		
33	Opinion on the quality of the service		
34	Remarkable complaints		
35	Suggestions by the customers		
Relevant activities			
36	No. of calls to 800ASEO service:	37	Remarkable complaints:
38	Cleanliness operations:		
Agenda			
	Date	Person who is calling	Message to: Outcome

b.2.5 Telephone Marketing Program

By means of the letter dated September 6th, 2002, DIMAUD's General Management office expressed the approval of the Telephone Marketing Program to the JICA Study Team.

The Telephone Marketing Program was initially configured to support the promotion and functioning of the brand new Special Collection Service for ICI Customers.

The letter from the General Management office regarding the Telephone Marketing Program stipulates the following:

- It approves the telephone marketing program and the establishment of a communications system with the customers and the community.
- It demands the addition of three more telephone operators, totaling five telephone operators.
- The Call Center will be able to handle 350 calls per day with the aid of five telephone operators.
- It approves the purchase of furniture and required ancillary equipment for operation by the DIMAUD.
- It requests the assistance by the Study Team to outline the program to be followed, in order to develop a telephone marketing plan and to organize a communications network with the community and its customers.

With the purpose of attending the request by the General Management Office and with participation from the Counterpart, the strategy hereinafter is shown for its consideration:

Communications Network with the Community and the Customers

- With the creation of the Customer Attention Unit it is ensured that the DIMAUD will have an specialized framework to be in charge of establishing, improving and maintaining relations with the community and the customers.
- The Customer Attention Unit will promote the organization of Cleansing and Ornate Committees. With the latter, a communications network will be set up along with the organized communities (civil society).
- The customers' database is being enhanced and updated via the 800ASEO service. Updating via telephone.

Strategy of the Telephone Marketing Program to assist ICI customers

Table 7-58 shows a recommendable strategy to develop a telephone marketing program to assist ICI customer.

Table 7-58: Recommended Strategy to Develop a Telephone Marketing Program

<p>Objective</p> <p>Support to the promotion activities and to the Special Collection Service for ICI customers by means of the 800ASEO Call Center.</p> <p>Activities</p> <p>The Telephone Marketing Service is developed to back up the promotion of the Special Collection Service for ICI customers; therefore, designing of the latter service in advance was necessary.</p> <p>The terms of reference for the design were prepared along with the Counterpart and its development started right away. The status as of the end of September is as follows:</p> <ol style="list-style-type: none">1. Updating of the database of ICI customers <p>The Enterprise Directory database of the Contraloría General de la República [Comptrollership General's Office of the Republic] was obtained. This directory is being compared with DIMAUD's ICI customers database. The result will be an improved and updated ICI customer database.</p> <ol style="list-style-type: none">2. Geographic location of customers on the digital map, provided by the Comptrollership General's Office of the Republic. <p>Arrangements were conducted and collaboration by the Comptrollership General's Office of the Republic was achieved to supply digital geographic information on the district of Panama, which includes the following:</p> <ul style="list-style-type: none">• District limits (polygons)• Corregimiento boundaries (polygons)• Neighborhood limits (polygons)• Streets of the district of Panama (lines)• Housing, industries, businesses and others (polygons)• Hydrographical data (lines) <p>This information will lay the foundations to introduce the following information:</p> <ol style="list-style-type: none">a. ICI customersb. Areas and routes of the collection service, both for the ICI service as well as for the ordinary collection servicec. Others services supplied by the DIMAUD <p>The result obtained will be gathering of the entire information and facilities offered by a geographic information system. This job requires the outside advise of an expert (3 months)</p> <ol style="list-style-type: none">3. Calculation of the generation of solid wastes in bulk <p>Partial data is available to date</p> <ol style="list-style-type: none">4. Designing of the Special Collection System <p>To be started.</p> <ol style="list-style-type: none">5. Analysis of the storage, collection, haulage, final disposal and administrative arrangement costs <p>Partial data is available to date.</p> <ol style="list-style-type: none">6. Elaboration of the new rate structure <p>In the beginning the current rate of U\$ 14.30 per cubic yard will be used</p> <ol style="list-style-type: none">7. Approval of the rate structure by the Municipality <p>The Cleansing Code establishes that rates will be volumetric-wise</p> <ol style="list-style-type: none">8. Promotion of the new special collection service and the rate structure by means of the Call Center <p>Currently in operation via the 800ASEO service</p> <ol style="list-style-type: none">9. Elaboration of the contract for the provision of the special service <p>To be drawn up by the Juridical Counseling</p> <ol style="list-style-type: none">10. Coaching of the contracted agents <p>To be trained in the appropriate chance</p> <ol style="list-style-type: none">11. Promotion of contracting via the Call Center <p>The 800ASEO service is fully capable of starting such promotion</p>

12. Calculation of the volume generated per customer to determine the storage type and volume capacity (container(s) to be supplied by the DIMAUD)
To be determined specifically for each customer
13. Acquisition of containers by the DIMAUD
Information is being gathered to proceed to a special tender
14. Signing of the contract
15. Personalized attention through the Call Center
The operators' staff of the 800ASEO service is currently being trained
16. Designing and execution of opinion surveys on the quality of the service by means of the Call Center
Surveys have already been designed and the operators' staff has already carried out the corresponding tests
17. Information feedback with the associated administrative units
The above is an activity that will become a routine. DIMAUD's administrative units will increase their synergy by working in an integral manner.

7.6.4 Evaluation and Conclusion

The two components of the project: use of the existing administrative organization and strengthening and expansion of the 800ASEO service, have been developed as complemented to achieve the objective of the pilot project: to establish a communications system for the management of solid wastes.

According to the strategy outlined by DIMAUD's General Management office, the first area to establish the communications system is Juan Díaz *corregimiento*.

Organization of the Cleansing and Ornate Committee at a Communal Board level was achieved in the above *corregimiento*, as well as the creation of the first Cleansing and Ornate Committees at a neighborhood level.

In order to establish communication with the civil society, the DIMAUD set up the Customer Attention administrative unit.

The 800ASEO service has been strengthened with new premises and six telephone lines. The computer system donated by JICA is being utilized by the personnel allocated by the Municipality and by the DIMAUD, staff that was duly trained.

The 800ASEO service performs as the communication link between the Cleansing and Ornate Committees and the DIMAUD's Customer Attention Unit, allowing their interaction; it supports the Commercialization Department to enhance the customers' database; and it also conducts the opinion surveys on the quality of the service. It was a complete turnaround from the previous service, where only complaints were received and transferred for their immediate attention.

Likewise, the potential of the 800ASEO service is being channeled to prepare the upcoming Special Collection Service for Institutional, Commercial and Industrial (ICI) customers.

The results obtained from the surveys carried out by the 800ASEO service have shown that there a positive response to the improvement actions conducted during the execution of the pilot project of collection. The target population for the latter project was informed about the changes by means of the actions performed by the Customer Attention staff: community meetings, flyers, telephone calls.

Sustainability of these new organizational structures is ensured, as their effectiveness has been demonstrated and no further expenditures are expected for the entity. The orderly utilization of the existing resources was the strategic goal pursued.

It can be affirmed that a communications system for the management of solid wastes is now available, and the former will contribute to the continuous improvement of quality of a sustainable service through the harmonic participation by the community and the DIMAUD as a whole.

7.6.5 Recommendations

The following are recommendations to continue and enhance the communications system and to expand its backup possibilities upon the entity's associated activities:

- Consolidate organization of the Cleansing and Ornate Committees at Juan Díaz *corregimiento*
- Share the experience of Juan Díaz *corregimiento* with the remaining *corregimientos* of the district
- Organize the Regional Network of Cleansing and Ornate
- Train the Customer Attention Unit staff
- Expand the call-receiving capacity of the 800ASEO service in order to be able to collaborate with the improvement and expansion program of the customers' database

The 800ASEO service supports the development of the Telephone Marketing Program, which is closely related to the kick-off of the Special Collection Service for ICI Customers.

Chapter 8

*Setting up Planning Framework
for the Master Plan*

8 Setting up Planning Framework for the Master Plan

8.1 Social Framework

8.1.1 Population Forecast

Contraloria has not finished at present the projections for every District based on the updated figures from the 2000 census.

The results for the Panama, San Miguelito, and Arraijan District as a whole are shown in Table 8-1. The counterpart agreed to use this projection for the current study.

Table 8-1: Population Forecast

Year	2000	2001	2002	2005	2010	2015
Corregimiento						
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

8.2 Economic Framework

8.2.1 Economic Growth

The Panamanian economy grew 4.5% in 1997, 4.1% in 1998, 3.2% in 1999, and at estimated 2.9% in 2000 and 1.8% in 2001. According to official sources, after growing at 1.5% in 2002, GDP is estimated to grow at 5% around 2005 or 2006 when the multi-modal transportation centering in the Panama Canal is expected to be fully operational (La Economía Panamena: Situación y Perspectivas, Ministerio de Economía y Finanzas, Setiembre 2001). Expected contributing factors include improvements in tourism and convention, the gradual recovery in the export of shrimp and banana, and the continued growth of beef exports. However, if economic signals from the administration get delayed and muddled due to political reasons, then the opportunity for economic recovery may be dampened.

The GDP growth projection can be made as forecast using growth data from past years, and varying the time period used as basis of forecast. The variation of time periods as basis of forecast was done on the rationale that initially real growth records of the past should be given more weight, but later the weight should be shifted toward recent growth data even if they were forecast results. As forecast goes farther into the future, data from longer periods were used in order to smooth out the basis of forecast. Still, the forecast values need to be subjectively corrected.

Consequently, the calculated growth rates were corrected by subjectively judging that in no year during the planning horizon the economy will grow more than the top real growth rate recorded during the time period under consideration, that is, the second half of 1990s.

Table 8-2: 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

The latest macroeconomic data corresponding to January-November of 2001, just released by the Statistics Office and showing further slowdown of the economy, may indicate the need for assuming another set of growth rates reflecting a pessimistic outcome.

The growth rate of the regional economy in Panama District may be estimated on the basis of the growth rate estimated for the country. Employment distribution in Panama District is already highly skewed toward service at 78%, as compared to 20% in the secondary sector and 2% in the primary sector. Consequently, it will probably be safe to assume that employment distribution by sector in Panama District will not change drastically within the planning horizon of this project until 2015. However, as the value of production in the tertiary sector is higher than in other sectors, the growth rate of the regional product in Panama District should be higher than for the country as a whole.

8.2.2 Industrial Structure

GDP data showed Panama to be a service economy with production distributed 74% in the tertiary sector, 18% in the secondary sector and 8% in the primary sector. On the other hand, employment data for Panama District suggested an even strongly skewed distribution: 78% in the tertiary sector, 20% in the secondary sector and 2% in the primary sector. However, it is difficult to imagine that the Panamanian economy as a whole will change so much as to resemble the economic structure of the Panama District within the relatively short planning horizon of this project, that is 2015. Therefore, it is safer to assume a stable industrial structure, similar to the present, up to 2015.

8.2.3 Individual Economy

The economic prospect of individual households is closely related with the estimated economic growth rate and the population growth rate. In other words, if it is assumed that household size will remain the same, a quick estimation of the economic prospects of individual households can be obtained by subtracting the population growth rate from the estimated economic growth rate.

8.3 Forecast of Future Waste Amount and Composition

8.3.1 Assumptions for Waste Amount Forecast

a. Waste Generation Rate

The waste generation rate of OECD member countries ranges from 800 to 1,900g/person/day, and its average is about **1,370g/person/day**¹.

On the other hand, the waste generation amount in Panama municipality is calculated as 1015 ton/day and its population is forecast at 744,448 in 2002. The waste generation rate derived from these figures is **1,363g/person/day**, which is as high as the average of the OECD member countries.

Table 8-3: Example of Waste Generation Rate in OECD Countries

Country	Generation Rate (kg/person/year)	Generation Rate (g/person/day)
Japan	408	1,118
USA	710	1,945
France	328	899
Denmark	475	1,301
Portugal	259	710
Spain	322	882
OECD	500	1,370

source : Environmental Indicators OECD 1994

The waste generation rate ranges widely depending on the cultural practices, economical situations, and consumption trends in respective societies, among which economical situation will mainly determine the magnitude of the waste generation rate. People in economically developing countries, in which the living standards are low, generate less waste and reuse and recycle more, therefore, their waste generation rates are in a low range (Table 8-4). Therefore, in order to estimate future waste amount especially in developing countries, it is important to consider the indicators such as economic growth rate for estimating the future waste generation rate.

Table 8-4: Example of Waste Generation Rate in Developing Countries

Country/City	Year	Generation Amount (ton/day)	Population	Generation Rate (g/person/day)
Paraguay/ Asuncion	1994	793	1,163,598	682
Tanzania/ Dar es Salaam	1996	1,771	2,030,000	872
Honduras/ Tegucigalpa	1997	480.7	848,859	566

source : results of JICA study

¹ Environmental Indicators, OECD 1994

On the other hand, the economy level of Panama municipality is already higher than the average of middle-income countries and its waste generation rate is at as same as other industrialized countries. It is expected that the municipal SWM by Panama municipality in the future will focus on waste minimization programs. Therefore, the future trends of waste generation rate in Panama municipality will be toward a little increase or a little decrease from that of today. Consequently in this M/P, the future waste generation rate is set up at the present waste generation rate.

The generation rate at each source is shown in Table 8-5.

Table 8-5: Waste Generation Rate

Source		unit	Generation rate	
Household waste		g/person/day	590	
Commercial waste	Restaurant	g/employee/day	6,373	
	Others		1,918	
Institutional waste				201
Market waste				4,178

b. Waste Generation Amount

- Future waste amount from households was obtained from the waste generation rate and projected population shown above.
- The increase in numbers of establishments (such as offices, market and hotels), their employees and/or other related parameters was obtained by assuming that it is proportional to the GDP growth ratio from 2002 to 2015, and used to estimate the future waste generation from those establishments.
- The industrial waste amount is simply supposed to increase in proportion to the GDP growth rate, as generation rate of industrial waste has not been obtained and the country's policies on the industrial waste are unclear.
- The waste amount from the municipalities (San Miguelito, Arraijan) was assumed to be proportional to their population. As for the future waste stream, all waste is supposed to be simply disposed of at the final disposal site of Cerro Patacon since the introduction of source separation in those municipalities is very unlikely.

8.3.2 Waste Composition

The waste composition, as well as waste generation rate, varies widely with the cultural practices, economical situations and consumption trends in respective societies. Table

8-6 shows examples of waste composition in OECD countries and Table 8-7 shows waste composition of waste in Panama Municipality.

Table 8-6: Example of Waste Composition in OECD Countries

Country \ Composition	Paper and cardboard (%)	Plastics (%)	Glass (%)	Metal (%)	Food & garden waste, etc. (%)	Other (%)
Japan	38	11	7	6	32	7
USA	38	8	7	8	25	15
France	31	10	12	6	25	17
Denmark	22	4	5	3	55	9
Portugal	25	9	4	3	NA	59
Spain	20	7	8	4	49	10

source : OECD Environmental Data 1993, OECD

Table 8-7: Waste Composition of Panama Municipality

Area \ Composition	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

Comparing the above two tables, the waste composition at source in Panama Municipality are similar to those in European countries. The waste composition in Panama Municipality, as well as the waste generation rate, turns out to be in the level of industrialized economies. Therefore, it can be estimated that the future waste composition remains same as that of today even taking the future economic growth into the consideration. Consequently in this M/P, the future waste composition is set as the present one.

8.3.3 Forecast of Future Waste Amount

a. Population

Table 8-8 shows detailed population forecast.

Table 8-8: Forecast of Future Population

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Population Forecast (person)															
Distrito de Panam	725,866	744,448	764,256	785,369	807,868	831,846	857,397	884,626	913,645	944,573	977,540	1,012,683	1,050,153	1,090,110	1,132,726
San Felipe	6,660	6,402	6,154	5,916	5,687	5,467	5,255	5,052	4,856	4,668	4,487	4,314	4,147	3,986	3,832
El Chorrillo	22,858	23,087	23,318	23,551	23,787	24,025	24,265	24,508	24,753	25,000	25,250	25,503	25,758	26,016	26,276
Santa Ana	20,535	19,986	19,452	18,933	18,427	17,935	17,456	16,990	16,536	16,095	15,665	15,246	14,839	14,443	14,057
La Exposición o Calidonia	19,348	18,975	18,609	18,249	17,897	17,552	17,213	16,881	16,555	16,236	15,922	15,615	15,314	15,018	14,728
Curundú	19,131	19,244	19,357	19,472	19,586	19,702	19,818	19,935	20,053	20,171	20,290	20,409	20,530	20,651	20,773
Betania	44,195	43,981	43,769	43,558	43,347	43,138	42,930	42,723	42,516	42,311	42,107	41,903	41,701	41,500	41,300
Bella Vista	28,789	29,163	29,541	29,924	30,312	30,705	31,103	31,506	31,914	32,328	32,747	33,172	33,602	34,038	34,479
Pueblo Nuevo	17,875	17,593	17,316	17,043	16,774	16,509	16,249	15,993	15,741	15,493	15,248	15,008	14,771	14,538	14,309
San Francisco	35,903	36,056	36,210	36,365	36,520	36,675	36,832	36,989	37,146	37,305	37,464	37,623	37,784	37,945	38,107
Parque Lefevre	37,035	36,934	36,833	36,733	36,633	36,533	36,434	36,334	36,235	36,137	36,038	35,940	35,842	35,744	35,647
Río Abajo	28,304	27,900	27,502	27,109	26,722	26,340	25,964	25,593	25,228	24,868	24,513	24,163	23,818	23,478	23,143
Juan Díaz	89,746	91,355	92,993	94,661	96,358	98,086	99,845	101,636	103,458	105,313	107,202	109,124	111,081	113,073	115,100
Pedregal	46,323	46,850	47,384	47,924	48,470	49,022	49,580	50,145	50,717	51,294	51,879	52,470	53,067	53,672	54,283
Ancón	11,135	11,100	11,066	11,032	10,998	10,965	10,931	10,897	10,864	10,831	10,797	10,764	10,731	10,698	10,665
Chilibre	42,126	43,845	45,634	47,495	49,433	51,449	53,548	55,733	58,007	60,373	62,836	65,400	68,068	70,845	73,735
Las Cumbres	97,188	102,093	107,245	112,657	118,343	124,315	130,589	137,179	144,102	151,374	159,014	167,038	175,468	184,324	193,626
Pacora	66,939	72,800	79,175	86,108	93,648	101,848	110,766	120,465	131,014	142,486	154,963	168,532	183,290	199,339	216,795
San Martín	3,708	3,847	3,990	4,139	4,293	4,453	4,619	4,792	4,970	5,156	5,348	5,547	5,754	5,969	6,191
Tocumen	88,069	93,237	98,708	104,501	110,633	117,126	123,999	131,276	138,980	147,136	155,770	164,911	174,589	184,834	195,681
San Miguelito	299,366	305,095	310,933	316,883	322,946	329,126	335,424	341,843	348,384	355,050	361,844	368,769	375,825	383,017	390,346
Arraijan	163,797	178,961	195,529	213,630	233,407	255,015	278,624	304,418	332,600	363,392	397,033	433,790	473,949	517,825	565,764

b. GDP Growth Ratio and Number of Employee

It was assumed that number of employees would increase in proportion to the GDP growth rate in the future. However, number of employees of public markets in the future was estimated as same as one at present, as it is unlikely that public markets would grow up like other commerce.

Table 8-9 shows forecast of GDP growth rate and number of employee.

Table 8-9: Forecast of GDP Growth Ratio and Number of Employee

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP growth ratio (%/year)	1.8	1.5	2.5	3.0	3.5	4.5	4.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Commercial total	75,840	76,978	78,874	81,149	83,803	87,216	90,629	92,904	95,179	97,454	99,730	102,005	104,280	106,555	108,830
Restaurant	16,448	16,695	17,106	17,599	18,175	18,915	19,655	20,149	20,642	21,136	21,629	22,123	22,616	23,109	23,603
Others	59,392	60,283	61,768	63,549	65,628	68,301	70,973	72,755	74,537	76,319	78,100	79,882	81,664	83,446	85,228
Institutions	149,527	146,051	149,648	153,965	159,002	165,477	171,952	176,269	180,586	184,903	189,219	193,536	197,853	202,170	206,486
Public institution	35,686	36,221	37,113	38,184	39,433	41,039	42,645	43,715	44,786	45,857	46,927	47,998	49,068	50,139	51,209
Other than public institution	108,207	109,830	112,535	115,781	119,569	124,438	129,307	132,554	135,800	139,046	142,292	145,538	148,785	152,031	155,277
Market	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634	5,634

c. Waste Generation Amount

The future waste amount is forecast by multiplying the waste generation rate listed in Table 8-5 by factors, such as population, employees and number of shops listed in Table 8-8 and Table 8-9. The number of employees was estimated to increase in proportion to the GDP growth ratio. Table 8-10 shows waste generation amount forecast by 2015.

Table 8-10: 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

8.3.4 Future Waste Stream

Future waste stream shows below.

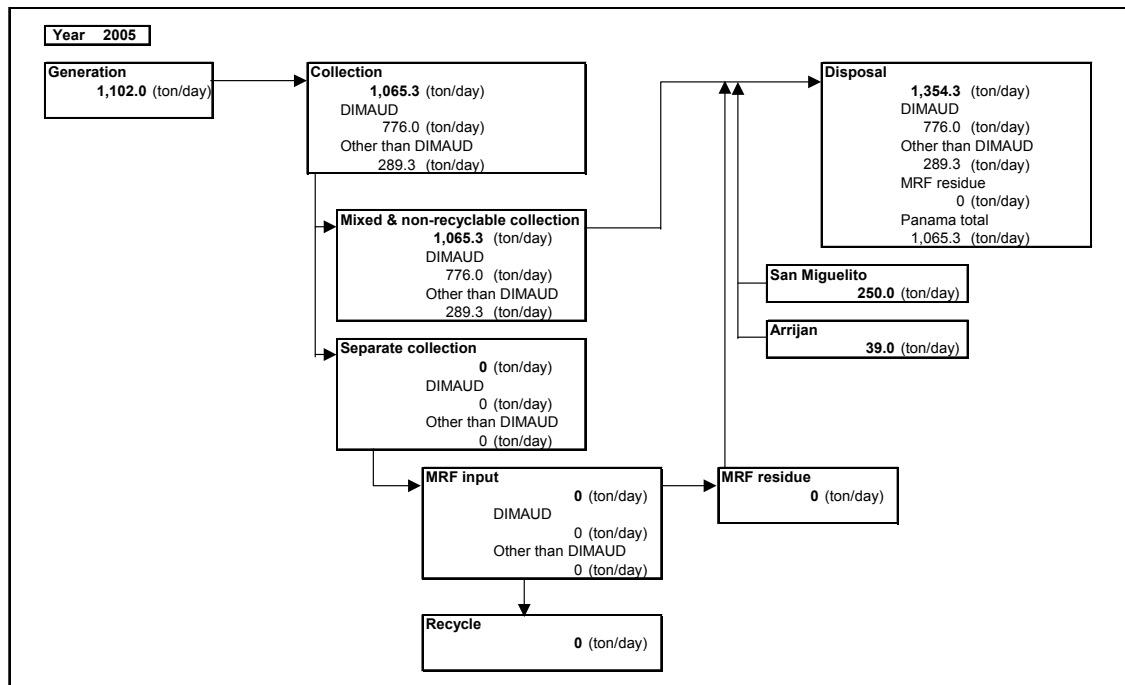


Figure 8-1: Waste Stream in 2005

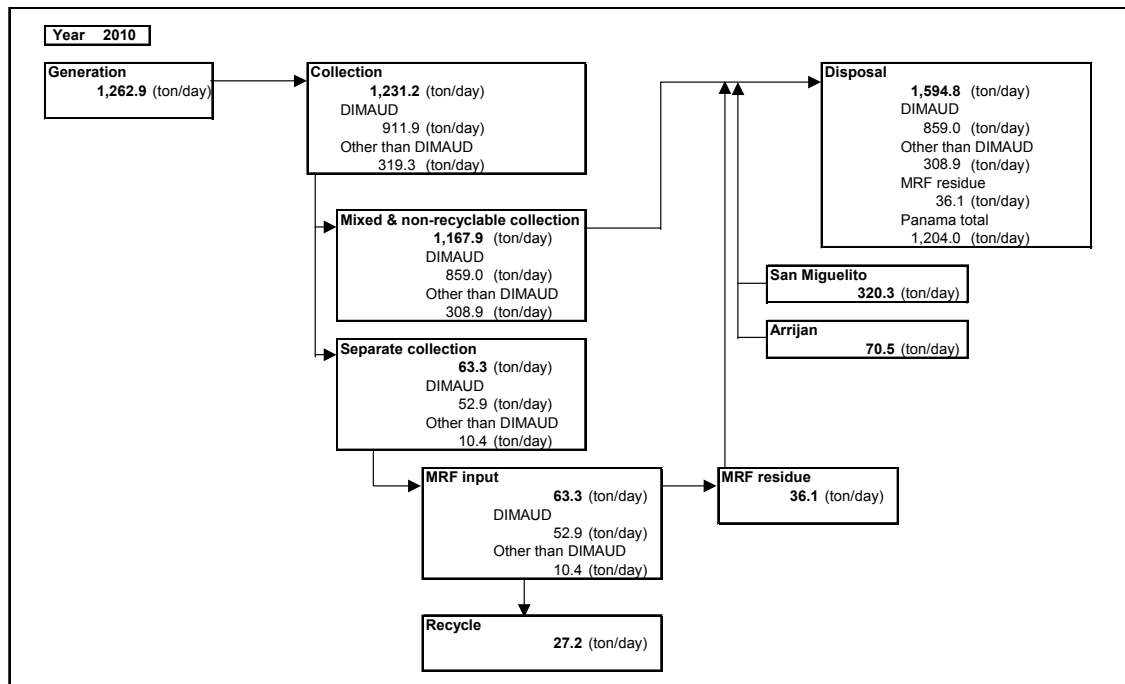


Figure 8-2: Waste stream in 2010

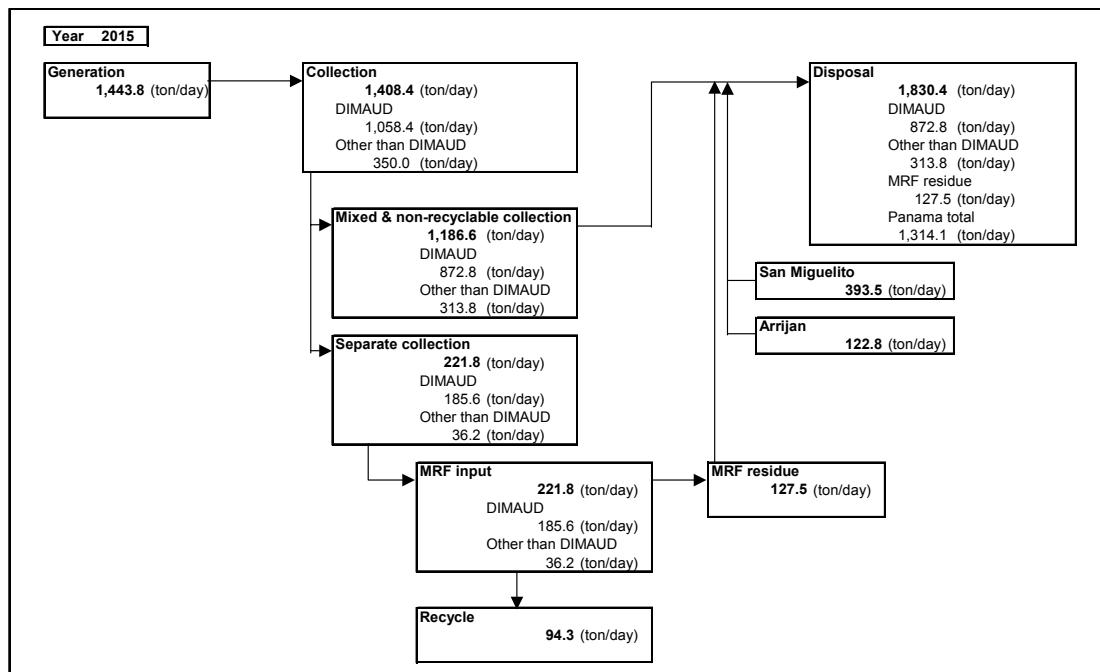


Figure 8-3: Waste Stream in 2015

Chapter 9

*Selection of an Optimum
Technical System*

9 Selection of an Optimum Technical System

9.1 Priority Ranking of Key Issues

DIMAUD is the executing body of the Municipal Solid Waste Management of Panama municipality. It has technical and management capabilities to collect, transport and dispose of about 1,000 ton/day of waste and to keep the city clean.

On the basis of the current situation analysis, key issues, or the current problems to be solved and the new challenges, in the technical aspect were prioritised in view of urgency and importance, and those are presented in Table 9-1. This section discusses selection of an optimum technical system with taking into account the key issues.

Table 9-1: Priority Ranking of Key Issues

Item		First priority	Second priority	Third priority
Technical system	Discharge and storage system	Improvement discharge manner	Introduce separate collection	-
	Collection system	Basic database establishment and maintenance	-	-
		Improvement of collection efficiency	-	-
		Expansion of collection area	-	-
	Intermediate treatment system	Establishment of policy on intermediate treatment system	Examination material recovery system	Examination of incineration system
	Final disposal	Improvement of current landfill operation	-	-
		Improvement of leachate management	-	-
		Ensuring final disposal capacity by 2015 (expansion plan of Cerro Patacon)	-	-
	Waste minimization and resource conservation	Education program for encouraging waste minimization and recycling	Execution of recycling program	-

9.2 Overall System

The table below shows potential technical system alternatives that could be introduced in Panama Municipality. In the following, those alternatives are analyzed in views of technical practicability, waste reduction and costs. Then, an optimum alternative is recommended at the end.

Table 9-2: Comparison of Technical System Alternatives

Alternatives	Sub-categories	Discharge and storage/Collection		Intermediate treatment			Final disposal item	
		Manner		Separation item	Facility	Recovery method		Recovery item
		Mixed	Separate					
ALT1	Type 1	X		non	non	non	Whole waste	
	Type 2	X		non	MRF	Manual sorting	Optionally (plastic, metals, glass & bottle)	Other than recovered item
ALT2	Type 1		X	Recyclable	MRF	Manual and mechanical sorting	Optionally (paper, plastic, metals, glass & bottle)	Residue of MRF
				Non-recyclable	non	non	non	Whole waste
	Type2		X	Organic	Composting	Composting	Organic matter (kitchen waste, Grass & wood)	Residue of composting
				Recyclable	MRF	Manual and mechanical sorting	Optionally (paper, plastic, metals, glass & bottle)	Residue of MRF
				Others	non	non	non	Whole waste
	Type3		X	Combustible	Incineration	Combustion	Thermal energy and/or power generation	Bottom and fly ash
Non-combustible				MRF	Manual and mechanical sorting	Optionally (metals, glass & bottle)	Residue of MRF	

notes : MRF : Material Recovery Facility

a. Technical Practicability

Alternatives of ALT1 can be taken, even if present collection system, i.e., mixed collection, does not change. Both types, Type 1 and Type 2, of ALT1 is judged as technically practicable.

Meanwhile, technical alternatives of ALT2 require separate collection. The separate collection will require change in collection system, e.g., other type of vehicle than one currently used would be necessary and discharge manner would need to be altered. Especially, cooperation of citizens will be the most significant to lead the separate collection successful. The results of the Environmental Education Pilot Project inferred that such cooperation could be well acquired with provision of proper education to schools and communities.

As for the intermediate treatment system, the results of the Recycling Market Survey tells that there are markets of valuable materials such as paper and aluminum, however, there is

currently no market for compost as well as in the near future. Therefore, MRF would meet with needs in the Panama District, but Composting would not suit to.

As for Incineration, its introduction would not be feasible at present. According to the results of WACS, mixed waste has about 1,100~1,200 kcal/kg (4,600~5,000kj/kg) of lower calorific value. Word Bank¹ does not recommend incineration for waste, which has lower calorific value of lower than 6,000 j/kg (1,434 kcal/kg). Besides, it advises that three components of waste are within the range shown in the following figure for application of incineration. The results of the Waste Composition Survey conducted in the Study revealed that the waste generated from the Study Area does not clear those two conditions, or the lower calorific value and the three components.

Characteristics of waste are to change with economic progress, then the lower calorific value and the three components are to vary as well. Therefore, it is important to monitor them with time in order to consider introduction of incineration in the future.

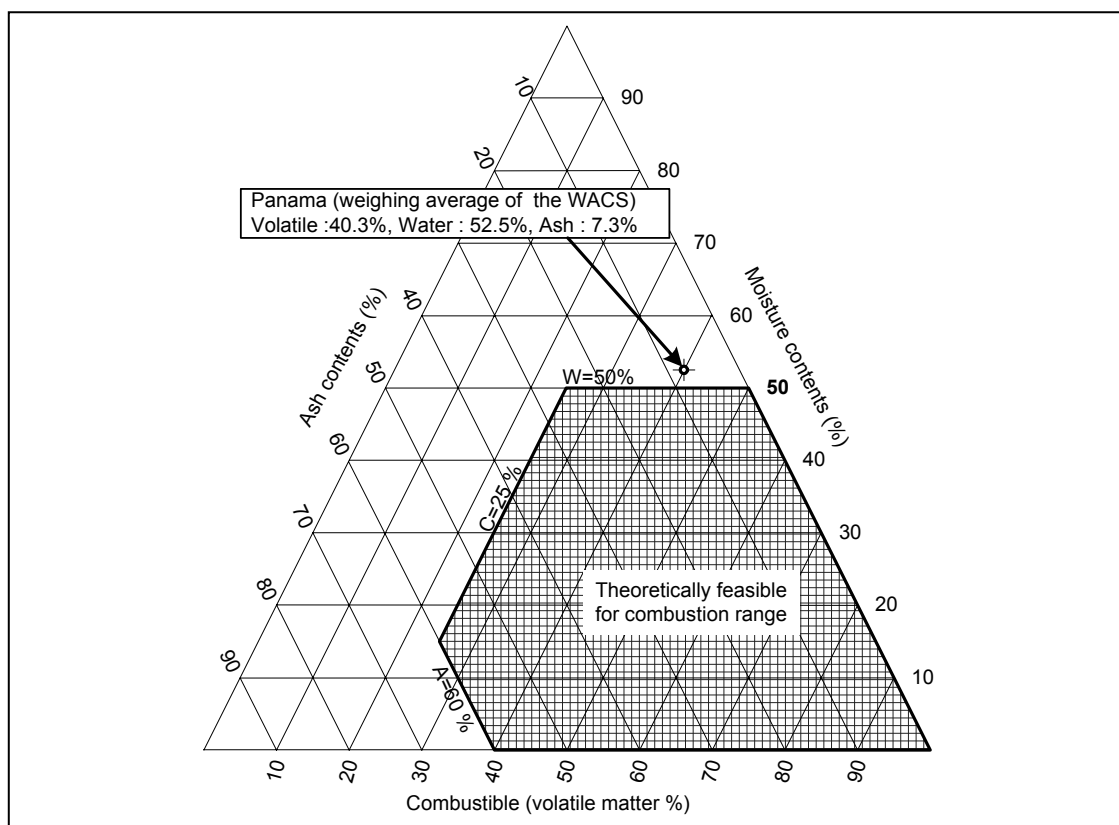


Figure 9-1: Tanner Triangle for Assessment of Combustibility of MSW

¹ World Bank Technical Paper No.462 Municipal Solid Waste Incineration, Requirements for a Successful Project, page 96

b. Reduction Effect

This section discusses effectiveness of waste reduction of alternatives listed in Table 9-2.

b.1. Physical Composition

Physical waste composition, which is used for selection of an optimum technical system, is shown in the table below. The composition was obtained based on the results of WACS and the waste stream analysis, and represents waste generated in Panama District.

Table 9-3: Overall Physical Composition

	Household			Commercial		Institutional	Market	Street Sweeping	Total/Weighting average	Ratio
	High income	Middle income	Low income	Restaurant	Others					
Generation amount (ton/day)	73.3	224.9	141	106.4	115.6	29.3	23.5	8.4	722.4	
Kitchen Waste (%)	32.9	53.3	43.9	46.4	25.0	14.0	64.1	14.8	42.2	89.8%
Paper (%)	25.0	20.3	17.8	32.7	37.3	58.7	15.9	24.6	26.3	
Textile (%)	7.5	3.3	9.7	1.5	1.9	0.7	2.5	3.5	4.3	
Grass Wood (%)	9.5	4.9	4.5	0.2	2.5	2.3	2.3	21.7	4.2	
Plastic (%)	15.4	9.5	11.5	8.1	20.5	8.4	7.0	16.7	12.0	
Rubber Leather (%)	1.4	0.1	3.1	0.0	0.0	0.0	0.0	1.3	0.8	
Metal (%)	3.3	3.3	4.3	1.9	5.5	9.1	2.3	2.4	3.8	10.2%
Bottles Glass (%)	4.6	5.0	4.6	9.3	5.9	6.8	5.6	6.3	5.8	
Soil Stone (%)	0.4	0.1	0.4	0.0	0.9	0.0	0.0	8.7	0.4	
Others (%)	0.0	0.3	0.2	0.0	0.5	0.2	0.3	0.0	0.2	
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

b.2. Impurity Rate

Even if the separate collection were introduced, it is impossible to separate items completely and impurities are found in each item of physical composition. Therefore, rate of impurities are assumed as shown in the table below.

Table 9-4: Impurity Rate in Intermediate Treatment Process

	ALT2/1	ALT2/2		ALT2/3	
	MRF input	MRF input	Composting input	MRF input	Incineration input
Kitchen Waste	20%	20%	50%	20%	80%
Paper	50%	50%	20%	50%	50%
Textile	20%	20%	50%	20%	80%
Grass, Wood	20%	20%	50%	20%	80%
Plastic	50%	50%	20%	50%	50%
Rubber, Lather	50%	50%	20%	50%	50%
Metal	50%	50%	20%	50%	50%
Bottles, Glass	50%	50%	20%	50%	50%
Soil, Stone	50%	50%	20%	50%	50%
Others	50%	50%	20%	50%	50%

b.3. Recovery and Reduction Ratio

Recovery and reduction ratios through processes are supposed as shown in the table below on the basis of the experiences in Japan.

Table 9-5: Recovery and Reduction Ratio

	ALT2/1		ALT2/2		ALT2/3	
	MRF recovery ratio	MRF recovery ratio	Composting		MRF recovery ratio	Incineration ash product ratio
			Compost product ratio	Reject ratio		
Kitchen Waste	0%	0%	10%	0%	0%	10%
Paper	60%	60%	5%	0%	60%	10%
Textile	0%	0%	0%	100%	0%	10%
Grass Wood	0%	0%	10%	0%	0%	10%
Plastic	60%	60%	0%	100%	60%	10%
Rubber Lather	0%	0%	0%	100%	0%	10%
Metal	60%	60%	0%	100%	60%	100%
Bottles Glass	60%	60%	0%	100%	60%	100%
Soil Stone	0%	0%	0%	100%	0%	100%
Others	0%	0%	0%	100%	0%	100%

b.4. Reduction Effects

The table below shows reduction effects of alternatives based on the recovery and volume reduction ratios mentioned above.

Table 9-6: Reduction Effect of Final Disposal Amount (weight ton base)

Alternatives	Sub-categories	Discharge/collection		Intermediate treatment			Final disposal amount
				Facility	Input amount	Recovery amount	
		Collection item	Ratio				
ALT1	Type1	Mixed	100%	none	none	none	100%
	Type2	Mixed	100%	MRF	100%	5%	95%
ALT2	Type1	Non-recyclable	65%	none	none	none	65%
		Recyclable	35%	MRF	36%	14%	21%
		total					86%
	Type2	Organic	35%	Composting	35%	2.6% (compost)	7%
		Recyclable	35%	MRF	35%	14%	21%
		Others	30%	none	none	none	30%
		Total					58%
	Type3	Combustible	65%	Incineration	65%	Thermal energy / power generation	11%
		Non-combustible	35%	MRF	35%	14%	21%
		Others (bulky & hospital waste)	0.3%	none	none	none	0.3%
Total					32%		

assumptions

ALT1 Type2 recovery ratio at MRF is 10% (based on data of Mexico City)

ALT2 Type1 separation ratio at generation sources is 50%

recovery items at MRF are paper, plastic, metal, and bottle and glass
recovery ratio at MRF 60%

Type2 separation ratio at generation sources is 50% for organic matter
separation ratio at generation sources is 50% for recyclable matter
compost production ratio is 10% of organic matter
recovery ratio at MRF 60%

Type3 separation ratio at generation sources are 80% for kitchen waste, textile, and grass & wood

separation ratio at generation sources are 50% for other than above items
waste reduction ratio of incineration is 10% to combustible matter (kitchen waste, paper, textile, grass & wood, plastic and rubber & lather
recovery ratio at MRF 60%

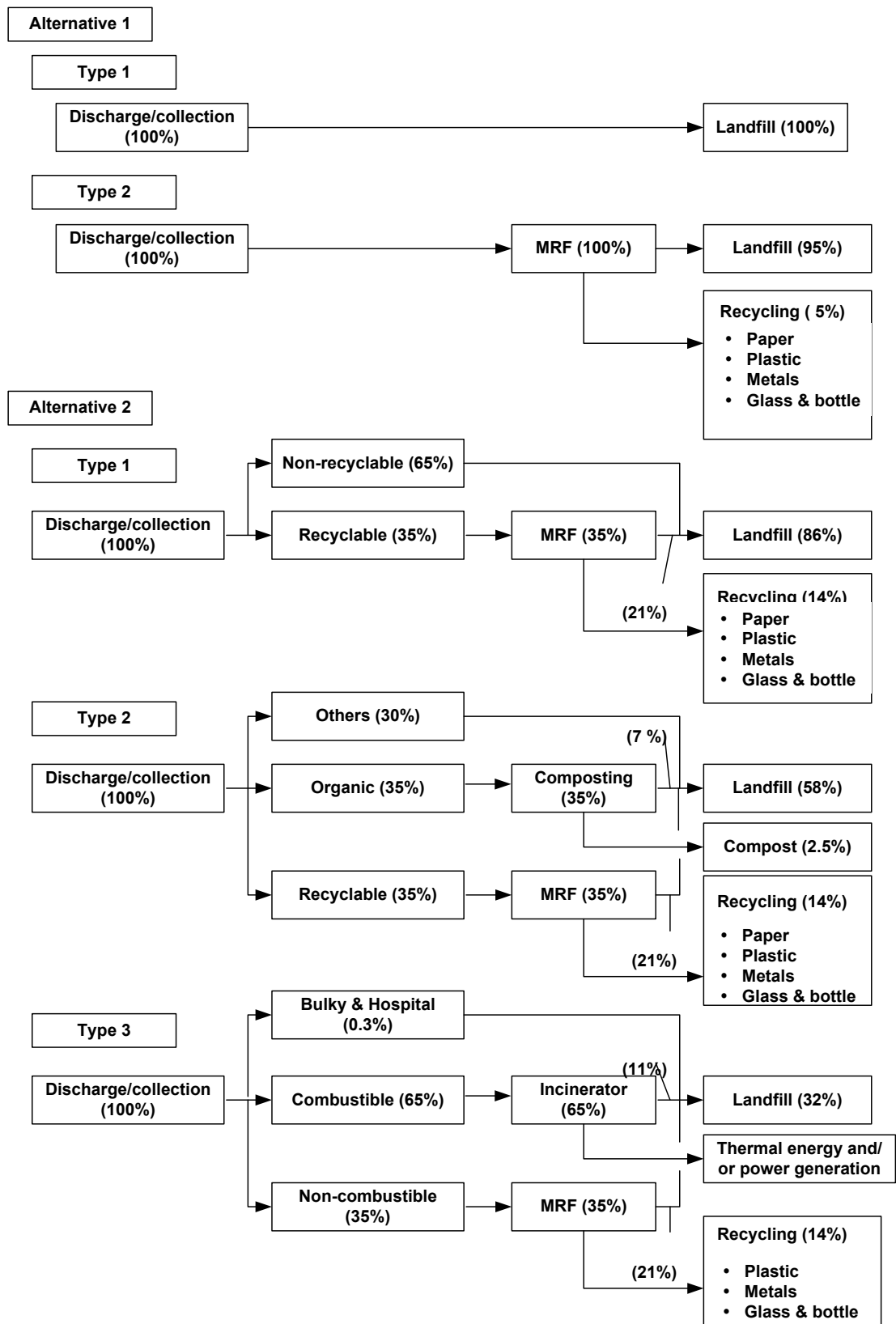


Figure 9-2: Flow Diagram of Alternatives

c. Costs

c.1. Collection Cost

It is estimated at present that the collection cost is US\$41/ton, which provides citizens with collection service of twice to four times per week according to the results of POS. If separate collection were introduced in addition to this collection service, further costs would be required in proportion to number of items to be collected separately. The following table shows such cost increase caused by introduction of separate collection.

Table 9-7: Cost Comparison of Mixed and Separate Collection

Collection method	Collection day per week (a)	Collection item (b)	Total working amount per week (c)=(a)*(b)	Index (d)	Collection cost (U\$/ton) (e)=(d)*41
Mixed collection	3.5(3 to4)	1	3.5	1.0	41.0
2 item separate collection	3.5(3 to4)	2	7.0	2.0	82.0
3 item separate collection	3.5(3 to4)	3	10.5	3.0	123.0

c.2. Treatment and Disposal Costs

For considering costs for alternatives, figures are used presented in Table 9-8, which shows general understandings of treatment and disposal costs according to income level of countries for large cities.

Table 9-8: Costs of Alternative Technologies for Large Cities

	Low income country	Middle income country	High income country
Average income from GDP	U\$ 379/cap./year	U\$ 2,400 /cap./year	U\$ 22,000 /cap./year
Sanitary landfill cost	U\$ 3 to 10/ ton	U\$ 8 to 15 / ton	U\$ 20 to 50 / ton
Composting	U\$ 5 to 20/ ton	U\$ 10 to 40 / ton	U\$ 20 to 60 / ton
Incineration	U\$ 40 to 60/ ton	U\$ 30 to 80 / ton	U\$ 70 to 130 / ton

Notes

1. Income based on 1992 Gross National Product data from the World Development Report 1994 published by the World Bank.
2. Costs are for owning, operation, maintenance, and debt service in 1995, assuming no equipment provision though grants.
3. The above sanitary landfill costs are for cities of over 500,000 people or over 250 ton/day, in order to capture economies-of-scale.
4. The higher range of costs for sanitary landfill is of for system with plastic membranes and full leachate collection and treatment systems; while the low range of costs is for natural attenuation landfills where site conditions do not require leachate management.
5. The higher range of costs for composting is for systems with mechanized classification, pulverization, and forced aeration; while the lower range of costs is for systems with hand sorting, trommel screening and simple open air-windrows.
6. The higher range of costs for incineration is for systems with air pollution control; while the lower range of costs is for systems with only stacks.

Source Sandra Conitreau-Levine 1999

c.3. Cost Index

On the basis of the costs mentioned above, cost index was devised and presented in Table 9-9, supposing that waste amount subjected is 1,000 ton/day. The index expresses increase of cost in percent with setting the present technical system's cost at 100%.

Table 9-9: Cost Index

Alternatives	Sub-categories	Item	Technical system					Total cost
			Collection	MRF	Composting	Incineration	Landfill	
AIT1	Type1	Landfill	80.4%	0.0%	0.0%	0.0%	19.6%	100.0%
	Type2	Landfill & MRF	80.4%	39.2%	0.0%	0.0%	18.6%	138.2%
ALT2	Type1	Landfill & MRF	160.8%	14.1%	0.0%	0.0%	16.7%	191.6%
	Type2	Landfill, Compost & MRF	241.2%	14.1%	16.7%	0.0%	11.4%	283.3%
	Type3	Landfill, Incineration & MRF	160.5%	14.0%	0.0%	125.5%	6.7%	306.7%

assumptions

MRF unit cost : US\$20/ton (inc. construction, operation and maintenance cost, exc. land acquisition cost) (study team estimated referring composting costs of Table 9-8)

Incineration unit cost : US\$100/ton (inc. construction, operation and maintenance cost, exc. land acquisition cost) (study team estimated referring incineration costs of Table 9-8 and dioxin treatment costs)

Composting unit cost : US\$25/ton (inc. construction, operation and maintenance cost, exc. land acquisition cost) (average value of composting costs of Table 9-8)

Landfill cost : US\$10/ ton (inc. construction, operation and maintenance cost, exc. land acquisition cost) (study team estimated referring sanitary landfill costs of Table 9-8 and present landfill unit cost of DIMAUD)

Management size : around 1,000 ton/day

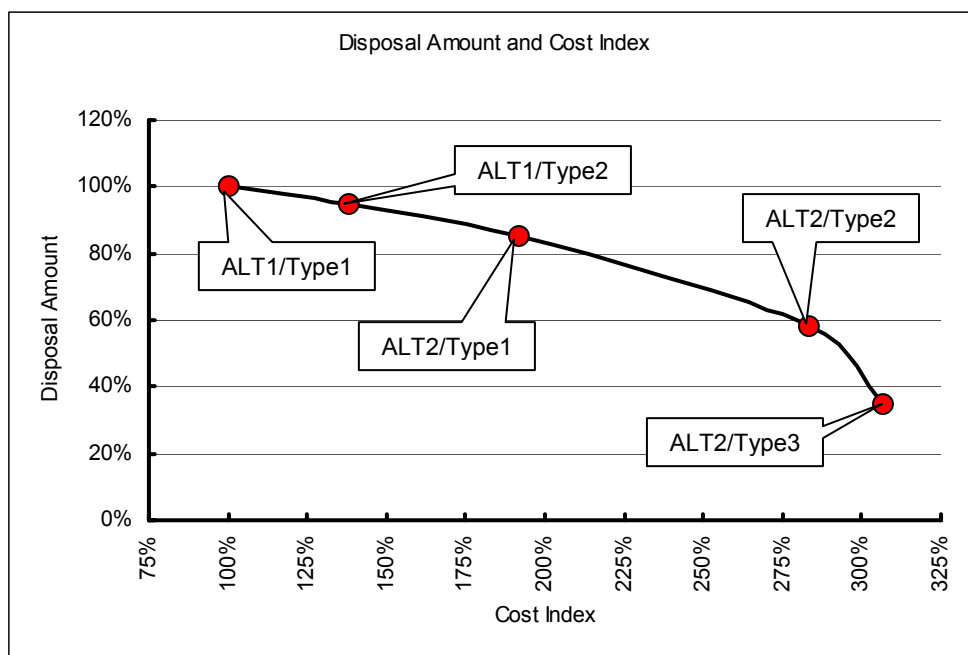


Figure 9-3: Relation Between Disposal Amount and Cost Index

Figure 9-3 schematizes Table 9-9. An important technical difference between ALT1 and ALT2 is the mixed collection or the separate collection. Comparing ALT1/Type2 and ALT1/Type1 on the assumption that separate collection is introduced in addition to the current mixed collection, i.e., frequencies of the current mixed collection will not change and further works for a new separate collection will be necessary,

- ALT1/Type2 achieves 5 % waste reduction by 38% of cost increase ($5/138=0.036$), and
- ALT2/Type1 attains 14% waste reduction by 91% of cost increase ($14/191=0.073$).

Therefore, it can be said that cost-effectiveness of ALT2/Type1 is twice as high as one of ALT1/Type2 ($0.073/0.036=2.03$), and introduction of MRF with separate collection will be more advantageous than one with mixed collection.

d. Recommendable Alternative

Introduction of intermediate treatment facilities will go towards the next step of MSWM, i.e., waste minimization and resource conservation. However, the present situation of Panama District indicates that there exist issues to be overcome before that.

- The present landfill, Etapa II, has a remaining life period of only 3 or 4 years, and the existing plan to expand the landfill is not sufficient to ensure waste disposal for a long period. Meanwhile, the site of Cerro Patacon itself has a large area to expand the

present landfill. Therefore, expansion of the present landfill without giving serious impacts on the surroundings should be prioritized rather than reduction of final disposal amount.

- There is no official and large scale recycling activities in Panama District, although waste-pickers are collecting recyclable materials in the city and Cerro Patacon final disposal site informally, in small scale and inefficiently. Separate discharge and collection is crucial for establishing efficient recycling system, however, it requires a long period.

Consequently, ALT2/Type1 is recommendable as an optimum technical system in the future. It requires separate discharge and collection, and it will take a long period to introduce it. Therefore, phased introduction of the system is considered as follows.

- First phase: introduce separate discharge and collection stepwise
- Second phase: introduction of MRF

9.2.1 Separate Collection

The primary target of collection system in Panama Municipality should be to raise collection service coverage to 100%. The subsequent target after achieving 100% collection service coverage should be introduction of separate collection system that will aim at resource conservation and reduction of final disposal amount.

The success in shifting the generators' behavior from mixed waste discharge to source separation largely depends on morals and devotion of themselves. Namely, the fewer the separation items are, the higher possibility of success.

Therefore, it is recommended the separation items of the initial separate collection system should be two (2) items: “**recyclable**” and “**non-recyclable**”.

a. Separate Collection Methods

Collection methods for separately discharged wastes comprise such as:

- **Normal vehicle collection:** Collection vehicles of single loading space are employed in this collection. Respective collection for each item is performed on different days of a week. (i.e., a vehicle, assigned in a fixed route, collects one “source separate” item on (a) specific day(s) of a week, and another item on another (other) day(s) of a week).
- **Point collection:** Plural containers are installed (one container for one “separate” item) at a designated collection point

- **Special vehicle collection:** A special collection vehicle with plural loading spaces is employed in the collection. The vehicle can collect plural items at the same time.

In view of an advantage of utilizing the existing collection system (i.e., maximum use of current resources and cost saving), **normal vehicle collection** appears to be most recommendable for a separate collection.

Although, the results of POS present that 84% of citizens show their willingness to cooperate with separate discharge, it is expected to take a long period for introducing it. There is no theoretical manner to estimate how long it would take to introduce the separate discharge and collection. In case of Mexico City, they aim to achieve 50% of introduction of two items separate collection for 10 years from 2000 to 2010.

It is conjectured that about same period or moreover would be necessary for Panama Municipality, as waste generation rate and ratio between household waste amount and commercial/institutional waste amount are similar to ones in Mexico.

Consequently, it is recommendable to achieve 100% collection coverage in 2006 and to attain 50% of separate collection introduction in the Master Plan's target year, 2015.

b. Separate Collection Plan

b.1. Scenario

It is important to achieve 100% collection coverage before introduction of separate collection. As of the end of 2001, the collection coverage was about 92%. By raising up the collection coverage 2% in every year, it will reach to 100% in 2006.

It is planned that the separate collection will begin in 2007 where 100% collection coverage is achieved, and 50% of separate collection introduction will be realized in 2015.

Two scenarios can be thought for separate collection introduction as follows.

- Scenario 1: raise ratio of separate collection introduction equally every year towards a target
- Scenario 2: apply a lower rate at the beginning of introduction, then apply a higher rate in later period

It is recommendable to take Scenario 2, to begin a lower rate, as separate collection has not been experienced so far in Panama District. The table below shows comparison of the scenarios.

Table 9-10: Comparison of Scenarios for Separate Collection Introduction

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Scenario 1	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	11.0%	16.5%	22.0%	27.5%	33.0%	38.5%	44.0%	50.0%
Scenario 2	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	6.6%	9.9%	16.5%	23.1%	29.7%	36.3%	42.9%	50.0%
Collection service coverage	92%	94%	96%	98%	100%	100.0%								

b.2. Potential Amount of Recyclable Materials to be Collected

It is important to grasp potential amount of materials to be collected separately as recyclable, in order to plan separate collection. It should be noted that materials collected as recyclable must include impurities. The table below shows such potential amount estimated based on the results of WACS and the impurity rate.

Table 9-11: Impurity Rate of Recyclable Waste

	Kitchen Waste	Paper	Textile	Grass Wood	Plastic	Rubber Leather	Metal	Bottles Glass	Soil Stone	Others
Impurity rate	20%	50%	20%	20%	50%	50%	50%	50%	50%	50%

Table 9-12: Potential Collection Amount of Recyclable Waste

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Waste collection amount (ton/day)	964.9	995.0	1,028.9	1,065.3	1,107.9	1,141.9	1,170.0	1,200.7	1,231.2	1,264.0	1,297.4	1,333.1	1,369.2	1,408.3
Potential collection amount (MRF input amount (ton/day))														
Kitchen Waste	66.9	69.4	72.2	75.1	78.5	81.1	83.4	85.7	88.2	90.8	93.5	96.4	99.4	102.5
Paper	117.7	121.6	126.0	130.8	136.6	141.4	145.2	149.2	153.3	157.5	161.9	166.3	170.9	175.7
Textile	6.2	6.5	6.8	7.1	7.4	7.7	7.9	8.1	8.4	8.7	9.0	9.3	9.6	9.9
Grass Wood	5.8	6.1	6.3	6.6	6.9	7.2	7.4	7.6	7.8	8.1	8.4	8.7	8.9	9.3
Plastic	50.6	52.3	54.3	56.5	59.1	61.1	62.8	64.6	66.4	68.3	70.2	72.3	74.4	76.6
Rubber Lather	2.7	2.8	2.9	3.1	3.2	3.3	3.4	3.5	3.6	3.8	3.9	4.1	4.2	4.4
Metal	16.2	16.9	17.5	18.2	19.0	19.6	20.2	20.8	21.4	22.0	22.6	23.2	24.0	24.7
Bottles Glass	25.2	26.1	27.0	28.1	29.3	30.3	31.2	32.0	32.9	33.8	34.7	35.7	36.7	37.8
Soil Stone	1.2	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.7	1.8	1.8
Others	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3
Total	293.4	303.8	315.2	327.8	342.4	354.2	364.1	374.2	384.7	395.9	407.1	418.9	431.2	444.0

b.3. Recyclable Materials Collection Amount and MRF Installation Plan

The table below shows planed collection amount of recyclable materials. Introduction of separate collection requires introduction of MRF that receives recyclable materials. Therefore, a separate collection plan should be formulated together with a plan of MRF. The table below shows a plan of installation of MRF as well.

Table 9-13: Separate Collection Amount and MRF Installation Plan

	unit : ton/day													
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Potential amount	293.4	303.8	315.2	327.8	342.4	354.2	364.1	374.2	384.7	395.9	407.1	418.9	431.2	444.0
Scenario 1														
Recyclable waste collection amount	0.0	0.0	0.0	0.0	0.0	19.5	40.1	61.7	84.6	108.9	134.3	161.3	189.7	222.0
DIMAUD collection amount (ton/day)	0.0	0.0	0.0	0.0	0.0	16.2	33.3	51.5	70.5	90.7	112.1	134.6	158.5	185.6
MRF Installation plan						42		43		50		55		32
MRF total capacity						42	42	85	85	135	135	190	190	222
Scenario 2														
Recyclable waste collection amount	0.0	0.0	0.0	0.0	0.0	11.7	24.0	37.0	63.5	91.5	120.9	152.1	185.0	222.0
DIMAUD collection amount (ton/day)	0.0	0.0	0.0	0.0	0.0	9.7	20.0	30.9	52.9	76.2	100.9	126.9	154.6	185.6
MRF Installation plan						25		40		60		60		37
MRF total capacity						25	25	65	65	125	125	185	185	222

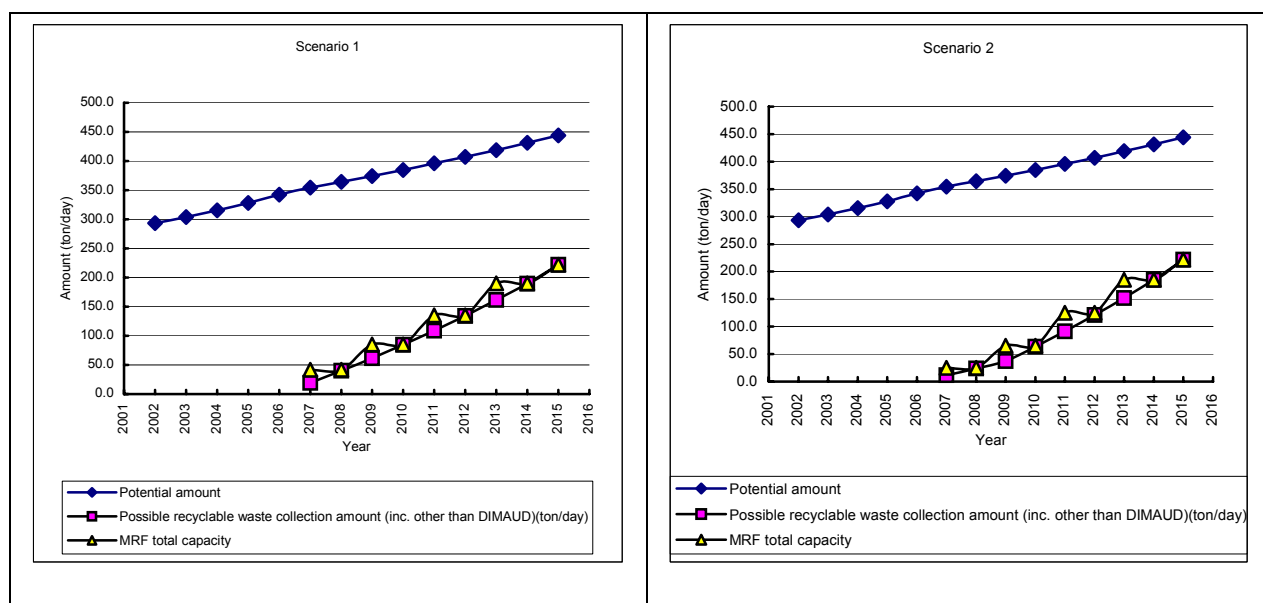


Figure 9-4: Separate Collection Amount and MRF Installation Plan

Scenario 1 has a merit to equalize investment for collection vehicles and MRF installation over the years. A strong point of scenario 2 is to require less investment than Scenario 1 during the early stage, although larger investment will be necessary in the later stage. Consequently, scenario 2 is recommendable to smoothly establish a system of separate collection and material recovery, because such system will be the first experience for Panama District.

9.2.2 Transfer Transport System

At present, transport of waste (to carry waste from collection area to a final disposal site) is carried out by collection vehicles themselves. As the right figure shows, a mileage of transport from Tocumen and Chilibre exceeds 40 km and a long time is consumed for the transportation. Then, it lowers collection efficiency.

Tocumen is developed rapidly as a bedroom town; the population in

2000 was about 80,000, however it is estimated that it would become about 150,000 in 2010 and reach about 195,000 in 2015. Therefore, establishment of efficient transfer transport system for the area is an urgent issue

Meanwhile, Chilibre has no collection service of DIMAUD. The area is still far from urbanization and many houses have enough premises to bury or burn waste. However, it is one of environmental concerns in Panama District that wastewater and waste may contaminate Panama Canal as the area is located in its watershed. Therefore, it is expected to provide reliable collection service by DIMAUD. Character of Chilibre is much different from Tocumen. Houses are scattered, then, an ordinary transfer transport system would result in inefficient. A manner different from Tocumen needs to be established.

9.2.3 Final Disposal System

Etapa 2 of Cerro Patacon final disposal site are the operated landfill at present. Its remaining capacity is estimated as about 1,800,000m³ as of the end of 2002. Then, it would be full within 3 to 4 years. Cerro Patacon final disposal site has a large area enough to expand the present landfill. Therefore, formulation of a plan to expand the landfill in the site is urgently necessary. Meanwhile, proper disposal of inorganic waste disposed of other area and medical waste is other urgent issue.

9.2.4 Optimum System

The table below shows the optimum technical system for Panama District in 2015, which summarizing the discussion so far.

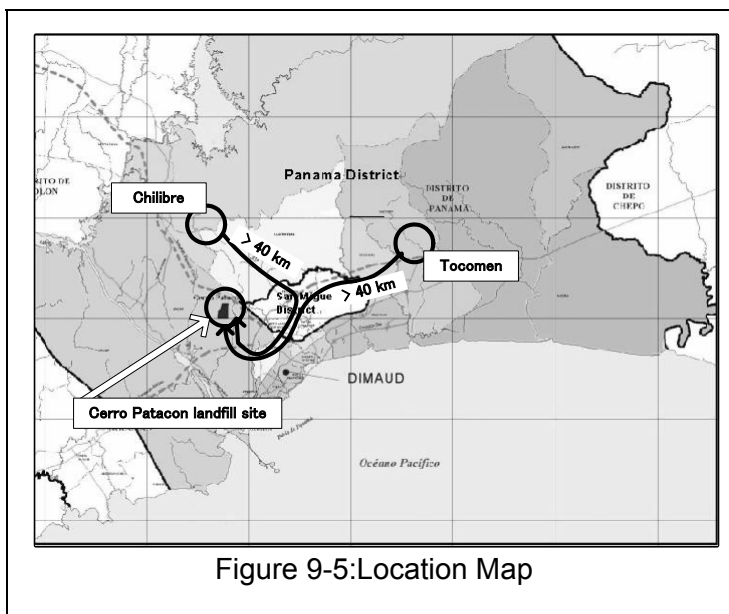


Table 9-14: Outline of Optimum System

Item	Outline
Collection service coverage	100%
Separate collection ratio	50%
Separation item	2 items (recyclable and non-recyclable)
Collection method	Normal vehicle collection (compactor truck)
Transfer transport system	installation of two transfer station and/or site
Recycling system	Material Recovery Facility
Final disposal system	Sanitary landfill with leachate treatment system in Cerro Patacon

Chapter 10

The Mater Plan

10 The Master Plan

10.1 Outline of the Master Plan

10.1.1 Goals

The principal goal of the Master Plan is to establish a sound Solid Waste Management System by the target year 2015 in Municipality of Panama, where the population and major economic activities of the country are centered.

The Master Plan aims to:

- ◆ **promote the citizens' well-being;**
- ◆ **implement sustainable SWM; and**
- ◆ **contribute to environmental conservation.**

The goals in practice of the Master Plan are as follows:

1. The improvement of public health and the reduction of health hazards in and around the city is a primary task of SWM, in order to promote the citizens' well-being.
2. As implementation of sustainable SWM services is the duty and mandate of the DIMAUD, the DIMAUD should expedite:
 - cost-effective SWM by continuous technical improvement;
 - cost-effective SWM by continuous legal/institutional improvement; and
 - cost-effective SWM by continuous administrative improvement of DIMAUD.
3. As the environmental conservation through SWM is today's requirement, DIMAUD should expedite the following:
 - encouragement of further citizens' environmental awareness on waste minimization,
 - promotion of environmental conservation through "reduction", "recycling" and "recovery" of waste, and
 - operation of solid waste processing and disposal facilities without polluting the environment.

In other words, well-being of citizens will be indirectly achieved by providing cost-effective SWM services. Meanwhile, a “**beneficiary-pays-principle (under which recipients pay for the services)**” has to take root in the citizens’ values. These will improve the cost-consciousness of the citizens and induce “**waste minimization at source**” by each citizen, and it consequently will also contribute to the environmental conservation.

4. Meanwhile, as part of the goal of the M/P (citizens’ well-being), well-being of all those who work for SWM should also be reminded in the formulation of the M/P.

10.1.2 Target Year

In accordance with the S/W of the Study, the target year for master plan is set up as follows:

Master Plan: Year 2015

Strategic actions to achieve the goals and targets should be, in practice, introduced step by step towards the target year 2015. Therefore, it is recommended to divide the period up to the target year into three phases.

- **Phase 1: Short term improvement (2003 to 2005)**
- **Phase 2: Medium term improvement (2006 to 2010)**
- **Phase 3: Long term improvement (2010 to 2015)**

10.1.3 Policies

In order to lead implementation of the M/P to the goals, policies of the M/P are formed as follows.

Policy 1: Elimination of waste from the living environment, in order to preserve citizens’ health

Policy 2: Establishment of appropriate final disposal system

Policy 3: Encouragement of waste minimization

10.1.4 Targets

a. Policies and Targets

Under the policies, clear and concrete targets to be achieved are set up. Policies and targets of the M/P are summarized below.

Table 10-1: Policy and Target of the Master Plan

Policies	Targets
Elimination of waste from the living environment	<ul style="list-style-type: none"> Keeping up waste collection coverage Improving waste collection coverage
Establishment of appropriate final disposal system	<ul style="list-style-type: none"> Improving the operation at Cerro Patacon Ensuring final disposal capacity by 2015
Encouragement of waste minimization	<ul style="list-style-type: none"> Keeping down waste generation rate (waste generation amount per capita) Introducing separate collection system

b. Target Figures

Target figures for the major components that constitute SWM were set as indicated in the table below.

Table 10-2: Target Figures of the Master Plan

Phase Target year	Present (2001 to 2002)	Phase 1 2005	Phase 2 2010	Phase 3 2015
Population	725,866/744,448	807,868	944,574	1,132,726
Waste generation rate				
Household waste (g/person/day)	589.8		590	
Commercial				
Restaurant (g/employee/day)	6,373		6,373	
Others (g/employee/day)	1,918		1,918	
Institutional waste (g/employee/day)	201		201	
Market waste (g/employee/day)	4,178		4,178	
Waste generation amount (ton/day)	1,025	1,102.0	1,262.9	1,443.6
Waste collection service coverage (%)	92	98	100 (2006)	100
Waste collection amount (ton/day)	965	1,065.3	1,231.2	1,408.3
Separate collection ratio (%)	0	0	16.5	50.0
Separate collection amount (ton/day)	0	0	63.3	222

c. Strategies

Strategies to attain the targets are summarized in the table below.

Table 10-3: Strategy for the Master Plan

Policies	Elimination of waste from the living environment	Establishment of appropriate final disposal system	Encouragement of waste minimization
Target	<ul style="list-style-type: none"> Keeping up waste collection coverage Improving waste collection coverage 	<ul style="list-style-type: none"> Improving the operation at Cerro Patacon Ensuring final disposal capacity by 2015 	<ul style="list-style-type: none"> Keeping down waste generation rate Introducing separate collection system
Technical system	<ul style="list-style-type: none"> Management of basic data Improvement of collection efficiency Improvement of street sweeping Expansion of collection area 	<ul style="list-style-type: none"> Improvement of current landfill operation Expansion of landfill at Cerro Patacon final disposal site 	<ul style="list-style-type: none"> Education program for waste minimization and recycling Establishing recycle market mechanisms

Policies	Elimination of waste from the living environment	Establishment of appropriate final disposal system	Encouragement of waste minimization
Management system	Improvement of DIAMUD's management Cooperation with Juntas Comunales and Juntas Locales Improvement of the private sector participation		
Legal and institutional system	Preparation of municipal regulations on solid waste management Establishment of a committee regarding MSWM Establishment of policy on waste minimization and resource conservation		
Issues to be considered	Social consideration (Waste-pickers, employees of DIMAUD, the poor) Environmental consideration (final disposal site, clandestine/illegal dumping, Lake Alajuela, Panama Bay)		

10.1.5 Outline of the Master Plan

Table 10-4 shows contents of the master plan.

Table 10-4: Outline of the Master Plan

Item		Present (2002)	Phase 1(2005)	Phase 2 (2010)	Phase 3 (2015)
General information					
	Population (Panama)	744,448	807,868	944,574	1,132,726
	Service coverage (%)	92	98	100 (2006)	100
Waste generation amount (ton/day)					
	Total (ton/day)	1,025	1,114	1,263	1,444
	Household waste	439	477	557	669
	Commercial, institutions and industries	421	459	534	596
	Market waste	24	24	24	24
	Bulky waste	12	14	19	26
	Street sweeping waste	8	8	8	8
	Hospital waste	20	20	20	20
	Demolition waste	96	96	96	96
	Sewage	5	5	5	5
	Potential recyclable waste	293	328	385	444
	Non-recyclable waste	732	774	909	1,047
Discharge and storage					
Discharge manner	Separate	0 %	0 %	16.5%	50%
	Mixed	0 %	0 %	83.5%	50%
Discharge amount (ton/day)	Total	965	1,065	1,231	1,408
	Separate	0	0	63	222
	Mixed	965	1,065	1,168	1,186
	Recycling amount (ton/day)	0	0	27	94
Collection and transport					
	Collection system	Collection vehicle	Collection vehicle	Collection vehicle	Collection vehicle
	Transport system	Collection vehicle	Collection vehicle and transfer station	Collection vehicle and transfer station	Collection vehicle and transfer station
Facilities					
	Transfer station	-	Installation and operation	Operation	Operation
	Material Recovery Facility	-	-	Installation, operation, expansion	
Final disposal					
	Final disposal site	Cerro Patacon	Cerro Patacon	Cerro Patacon	Cerro Patacon
	Landfill	Sanitary landfill and control dumping	Sanitary landfill		
Disposals amount (ton/day)	Panama	965.0	1,065.3	1,204.0	1,314.1
	San Miguelito	216.7	250.0	320.3	393.5
	Arraijan	27.4	39.0	70.5	122.8
	Total	1,209.1	1,354.3	1,594.8	1,830.4

10.1.6 Proposed Improvement Measures

Proposed improvement measures corresponding to the strategies, which are contents of the M/P, are shown in the tables below.

Table 10-5: Proposed Improvement Measures (1)

Strategies		Contents (Proposed Improvement Measures)
Collection System and Transport System	Basic Database Establishment and Maintenance	<p>Basic database, which is necessary for planning, implementation, monitoring, evaluation and revision of collection system, is established and maintained.</p> <p>1) Preparation of collection area and route map</p> <ul style="list-style-type: none"> • acquisition and update of maps • clarification of collection areas and routes on the maps <p>2) Establishment of methods of information gathering, accumulation, analysis and evaluation</p> <ul style="list-style-type: none"> • establishment of methods of gathering, accumulation, analysis and evaluation of the weighbridge's data at Cerro Patacon Final Disposal Site • preparation of manual of T&M survey • preparation of a form of daily working report
	Improvement of Collection Efficiency	<p>1) Definition of collection areas and routes</p> <ul style="list-style-type: none"> • definition of collection areas according to Corregimientos • definition of collection routes according to Corregimientos • definition of roads and public spaces for sweeping (manual, mechanical) <p>2) Establishment of collection work standards</p> <ul style="list-style-type: none"> • loadage per trip by vehicle type • nos. of personnel per vehicle type • nos. of working shifts • collection methods for each type of discharger or area • collection amount (ton/vehicle/hour, ton/worker/hour) <p>3) Improvement of corresponding measures to emergency and supervision of vehicles</p> <ul style="list-style-type: none"> • equipping radio on vehicle • equipping GPS on vehicle <p>4) Improvement of street sweeping</p> <p>5) Improvement of vehicle maintenance</p> <ul style="list-style-type: none"> • preparation of maintenance program • keeping up and improving mechanics' capability (employment of qualified person, training program) • examination of maintenance method (maintenance contract, lease contract, etc.)
	Expansion of Collection Area (measures coping with the expanding urbanized areas to the north and east)	<p>1) Examination of transfer transport</p> <ul style="list-style-type: none"> • examination of transfer type (setting large containers, construction of transfer station) • planning of transfer transport (cooperation with Corregimientos, introduction of the private sector) <p>2) Introduction of transfer transport</p> <ul style="list-style-type: none"> • designing of transfer station • construction of transfer station <p>3) Demarcation of collection works</p> <ul style="list-style-type: none"> • clarification of roles of Corregimientos in collection works (e.g. collection by DIMAUD and transport by Corregimientos) • examination of possible roles in collection works for introduction of the private sectors
	Special collection for ICIs	Establishment of a special collection system for ICIs waste

Table 10-6: Proposed Improvement Measures (2)

Strategies		Contents (Proposed Improvement Measures)
Final Disposal	Improvement of Current Landfill Operation Measures	<ol style="list-style-type: none"> 1) Establishment of information gathering, accumulation, analysis and evaluation <ul style="list-style-type: none"> • waste amount brought into Cerro Patacon (weighbridge's data) • settlement of landfill (by topographic survey) • amount of soil used • estimation and planning of soil acquisition (by topographic survey) • environmental information (leachate, landfill gas) • waste amount and composition survey manual 2) Establishment of standards for landfill works will keep quality of landfill operation 3) Improvement of safety of waste-pickers' works <ul style="list-style-type: none"> • consultation with waste-pickers • establishment of rules with waste-pickers • registration of waste-pickers (issuing identification card to waste-picker) 4) Improvement of leachate treatment <ul style="list-style-type: none"> • installation of pumps to raise up leachate to the lagoon 5) Improvement of landfill gas treatment 6) Urgent improvement of medical waste disposal method <ul style="list-style-type: none"> • separation from general waste disposal operation
	Ensuring final disposal capacity by 2015	<p>In order to ensure the appropriate final disposal in the municipality, it is recommended to take the following measures.</p> <ul style="list-style-type: none"> • Carrying out survey, planning, designing of facilities for ensuring final disposal capacity within the Cerro Patacon site (Feasibility Study) • Implementation of the above plan
Waste Minimization and Resource Conservation		<p>Waste minimization and resource conservation cannot be overcome only by technical system. It is needless to say that a comprehensive approach, increasing citizens' awareness on environment, introduction of economic incentives, laws and regulations to facilitate, and so forth, is necessary. Such comprehensive approach is dealt with in the improvement of institutional system later.</p>
	Education Program for Encouraging Waste Minimization and Recycling	<ol style="list-style-type: none"> 1) Preparation of education program for schools <ul style="list-style-type: none"> • preparation of education program • preparation of education materials • training on teachers 2) Experimental implementation of the education program is for examining validity of the program 3) Implementation of the education program will be conducted by the Panamanian side 4) Preparation of education program for communities <ul style="list-style-type: none"> • preparation of education program • preparation of education materials • training on community leaders or NGO 5) Experimental implementation of the education program is for examining validity of the program 6) Implementation of the education program will be conducted by the Panamanian side
	Waste Separation /Material Recovery	<ol style="list-style-type: none"> 1) Planning of experimental separate collection/material recovery system 2) Implementation of the experimental separate collection/material recovery system <ul style="list-style-type: none"> • separate discharge at public institutions and/or schools • placement of recipient for cans, bottles at supermarkets • collection of separated materials 3) Analysis and evaluation of the experiment 4) Examination of introduction of waste minimization and recycling system <ul style="list-style-type: none"> • materials subject to separate collection • necessary facilities

Table 10-7: Proposed Improvement Measures (3)

Strategies	Contents (Proposed Improvement Measures)
Improvement of Management System	<p>In order to function the proposed technical system, it is crucial to improve the implementation system.</p>
	<p>Improvement of DIMAUD's Management</p> <p>1) Establishment of Management Indicators contains In order to establishing a management tool, use of indicators is recommendable. The following are measures to be taken.</p> <ul style="list-style-type: none"> • Adjustment the accounting system to technical component (e.g. collection, transport, final disposal, etc.) • Establishment of management indicators (application of CEPIS/COSEPRE System) • Establishment of methods to monitor and evaluate with the indicators • Experimental introduction of the above system • Evaluation of the experiment • Introduction of the system <p>2) Establishment of Management Information System In order to realize efficient and effective management, it is very important to exchange information vertically and horizontally in the organization. The following are recommendable measures to facilitate such communication.</p> <ul style="list-style-type: none"> • Clarification of information to be exchanged (e.g. weighbridge's data, management indicators) • Establishment of rules to exchange the information (e.g. from which section to which section) • Establishment of tools for exchanging the information (e.g. document form, computer network) <p>3) Human Resource Development In order to keep up and increase capability of an organization, human resource development is necessary. The following measures are recommendable to take.</p> <ul style="list-style-type: none"> • Organizing "Executing Unit" • Technology transfer to "Executing Unit" <ul style="list-style-type: none"> ➤ preparation of manual of site surveys ➤ planning methods ➤ use of the management indicators ➤ use of the management information system • Preparation of training program of personnel • Implementation of training <p>4) Improvement of tariff system In order to improve the present tariff system, it is recommended to take the following measures.</p> <ul style="list-style-type: none"> • Examination of tariff collection method (direct, combination with water supply/electricity, etc.) • Examination of tariff rate (WTP, ATP) • Improvement of tariff system (simplifying tariff categories of ICIs "institutions, commercial and industries") • Improvement of tariff collection rate from ICIs <ul style="list-style-type: none"> ➤ preparation of list of ICIs ➤ establishment of tariff collection method

Table 10-8: Proposed Improvement Measures (4)

Strategies		Contents (Proposed Improvement Measures)
Improvement of Implementation System	Cooperation with Corregimientos	In order to establish communication with citizens, it is recommendable to establish cooperation with Corregimientos that have closer relationship with citizens. 1) Establishment of rules for cooperation with Corregimientos <ul style="list-style-type: none"> for conveying information from DIMAUD to residents through Corregimientos such as collection day and time, separate collection for conveying information from residents to DIMAUD through Corregimientos such as collection service quality
	Efficient Use of the Private Sector	The private sector has potential resources, such as human resource and equipment, which is to be useful in MSWM. In order to use such resources in MSWM appropriately, it is recommended to take the following measures. <ul style="list-style-type: none"> Examination of contract and supervision manner with the private sector Registration of qualified private companies for collection service and disposal works Introduction of the private sector in MSWM
Improvement of legal and institutional system		In order to function MSWM appropriately, legal and institutional system that give regulatory framework is also very important.
	Municipal Regulations on SWM	In order to maximize citizens' benefit and make policy on MSWM firmly, the following measures are recommendable to take. <ul style="list-style-type: none"> Preparation of municipal regulations on SWM Enforcement of the municipal regulations
	Establishment of a Committee regarding MSWM	In order to construct a consensus on MSWM, it is recommendable to set up a committee consisting of various types of stakeholders. Establishment of a committee on MSWM (members from Panama Municipality, DIMAUD, Corregimientos)
	Establishment of Policy on Waste Minimization and Resource Conservation	The followings are recommendable to establish policy on waste minimization and resource conservation. <ol style="list-style-type: none"> Suggestion for policy establishment <ul style="list-style-type: none"> economic incentives (e.g. deposit system for cans and bottles, tariff system imposing more on large dischargers, etc.) laws or regulations education (e.g. establishment of environmental curriculum in the compulsory education) recycling in factories waste exchange within industries Establishment of policy on waste minimization and resource conservation

10.1.7 Future Waste Stream

Future waste stream shows Figure 10-1, Figure 10-2 and Figure 10-3.

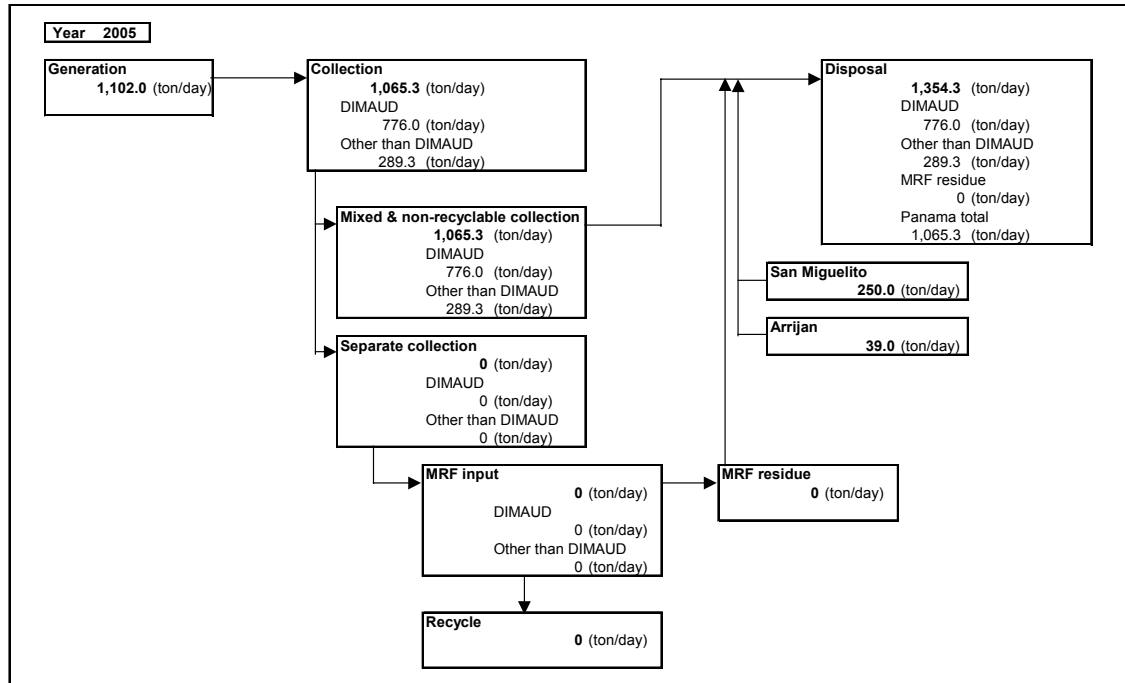


Figure 10-1: Waste Stream in 2005

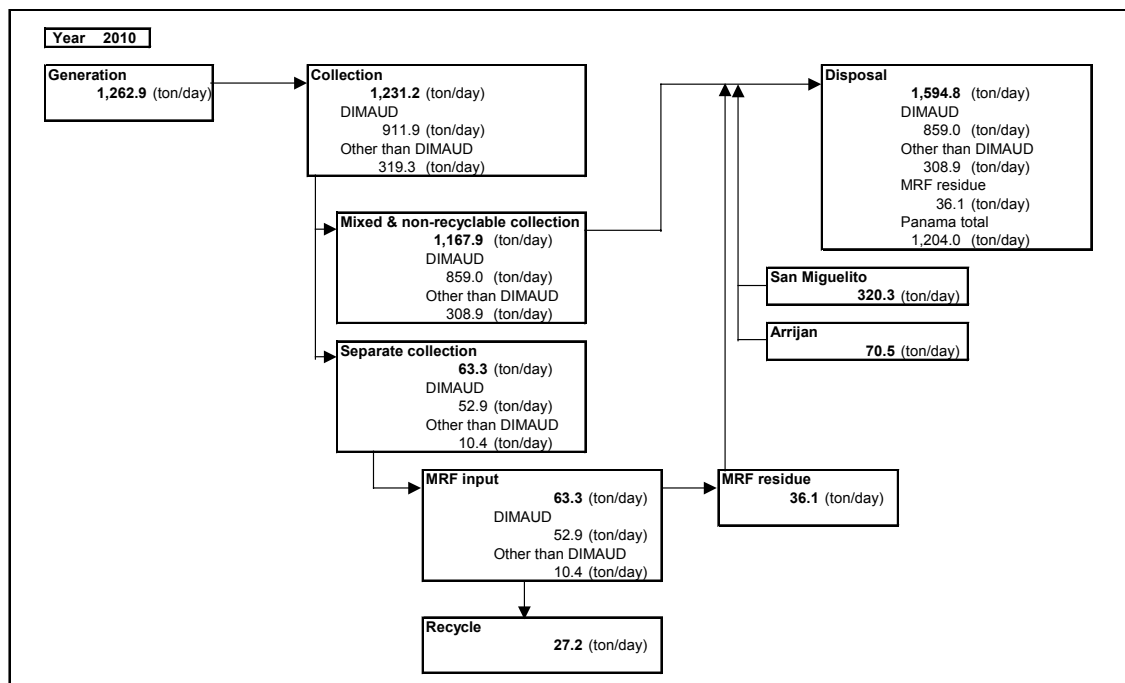


Figure 10-2: Waste Stream in 2010

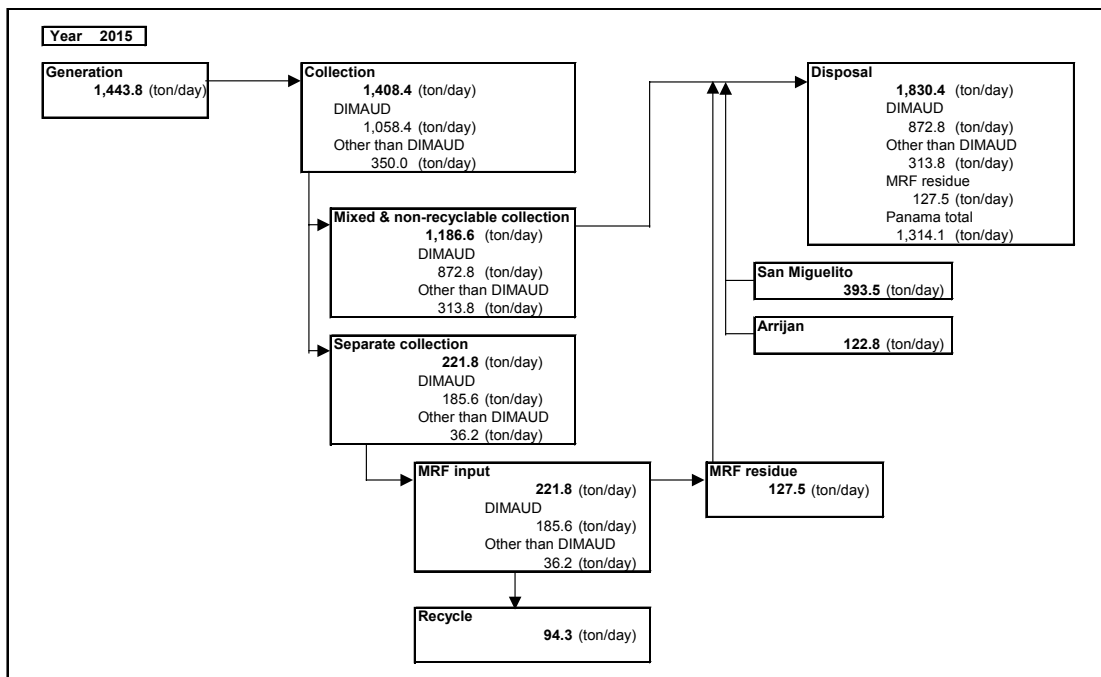


Figure 10-3: Waste Stream in 2015