National District Municipality
Santo Domingo de Guzman, National District,
Dominican Republic

Project for Appropriate Waste Management in Santo Domingo de Guzman, National District, Dominican Republic

Project Completion Report

August 2012

Japan International Cooperation Agency (JICA)

EX Research Institute Ltd.
Kokusai Kogyo Co., Ltd.

GE
JR
12-215

Dominican Republic

Source: MSN Encarta World Atlas

Community meeting (Invi district)

Distributing plastic bags to Pilot Project participants (Antillas district)

Explaining the Pilot Project to resident

Community meeting at Antillas district

Street without garbage on non-collection day (Invi district)

Follow-up meeting in Invi district

Photo 1: Pilot Project for Improvement of waste discharge manner

Training for chipping machine

Chipped material used in public park (Parque la Arboleda)

Measuring temperature of compost

Measuring heaped compost

Collection of waste water at Victor Garrido Puello school

Explaining the pilot project on waste paper collection to the school teachers

Photo 2: Pruning, composting, and waste paper collection in the pilot project

Safe Driving & Daily Check Instruction by C/P

Vechicle check performed by C/P

C/P meeting

Technical training (Hydraulics)

Repair training performed with actual truck

Washing after waste collection work

Photo 3: Vehicle maintenance workshop

Courtesy Call to Sub-secretariat of State of Environment of Campana Municipality

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Campana y Zarate final disposal site (Campana Municipality)

Campana y Zarate final disposal site (Campana Municipality)

Environmental education in kindergarten

Visit to CLIBA (Wastes Collection Private Enterprise)

Photo 4: Third country training (Argentine)

Courtesy Call to the Minister of Environment and Natural Resources (MARN)

Suchitoto Compost Plant

Aragon transfer station

Santa Tecla transfer station

Nejapa landfill site

Salvadoran North Intermunicipal Association of the Union (ASINORLU)

Photo 5: Third country training (El Salvador)

Biodigester plant

Calle 100 final disposal site

Visit and discussion at the Central Workshop in Havana

Central workshop

Gas extraction facility in the landfill

Composting

Photo 6: Third county training (Cuba)

Conference with trainees

Recycling plant for contrsction waste

Iztapalapa transfer station

Compost plant

Glass recycling plant（Vitro）

PET bottle recycling plant（Pet start）

Photo 7: Third Country training (Mexico)

Signing of Minutes of Meeting
(August 2009)

JCC
(July 2010)

ADN Annual seminar for waste management
(July 2010)

Technical workshop about adequate waste management for municipalities
(July 2011)

ADN Annual seminar for waste management
(July 2012)

Technical workshop about adequate waste management for municipalities
(July 2012)

Photo 8: Seminars, Workshop and JCC meeting

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Abbreviations

ADN	National District Municipality
CIA	Environmental Information Center
C/P	Counterpart
CPR	Recycle Promotion Center
DF/R	Draft Final Report
DGDH	General Directorate of Human Development
DGPU	General Directorate of Urban Planning
DIGAU	General Directorate of Urban Cleansing and Equipments
DR	Dominican Republic
IC/R	Inception Report
IDB	Inter-American Development Bank
JCC	Joint Coordination Committee
JET	Japanese Experts Team
JICA	Japan International Cooperation Agency
MARENA	Ministry of Environment and Natural Resources
MEPyD	Ministry of Economy, Planning and Development
M/M	Minutes of Meeting
M/P	Master Plan
MSPS	Ministry of Public health and Social Welfare
PAHO	Pan-American Health Organization
PP	Pilot Project
PR	Progress Report
R/D	Record of Discussion
MARENA	Ministry of Environment and Natural Resources
MEPyD	Ministry of Economy, Planning and Development
MSP	Ministry of Public health and Social Welfare
S/W	Scope of Work
SWM	Solid Waste Management
TC	Technical Committee

Terminology

English Terminology	Terminología Española
(Project) Project for Appropriate Waste Management in Santo Domingo de Guzman, National District, Dominican Republic	(Proyecto) Proyecto de Seguimiento al Manejo Adecuado de los Residuos Sólidos en Santo Domingo de Guzmán, Distrito Nacional, República Dominicana
Joint Coordinating Committee (JCC)	Comité de Coordinación Conjunta (CCC)
Technical Committee (TC)	Comité Técnico (CT)
Counterpart (C/P)	Contraparte (C/P)
Project Director	Director General del Proyecto
Project Manager	Director del Proyecto
Japanese Experts Team (JET)	Equipo de Expertos Japoneses (EEJ)
JET Chief Adviser	Asesor Principal de EEJ
Deputy Chief Adviser	Asesor Principal Adjunto
Government of Dominican Republic (GoDR)	Gobierno de República Dominicana (GoRD)
Dominican Republic (DR)	República Dominicana (RD)
Government of Japan (GoJ)	Gobierno de Japón (GoJ)
Gran Santo Domingo (GSD)	Gran Santo Domingo (GSD)
National District (DN)	Distrito Nacional (DN)
National District Municipality (ADN)	Ayuntamiento del Distrito Nacional (ADN)
General Directorate of Urban Cleansing and Equipment (DIGAU)	Dirección General de Aseo Urbano y Equipos (DIGAU)
General Directorate of Human Development (DGDH)	Dirección General de Desarrollo Humano (DGDH)
General Directorate of Urban Planning (DGPU)	Dirección General de Planeamiento Urbano (DGPU)
Environmental Information Center	Centro de Información Ambiental
Recycling Promotion Center	Centro para la Promoción del Reciclaje
Department of Programming and Control	Departamento de Programación y Control
Department of Administration	Departamento Administrativo
Environmental Department	Departamento de Medio Ambiente
Urban Cleansing Department	Departamento de Aseo Urbano
Operation Unit of Compactor Trucks	Unidad de Operación de Compactadores
Department of Maintenance	Departamento de Mantenimiento
Department of Operation	Departamento de Operaciones
Ministry of Environment and Natural Resources (MARENA)	Ministerio de Medio Ambiente y Recursos Naturales (MARENA)
Ministry of Economy, Planning and Development (MEPyD)	Ministerio de Economía, Planificación y Desarrollo (MEPyD)
Ministry of Public Health and Social Welfare (MSP)	Ministerio de Salud Pública y Asistencia Social (MSP)
Japan International Cooperation Agency (JICA)	Agencia de Cooperación Internacional del Japón (JICA)
Pan-American Health Organization (PAHO)	Organización Panamericana de la Salud (OPS)
Inter-American Development Bank (IDB)	Banco Interamericano de Desarrollo (BID)
Solid Waste Management (SWM)	Manejo de Residuos Sólidos (MRS)
Integrated Solid Waste Management (ISWM)	Manejo Integrado de Residuos Sólidos

English Terminology	Terminología Española
	(MIRS)
Pilot Project (P/P)	Proyecto Piloto (P/P)
Reduce, Reuse, Recycle (3Rs)	Reducir, Reutilizar, Reciclar (3Rs)
Compost	Compost
Composting	Composteo
Public Awareness	Concienciación Pública
Inception Report (IC/R)	Informe Inicial (I/I)
Progress Report (P/R)	Informe de Avance (I/A)
Draft Final Report (DF/R)	Borrador de Informe Final (BI/F)
Minutes of Meetings (M/M)	Minuta de Reuniones (M/R)
Record of Discussions (R/D)	Registro de Discusiones (R/D)
Project Design Matrix (PDM)	Matriz de Diseño del Proyecto (PDM)
Plan of Operation (PO)	Plan de Operación (PO)
Master Plan (M/P)	Plan Maestro (P/M)
Scope of Work (S/W)	Alcance del Trabajo (A/T)
Official Development Assistance (ODA)	Asistencia Oficial para el Desarrollo (AOD)
“the Agreement”	“el Acuerdo”
“the Equipment”	“el Equipo”

1 Background of the Project

1.1 Background of the Project

In Santo Domingo metropolitan area, various environment-related problems are becoming serious due to rapid urbanization. Among others, solid waste management is considered one of the most crucial issues to be tackled urgently. Daily per capita generation of solid waste amounts in the metropolitan area, where approximately 2.5 million tourists visit every year, amount to 1.26 kg/day (2005), comparable to that of higher-income countries.

The Santo Domingo National District, with population of about 965,000 and area of 93.5km2, is most urbanized and, at the same time, most seriously affected by solid waste problems in the metropolitan area, has been working on the waste management improvement ahead other adjacent municipalities.

Under the circumstances, in July 2005, JICA conducted the Study on Integrated Solid Waste Management Plan in Santo Domingo de Guzman National District (the Study). In the Study, in order to strengthen the capacity of the municipal government (ADN), an Integrated Solid Waste Management Plan for Santo Domingo (Master Plan; M/P) was developed aiming at achieving the following four goals;

i) collection service to maintain healthy living environment (100% waste collection);
ii) waste disposal in an environmentally-sound manner,
iii) promotion of waste minimization through recycling and reducing (15% reduction rate), and;
iv) ensuring fiscal soundness (limiting waste management-related cost from the general account to 30-50% of the budget) by 2015.

The Study also conducted pilot projects, including Integrated Improvement of the Collection Service, for capacity development of ADN. Furthermore, cleaning ordinance, called "Regulation for Non-hazardous Solid Waste Management Service in the Territory of the National District Municipality," the first in Dominican Republic, was established with support of the Study Team, which was adopted by the Council Members in August 2006.

With experiences and knowledge gained from the pilot projects, ADN re-designed the collection routes, improved collection services and terms of contract with private collection firms for higher percentage of collection. As a result, solid waste management has been contracted approximately in 80% of the area, under ADN's management and technical guidance. In addition, data collection and management system has been developed and improved on financial management system of the DIGAUE[1].

Meanwhile, despite the recommendations in the M/P, some activities such as waste minimization, public awareness raising in terms of waste discharge practices, and maintenance of collection and transportation vehicles, was not fully achieved yet due to lack of knowledge, skill or experiences of ADN staff.

As for waste minimization, although some valuable resource like waste paper are recycled in limited scale, other resources identified in the M/P as key materials, including green waste and organic wastes from markets, had not been fully recycled.

[1] DIGAU and the Department of Transportation and Equipment were integrated into DIGAUE in October 2008.

For public awareness raising, there was not adequate framework to disseminate information on waste discharging practices, such as site location to discharge the wastes, date and time of discharge and so on. In some areas, therefore, wastes are discharged in non-collection day and wastes are scattered around in the street.

Concerning collection vehicle maintenance management, there was no appropriate maintenance or repair records and there were constraints for repair tools or spare parts management system.

Under those circumstances, ADN determined that technology acquisition is necessary to realize the appropriate waste management identified in M/P, and through Government of the Dominican Republic, requested the Government of Japan to dispatch experts in waste management field to implement Technical Cooperation Project.

In response to this request, the Government of Japan carried out a preliminary study in September 2008 and developed a basic plan, implementation structure, and responsibilities of each party in terms of the Project. Those were documented as Minute of Meetings (hereinafter referred to as M/M). Subsequent Record of Discussion (hereinafter as R/D) was signed in February 2009. Based upon above-mentioned request from the Government of the Dominican Republic, the Project has been implemented since July 2009 to strengthen ADN's capacity on SWM through;

i) revision of the integrated SWM Plan (M/P),
ii) waste minimization,
iii) public awareness raising on waste discharge and
iv) improving waste collection vehicle maintenance.

1.2 Outline of the Project

1.2.1 Objectives and Outputs

Overall Goal: Target of the Integrated Solid Waste Management (Integrated SWM) Plan (revised M/P) are substantially achieved by 2015.

Project Purpose: Integrated SWM in Santo Domingo de Guzman, National District, is enhanced.

Outputs:
1. Capacity of ADN on Integrated SWM planning is strengthened.
2. Solid waste collection system is consolidated through improvement on vehicle maintenance and public awareness.
3. 3Rs (Reduce, Reuse and Recycle) approach is introduced to divert waste from final disposal site(s).

1.2.2 Targets

Target Area:	Santo Domingo de Guzman, Gran Santo Domingo and surrounding areas
Target Population:	Residents of Santo Domingo de Guzman (approx. one million) and population flowing in from surrounding areas
Target Waste:	General waste (does not include medical & industrial wastes)

1.2.3 Implementing Policy

DIGAUE take ownership in executing the project while Japanese Experts Team supports the DIGAUE's effort.

2 Project Output and Achievement

2.1 Outputs

1. Capacity of ADN on Integrated SWM planning is strengthened
2. Solid waste collection system is consolidated through improvement on vehicle maintenance and public awareness
3. 3Rs (Reduce, Reuse, Recycle) approach is introduced to divert waste from final disposal site

2.2 Main Activities

1. Strengthen Capacity of ADN on Integrated SWM planning.

1-1 Review the current status of integrated SWM and identify issues to be addressed.
1-2 Review and analyze the implementation status of' the integrated SWM Plan (M/P).
1-3 Revise/develop targets and action programs of the integrated SWM Plan towards 2011 and 2015.
1-4 Prepare training materials on SWM planning to support other municipalities.
1-5 Conduct training and workshops on SWM planning to support other municipalities using the above-mentioned materials.

2. Consolidate solid waste collection system through improvement of vehicle maintenance and public awareness.

2-1-1 Study current situation of the maintenance operation of ADN collection vehicles.
2-1-2 Develop an improvement plan of vehicle maintenance system
2-1-3 Develop a procedure on the vehicle maintenance
2-1-4 Implement the improvement plan
2-1-5 Monitor the implementation and feedback to the maintenance procedure
2-2-1 Study the current situation of waste discharge practices
2-2-2 Develop a plan for improving waste discharge practices
2-2-3 Develop materials for public awareness on waste discharge
2-2-4 Implement the plan using the above mentioned materials
2-2-5 Monitor the implementation and feedback to the plan

3. Introduce 3Rs (Reduce, Reuse and Recycle) approach to divert waste from final disposal site(s).

3-1-1 Review the current situation of recycling activities on papers, glass, metal, plastic and organic waste
3-1-2 Study the feasibility of recycling of valuable materials
3-2-1 Design a program for 3Rs introduction.
3-2-2 Develop materials for public awareness and promotion of 3Rs.
3-2-3 Implement the program for 3Rs introduction.
3-2-4 Monitor the implementation and feedback to the program.
3-3-1 Develop a pilot project plan to expand current paper recycling activities.
3-3-2 Implement the pilot project for paper recycling.
3-3-3 Review the pilot project and develop plan for expansion of paper recycling.
3-4-1 Develop a pilot project plan for pruning waste management.
3-4-2 Implement a pilot project for pruning waste management.
3-4-3 Review the pilot project and develop a plan for expansion of pruning waste management.

2.3 Achievement of Outputs

The achievement of the expected Outputs, over the Project period, is summarized as follows. Details are shown in Appendix.

Output 1: Capacity of ADN on Integrated SWM planning is strengthened.

Indicator: 1-1) Revised M/P is drafted.

The revised M/P is completed. As for the final disposal site, depending on the IDB study (Master Plan Study for ISWM in Greater Santo Domingo) results, further review of revised M/P will be necessary. See Appendix B.

Indicator: 1-2) Training materials for SWM planning are prepared.

In 2011, all the planned materials were developed. Workshops for other municipalities were conducted in 2011 and 2012.

Indicator: 1-3) At least two training workshops for other municipalities are conducted by ADN.

Two technical workshops on appropriate management of municipal solid waste were successfully conducted.

Output 2: Solid waste collection system is consolidated through improvement on vehicle maintenance and public awareness.

Indicator: 2-1) Information on vehicle maintenance is systematized.

The information on vehicle management has been systematized by introducing the database system. See Appendix C.

Indicator: 2-2) Number of records regarding negligent waste discharge is reduced.

Number of negligent waste discharge practices in pilot project areas is reduced. See Appendix D.

Output 3: 3Rs (Reduce, Reuse, Recycle) approach is introduced to divert waste from final disposal site.

Indicator: 3-1) Feasibility for other valuable resources is recognized.

A recycle mechanism was designed based on the results of recycling market survey and feasibility study of recycling of valuable materials. See Appendix E.

Indicator: 3-2) Number of communities (e.g.Juntas de vecinos) where 3Rs promotion programs are introduced.

Through the pilot project, 3Rs activities are introduced in INVI and Antillas . A plan of 3R activities dissemination to other area is under preparation. See Appendix D.

Indicator: 3-3) Amount of used-paper recycling by ADN activities increased.

A paper separation project has been taken place inside ADN municipal building not only at DIGAUE office but also increasing the collection boxes at other offices. See Appendix E.

Indicator: 3-4) Amount of pruning waste dumped at final disposal site is decreased.

It has been executing the pruning waste management pilot project (mechanical pruning waste chipping) with the purpose to reduce the final disposal volume since October 2010. Reduction through the pruning waste chipping was about 2ton/day at the end of the project. It is expected to be raised to 10 ton/day by increasing the manpower and using three chipping machine simultaneously. See Appendix F.

2.4 Achievement of the Project Purpose

The achievement of the Project Purpose, over the Project period, is summarized as follows:

2.4.1 Indicator:1) Collection rate target on revised M/P (100%)

Taking into consideration that the present ADN administration showed its commitment to keep the city clean (i.e., it can be interpreted as a commitment of provision of satisfactory collection services) by raising slogan of "Ciudad Limpia, Orgullo de Todos (Clean city; the pride of all citizens)", and that ADN is maintaining possible maximum collection rate at the moment by employing private sectors (large companies and community foundations) in addition to direct collection services, it also can be judged that, in a practical sense, almost 100% collection rate is achieved except for the areas where collecton vehicles cannot approach and small areas due to unexpected circumstances.

In 2012, ADN has a plan to introduce 8 dump trucks, 3 small-scale compactor trucks, and a front loader to enhance the collection service. The small-scale compactor will improve access to the areas where it used to be difficult to implement collection service due to narrow streets, which will result in better collection rate. (15 inspectors cover every street everyday to provide qualified information in terms of collection service.)

2.4.2 Indicator:2) Waste Minimization target on revised M/P (8.5%)

Waste haulage amount to the final disposal site estimated based on the generation ratio in 2011 is 2,103 ton/day and actual being 1,925 ton/day. Actual amount is approximately 91.5% of the estimated amount. In other words, it can be interpreted that waste reduction rate of 8.5% is achieved in 2011 although it should be understood that the reduction is achieved not directly through the Project activities but also through various activities includng those of unidentified waste collectors.

At the moment, the verifiable amount of waste minimization under the Project is limited in pruning waste chipping and used paper collection activities, the total amount of which is to be approximately 11ton/day at the maximum (pruning waste and used paper recycle).

2.4.3 Indicator:3) Number of complaints received at the ADN call center

The number of complaints received at ADN call center from 2009 to 2011 was summarized in the table below.

Table 2-1: The Number of Claims Received and Resolved (2009-2011)

Month / Year	Received Claims	Resolved Claims	Unsolved Claims	Rate of Resolution
2009	5,007	4,428	579	88.4%
2010	6,703	5,784	919	86.3%
2011	7,132	6,099	1,033	85.6%

Source: ADN

As is seen in the table, the number of calls increased as compared to the previous year. Generally, it is straightforward to view that the number of calls increases or decreases depending on the quality of collection service. However, in reality, other factors such as weather conditions (e.g. strong rainy season that affects the access to the final disposal site, tariff hike, etc.) might affect the number. Therefore, it is considered difficult to judge the quality of collection service of ADN by the number of claims received at the ADN call center.

Meanwhile, the rate of resolution is stable, and nearly 90 % of the complaints were responded and resolved within 48 hours, which is considered to implicate the quality of the collection services from the standpoint of claim management.

2.4.4 Indicator:4) Satisfaction rate for collection service

According to the Social Survey conducted by JICA in January 2012, respondents satisfied with the collection services account for 64% of the respondents, and the dissatisfied respondents account for 35%.
Circumscription-wise, the correspondents in the pilot project area show the highest satisfaction rate of 77% (both satisfied and reasonably satisfied). The other areas (circumscription1-3) show satisfaction rate of approximately 60%.
As for the reason for dissatisfaction, more than 50% of the dissatisfied respondents consider that the interval between collection service is too long. However, collection service is conducted three times a week in many of the ADN service areas, and it may be difficult to increase the frequencies. Those who are not satisfied because the collection service is not reliable count for only 6%.

2.5 Capacity Development Achieved

a. Output 1: Capacity of ADN on Integrated SWM planning is strengthened.

Capacity of ADN C/P on Integrated SWM planning is considered strengthened to a reasonable extent according to the observation by the Third Country Evaluator.

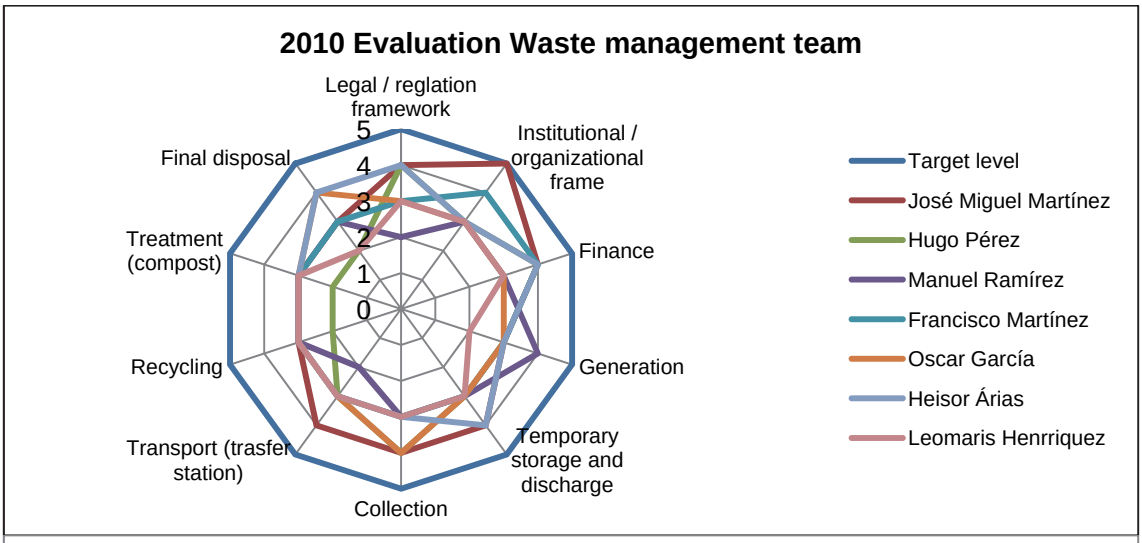
Table 2-2: Capacity of ADN C/P of Integrated SWM Planning Group (8 persons)

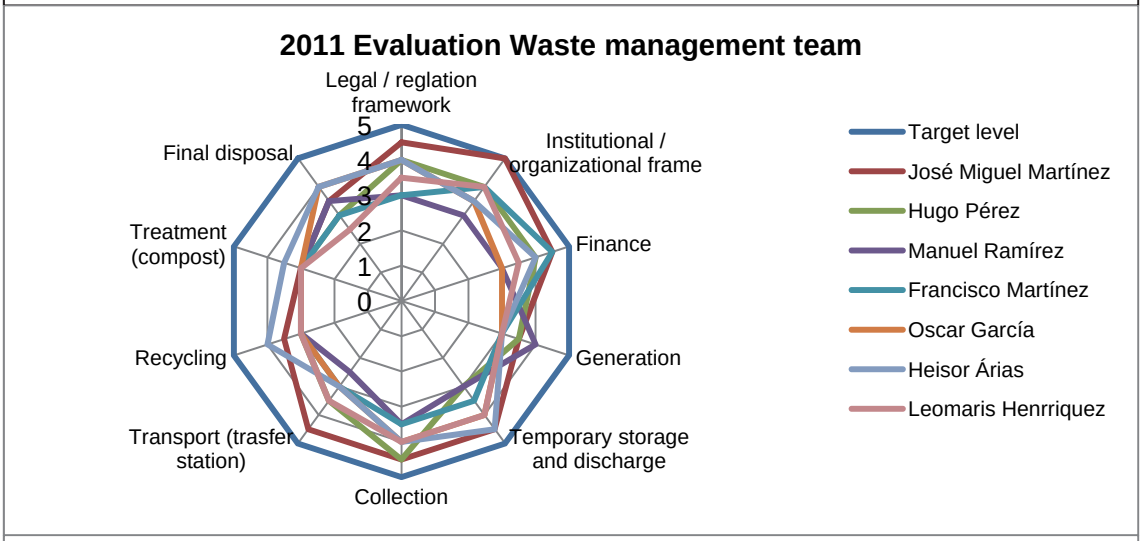
Necessary Aspects in Integral SWM planning	The number of C/P members who developed his/her capacity marking "4" or above which is based on the Criteria below.		
	2010.9	2011.8	2012.7
Legal /Regulation Framework	3 persons	4 persons	5 persons
Institutional/ Organizational Framework	2 persons	4 persons	6 persons
Finance	4 persons	4 persons	5 persons
Generation	1 person	1 person	3 person
Temporary Storage /Discharge	2 persons	4 persons	5 persons
Collection	3 persons	5 persons	6 persons
Transportation (transfer station)	1 person	1 person	2 person
Recycle	0	1 person	3 person
Treatment of Compost	0	0	2 persons
Final disposal	2persons	2 persons	3 persons

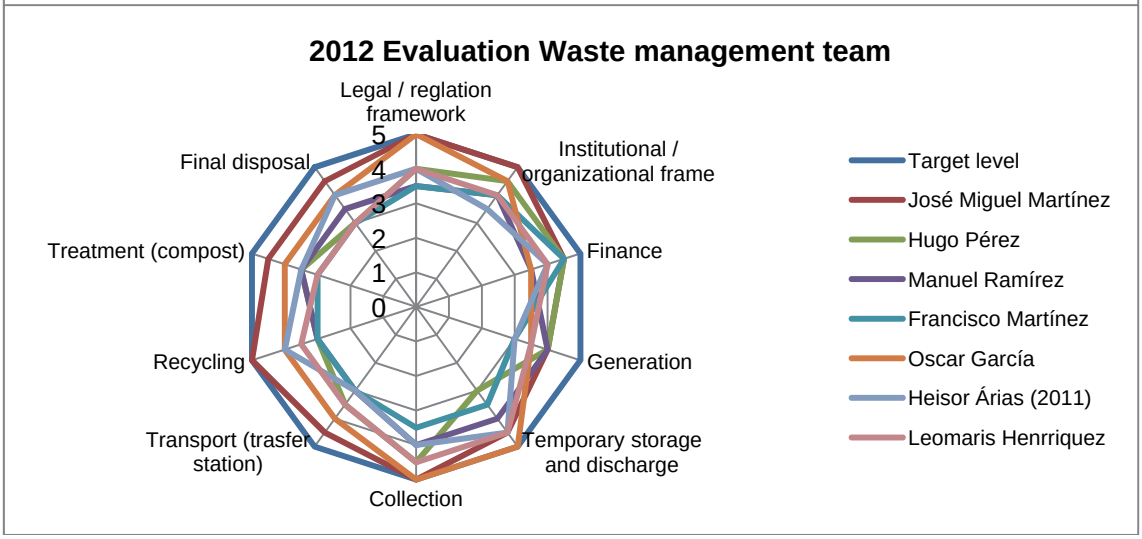
Grading Criteria:

Level 5. Possible to carry out an excellent job without the Japanese Expert support.
Level 4. Possible to carry out a satisfactory job without the Japanese Expert support.
Level 3. A little help from the Japanese Expert is needed to reach the goal level.
Level 2. A lot of help from the Japanese Expert is needed to reach the goal level.
Level 1. Impossible to carry out a satisfactory job, even after capacity development with the Japanese Expert.

As shown in the figure below, ADN staffs are attaining capability to execute necessary aspects without help of the JET (Japanese Expert Team) over time. In the beginning of the project, some weakness was observed in the downstream of the waste flow, i.e.: recycling, treatment (composting), and final disposal; however, many staffs gained capacities in the said area of the work aspects by the final phase of the Project.







b. Output 2: Solid waste collection system is consolidated through improvement on vehicle maintenance and public awareness.

Individual Capacity Assessment of C/P by the Third Country Evaluator on vehicle maintenance are summarized as below:

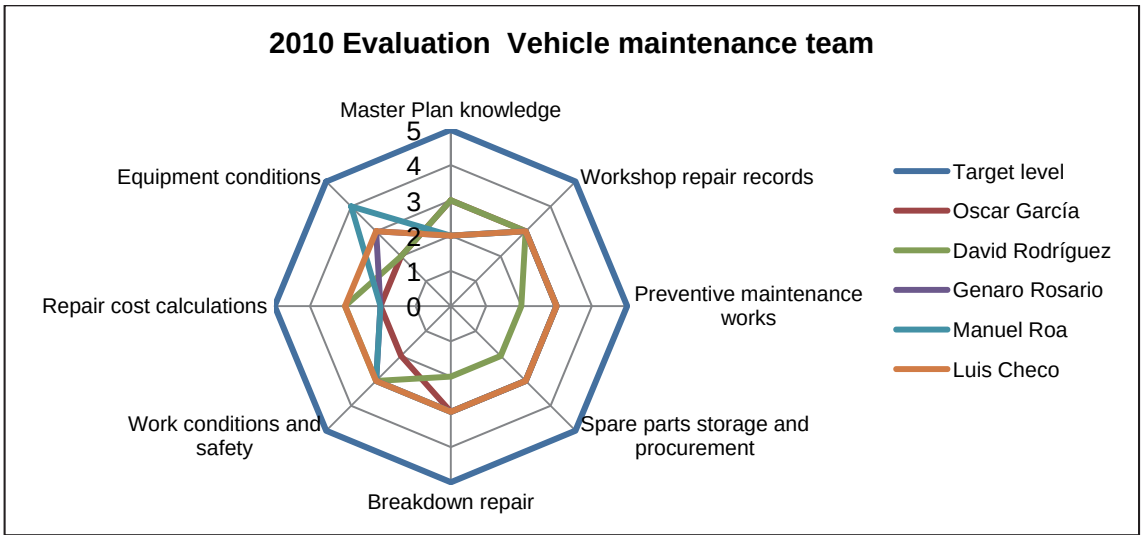
Table 2-3: Capacity of ADN C/P of Vehicle Maintenance Group (5 persons)

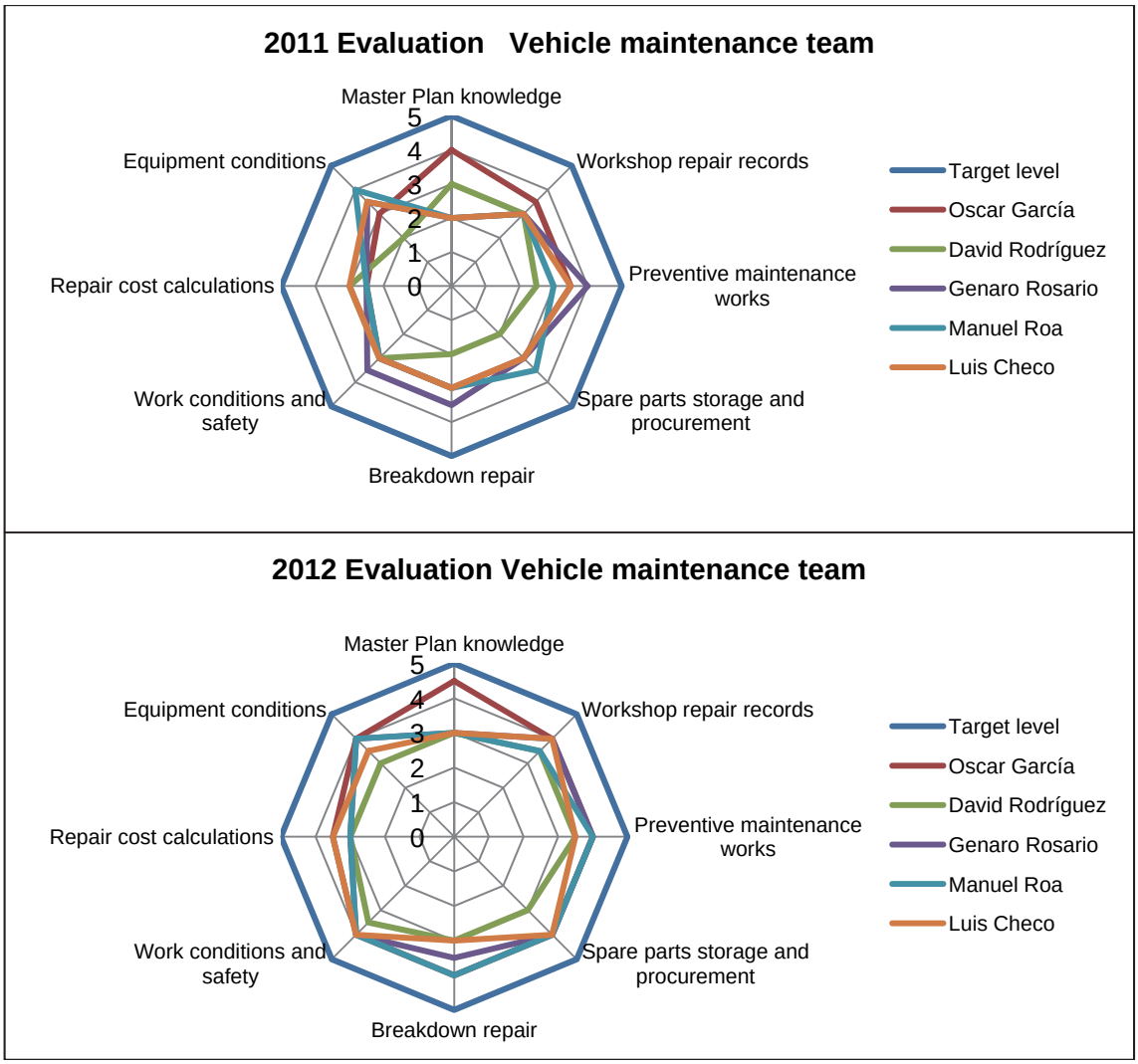
Necessary Aspects in Vehicle Maintenance	The number of C/P members who developed his/her capacity marking "4" or above which is based on the Criteria below.		
	2010.9	2011.8	2012.7
Knowledge on Master Plan	0	1 person	1 person
Repair Record in the Workshop	0	1 person	3 persons
Preventive Maintenance	0	0	3 persons
Storage / Purchase of Auto Parts	0	0	4 persons
Breakdown Repair	0	0	2 persons
Managing Work Condition/Safety	0	0	4 persons
Repair Cost Calculation	0	0	0
Machine and Equipment Management	1 person	1 person	3 persons

Grading Criteria:

Level 5. Possible to carry out an excellent job without the Japanese Expert support.
Level 4. Possible to carry out a satisfactory job without the Japanese Expert support.
Level 3. A little help from the Japanese Expert is needed to reach the goal level.
Level 2. A lot of help from the Japanese Expert is needed to reach the goal level.
Level 1. Impossible to carry out a satisfactory job, even after capacity development with the Japanese Expert.

As shown in the figure below, capacity of ADN staff for the work aspects mentioned above has increased over time. Base line capacity technical capacities for maintenances and repairs in the beginning of the Project, in particular, has improved since practical skill trainings were implemented in the last half of the Project period.





Individual Capacity Assessment of the C/P by the Third Country Evaluator on public awareness are shown below:

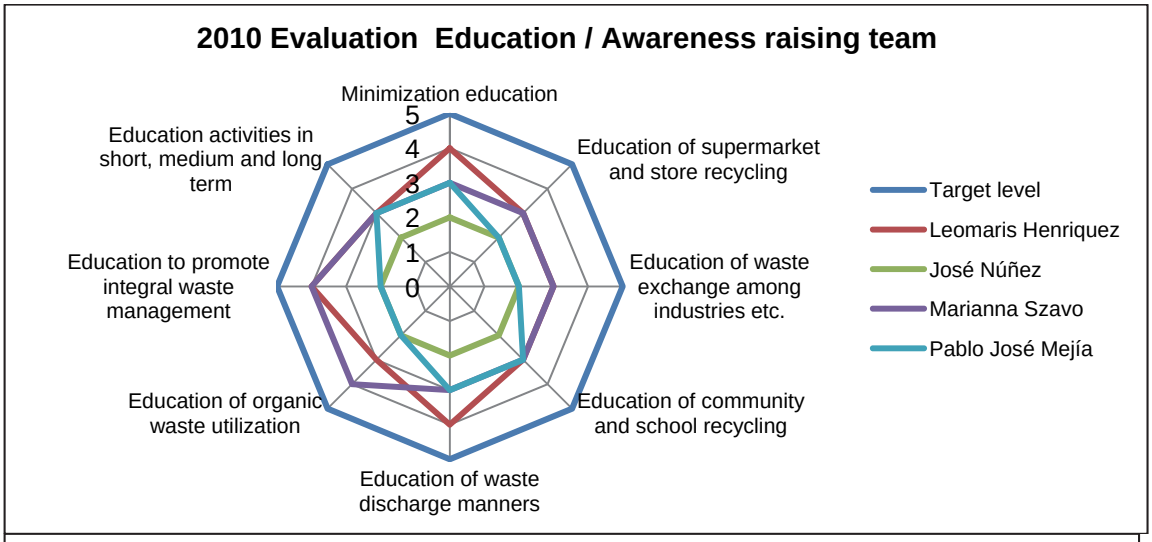
Table 2-4: Capacity of ADN C/P of Public Awareness Group (8 persons)

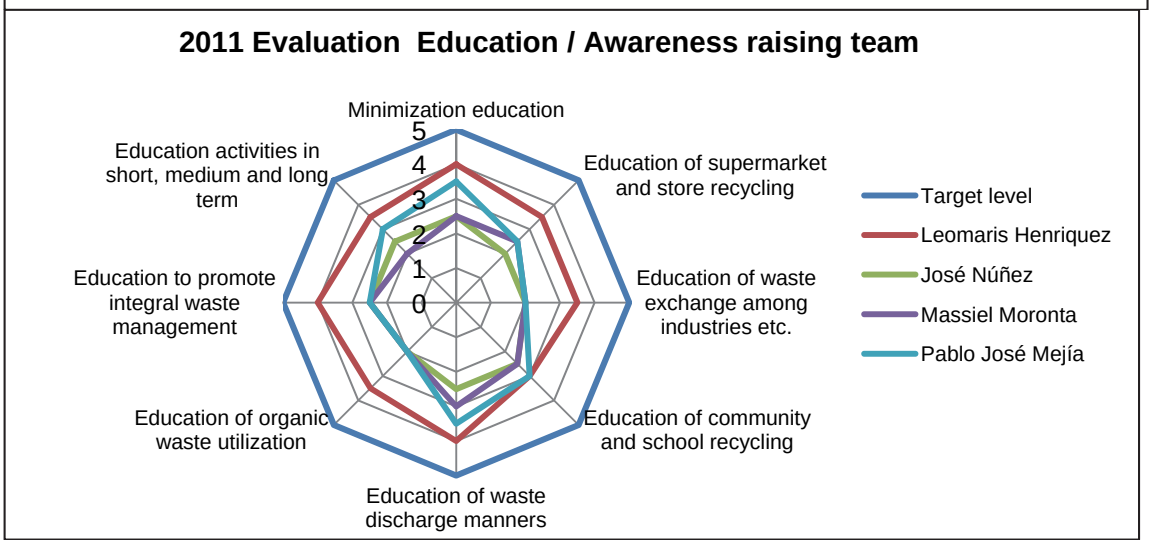
Necessary Aspects in Public Awareness	The number of C/P members who developed his/her capacity marking "4" or above which is based on the Criteria below.		
	2010.9	2011.8	2011.8
Education for Minimization	1 person	1 person	2 persons
Education for Recycle in Supermarket and Convenience Store	0	0	1 person
Educación for Industrial Waste Exchange	0	0	1 person
Recycle Education for Communities and Schools	0	0	2 persons
Education for Waste Discharge Rules	1 person	1 person	2 persons
Education for Organic Waste Utilization	0	0	1 person
Education for Integrated Solid Waste Management	1 person	1 person	1 person
Short-term and Long-term Strategy for Public Awareness	0	0	1 person

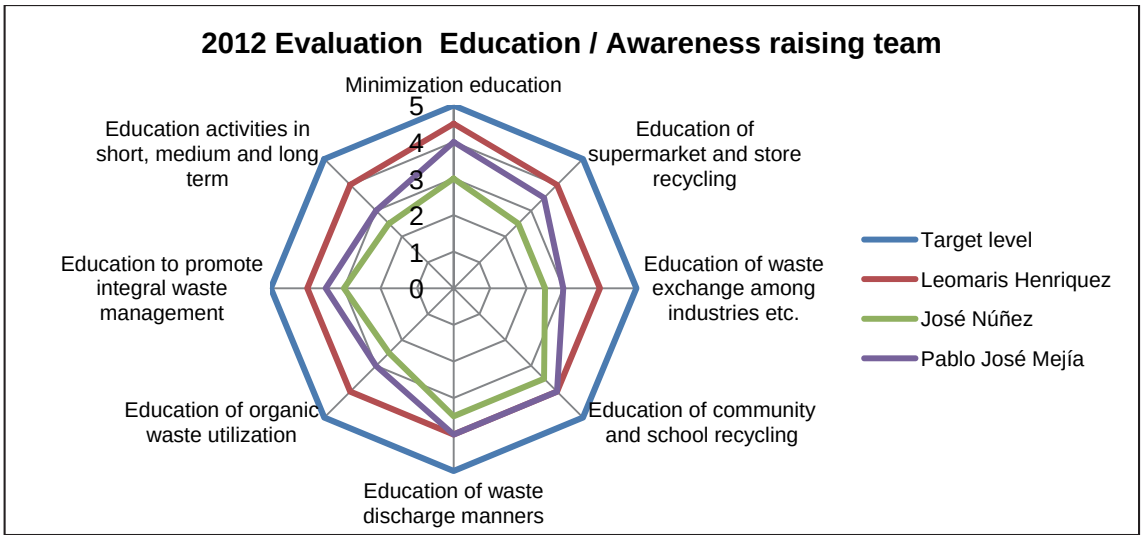
Grading Criteria:

Level 5. Possible to carry out an excellent job without the Japanese Expert support.
Level 4. Possible to carry out a satisfactory job without the Japanese Expert support.
Level 3. A little help from the Japanese Expert is needed to reach the goal level.
Level 2. A lot of help from the Japanese Expert is needed to reach the goal level.
Level 1. Impossible to carry out a satisfactory job, even after capacity development with the Japanese Expert.

As shown in the figure below, capacity of ADN staff for the work aspects mentioned above has increased over time. There were many aspects that cannot be performed if assistance from Japanese Expert provided help in the beginning of the Project. By the end of the Project, there are at least one staff who is capable to carry out the task without Japanese Expert help. Further capacity development is expected.







c. Output 3: 3Rs (Reduce, Reuse, Recycle) approach is introduced to divert waste from final disposal site.

Individual Capacity Assessment of the C/P by the Third Country Evaluator on 3Rs approach introduction is summarized as shown below:

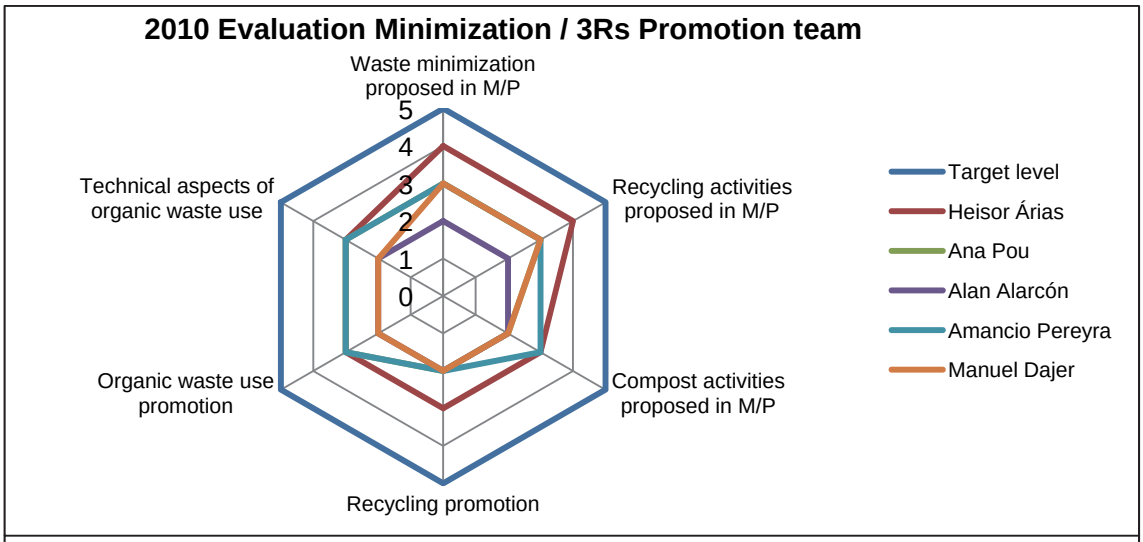
Table 2-5: Capacity of ADN C/P of 3Rs Approach Introduction Group (7 persons)

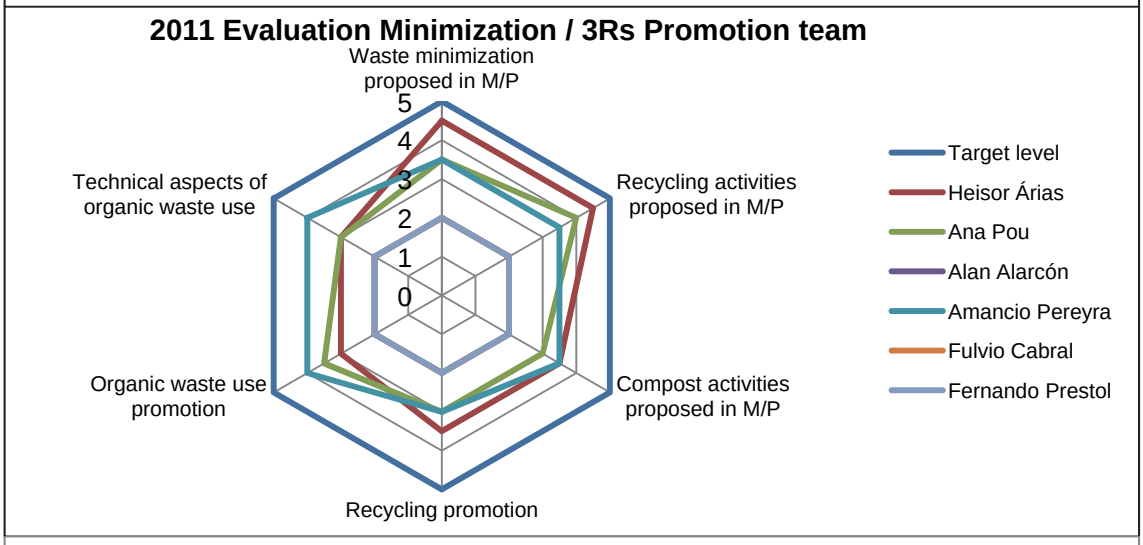
Necessary Aspects in 3Rs approach introduction	The number of C/P members who developed his/her capacity marking "4" or above which is based on the Criteria below.		
	2010.9	2011.8	2012.7
Waste Minimization Plan in M/P	1 person	1 person	3 persons
Recycle Activity Plan in M/P	1 person	2 persons	3 persons
Compositing Activity Plan in M/P	0	0	1 person
Recycle Enhancement	0	0	3 persons
Enhancement of Organic Waste Utilization	0	1 person	2 persons
Technical Characteristics of Organic Waste Utilization	0	1 person	1 person

Grading Criteria:

Level 5. Possible to carry out an excellent job without the Japanese Expert support.
Level 4. Possible to carry out a satisfactory job without the Japanese Expert support.
Level 3. A little help from the Japanese Expert is needed to reach the goal level.
Level 2. A lot of help from the Japanese Expert is needed to reach the goal level.
Level 1. Impossible to carry out a satisfactory job, even after capacity development with the Japanese Expert.

As shown in the figure below, capacity of ADN staff for the work aspects mentioned above has increased over time. There were many aspects that cannot be performed if assistance from Japanese Expert provided help in the beginning of the Project. By the end of the Project, there are at least one staff who is capable to carry out the task without Japanese Expert help. Further capacity development is expected.


2010 Evaluation Minimization / 3Rs Promotion team
Waste minimization proposed in M/P
Recycling activities proposed in M/P
Compost activities proposed in M/P
Recycling promotion
Organic waste use promotion
Technical aspects of organic waste use
5
4
3
2
1
0
Target level
Heisor Árias
Ana Pou
Alan Alarcón
Amancio Pereyra
Manuel Dajer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Waste minimization proposed in M/P
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Compost activities proposed in M/P
Recycling promotion
Organic waste use promotion
Technical aspects of organic waste use
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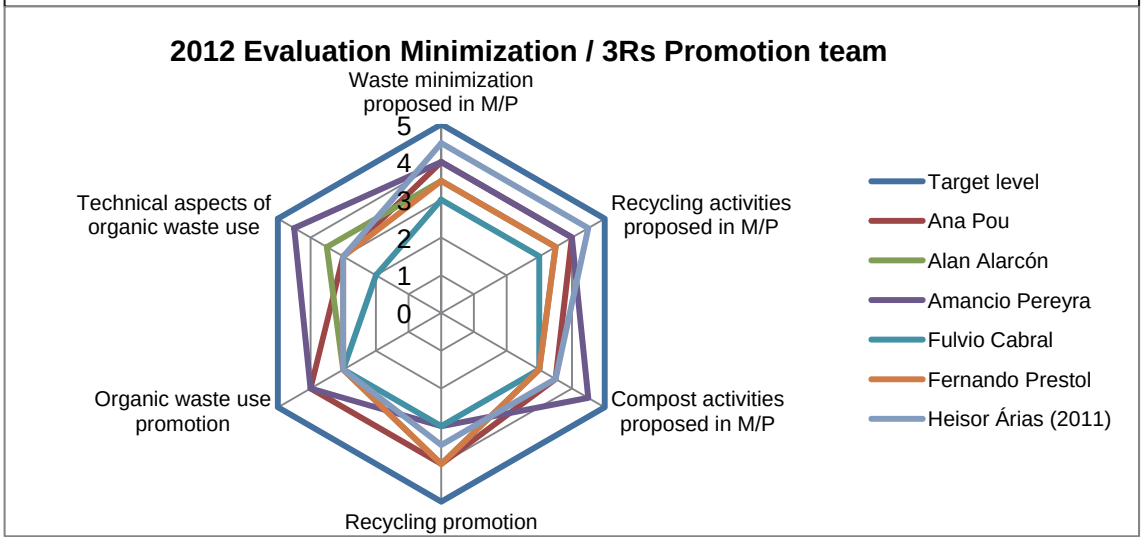
Target level
Heisor Árias
Ana Pou
Alan Alarcón
Amancio Pereyra
Fulvio Cabral
Fernando Prestol


2012 Evaluation Minimization / 3Rs Promotion team
Waste minimization proposed in M/P
Recycling activities proposed in M/P
Compost activities proposed in M/P
Recycling promotion
Organic waste use promotion
Technical aspects of organic waste use
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4
3
2
1
0
Target level
Ana Pou
Alan Alarcón
Amancio Pereyra
Fulvio Cabral
Fernando Prestol
Heisor Árias (2011)

3 Activities Implemented

Activities implemented during the Project period of July 2009 to July 2012 are summarized in the following table, along with respective items of Outputs listed in the Project PDM.

Table 3-1: Summary of Activities Implemented

Outputs	Verifiable Indicators	Activities of the Project	Outline of Activities Progress					
			December 2009	October 2010	March 2011	November 2011	March 2012	Project end situation and future prospects
			Progress Report (1)	Progress Report (2)	Progress Report (3)	Progress Report (4)	Progress Report (5)	
I. Capacity of ADN on Integrated SWM planning is strengthened.	1.1 Revised M/P is drafted.	1.1 Review the current status of integrated SWM and identify issues to be addressed	JET and C/P team reviewed the current status of integrated SWM and identified issues to be addressed.					
		1.2 Review and analyze the implementation status of the integrated SWM Plan(M/P)	Since M/P formulation, action programs have developed and satisfactory results were produced. The areas not covered by those action programs particularly such as communication with citizens, waste discharge manners, 3Rs introduction and vehicles maintenance form the tasks of this project.	Reviewed the established Plan of Integrated Solid Waste Management (M/P) in connection with the current issues addressed, and developed the first draft of revised M/P responding to the present situation.	Developed second draft of revised M/P with discussion and modification based on the first revised M/P.			M/P revision finalized in July 2012. It will be necessary to cope with IDB study results. (final disposal site for the metropolitan region).
		1.3 Revise/ develop targets and action programs of the integrated SWM Plan towards 2011 and 2015				Based on the situations and tasks described in P/R (1) to (3), a frame of M/P modification is summarized.	M/P modification (final draft) is summarized.	
	1.2 Training materials for SWM planning are prepared.	1.4 Prepare training materials on SWM planning to support other municipalities		Studied the knowledge which DIGAU has acquired for planning waste management, identified knowledge which is lacked in other municipalities and established the dissemination schedule.	Developed training materials.			It might be possibly that it is needed to be revised and updated the training materials. Other type of manuals might be elaborated, such as, for special waste (debris, batteries, etc.) See Appendix B: M/P revision
	1.3 At least two training workshops for other municipalities were conducted by ADN.	1.5 Conduct training and workshops on SWM planning to support other municipalities using the above mentioned materials			Reviewed timing on the training and workshop and decided to implement them from 2011.	Technical workshop targeted for other municipalities is conducted in July 2011.	Second workshop is prepared to be conducted in June 2012.	It is possible to coordinate with IDB study in selection of target municipalities for the training.

Outputs	Verifiable Indicators	Activities of the Project	Outline of Activities Progress					
			December 2009	October 2010	March 2011	November 2011	March 2012	Project end situation and future prospects
			Progress Report (1)	Progress Report (2)	Progress Report (3)	Progress Report (4)	Progress Report (5)	
2. Solid waste collection system is consolidated through improvement on vehicle maintenance and public awareness.	2.1 Information on vehicle maintenance is systematized	2.1.1 Study current situation of the maintenance operation of ADN collection vehicles	In general, repair works take place after breakdowns, which require more time to procure the repair parts. Also it lacks statistical record for the maintenance.					
		2.1.2 Develop an improvement plan of vehicle maintenance system	Examined a manual (draft) of vehicle management/ maintenance and stock/ parts management, and its improvement plan (draft). Currently maintenance is done based on experience and memory of the mechanics rather than using a manual. How to utilize a manual is a task to be addressed.	Studied about an operation manual (draft) of vehicle management/maintenance and stock/parts management, and after modification finalized first draft of operation manual.				It is finalized the maintenance plan and the maintenance/material management manual. It will be required continuous improvement of the manual in the management process. See Appendix B.
		2.1.3 Develop a procedure on the vehicle maintenance			Based on the procedures in the manual, maintained vehicles and managed materials. Reviewed the results. Developed vehicle maintenance database.			
		2.1.4 Implement the improvement plan		Collaborated with JET, developed an improvement plan on vehicle management/ maintenance and stock/ parts management system		Having an opportunity to modify the vehicle workshop, area modification is being instrumented. Several broken down vehicles are repaired through practical repair training.		
		2.1.5 Monitor the implementation and feedback to the maintenance procedure						
	2.2 Number of records regarding negligent waste discharge is reduced	2.2.1 Study the current situation of waste discharge practices	The discharge rules have not been informed to the community enough, causing the inefficiency in the collecting operation and creating aesthetic problems in many sectors.					
		2.2.2 Develop a plan for improving waste discharge practices	C/P team and JET developed an improvement program for waste discharge practices based on the results above. Inform discharge rules to the public to improve the discharge manner, while					

Outputs	Verifiable Indicators	Activities of the Project	Outline of Activities Progress					
			December 2009	October 2010	March 2011	November 2011	March 2012	Project end situation and future prospects
			Progress Report (1)	Progress Report (2)	Progress Report (3)	Progress Report (4)	Progress Report (5)	
			ADN should make a commitment to implement regular collection service.					
		2.2.3 Develop materials for public awareness on waste discharge		C/P took an initiative in developing materials for public awareness on waste discharge				
		2.2.4 Implement the plan using the above mentioned materials		Discussed with neighborhood associations (Junta de Vecinos) and prepared Pilot project	Implemented a pilot project on waste discharge improvement.	Review the pilot project results and formulate a plan to expand to other area.	Pilot project results are expanded to other communities.	Continued.
		2.2.5 Monitor the implementation and feedback to the plan				It is necessary not only awareness raising for waste dischargers, but also service providers' commitment to implement regular collection. This is included in the M/P revision.	Monitoring and feedback is continued	Continued.
3. 3Rs (Reduce, Reuse and Recycle) approach is introduced to divert waste from final disposal site(s).	3.3 Feasibility for other valuable resources is recognized	3.1.1 Review the current situation of recycling activities on papers, glass, metal, plastic and organic waste	Situations found in the Recycling Market Study, conducted under the Development Study 2005-07, have not changed significantly. The same flows of different materials are maintained and only the prices and demands change depending on international market.					
		3.1.2 Study the feasibility of recycling of valuable materials		In accordance with advices by JET, Recycle Promotion Center has slowly started its activities.	A "Recycle Mechanism" is examined aiming for systematic recycle activities in order to minimize final disposal, and guidance based on this design is considered. In practice, CP examined roles of the public and private sectors to promote recycling in	After examining the "mechanism", recyclables market trends are monitored by CPR and data compilation is started.	Continued	Organize results of pilot design and possible difficulties to implementation. It is expected to develop responsibilities and roles of public and private sectors to promote recycling.

Outputs	Verifiable Indicators	Activities of the Project	Outline of Activities Progress					
			December 2009	October 2010	March 2011	November 2011	March 2012	Project end situation and future prospects
			Progress Report (1)	Progress Report (2)	Progress Report (3)	Progress Report (4)	Progress Report (5)	
					the Santo Domingo District, and then examined recycling mechanism.			
	3.4 Number of communities (e.g.Juntas de vecinos) where 3Rs promotion programs are introduced	3.2.1 Design a program for 3Rs introduction		To promote 3R, studied about the available recycle companies and discussed with target schools to start the pilot project.	With the cooperation of school (la Escuela Víctor Garrido Puello) started a pilot project collecting classified paper in the classrooms.			
		3.2.2 Develop materials for public awareness and promotion of 3Rs		Developed materials(magnets, stickers, leaflet and brochures) for public awareness and promotion of 3Rs	Distributed 3R promotion tools (magnets, stickers, leaflets, brochures) in residents meetings as required.			Continue divulgation of 3R using promotion tool
		3.2.3 Implement the program for 3Rs introduction		Targeted only used-paper for recyclable material for the pilot project. Designing an action plan for used-paper collection by middle of December.	Have held workshops to students, teachers and sweepers of the targeted schools from January 2011 based on the plan on developed in December.	Continued	Continued	Continue promotion activities
		3.2.4 Monitor the implementation and feedback to the program		Based on the action plan on 3R promotion, establishing monitoring plan for evaluating pilot project quantitatively.	With the implementation of the pilot project, began regular monitoring the collected amount of used paper.	Monitoring and feedback is continued	Monitoring and feedback is continued	Continue monitoring and improve activities based on the results of monitoring.

Outputs	Verifiable Indicators	Activities of the Project	Outline of Activities Progress					
			December 2009	October 2010	March 2011	November 2011	March 2012	Project end situation and future prospects
			Progress Report (1)	Progress Report (2)	Progress Report (3)	Progress Report (4)	Progress Report (5)	
	3.1 Amount of used-paper recycling by ADN activities increased	3.3.1 Develop a pilot project plan to expand current paper recycling activities		In respond to the result of the examination, developed the expansion measures.	Prepared and reported the Recycling Promotion Center's report (second number) and it shows the status of various recycling activities including pilot projects of waste paper recycling.			Prepare periodical reports (now quarterly) of Recycling Promotion Center and improve its contents.
		3.3.2 Implement the pilot project for paper recycling		Started accumulating the record of recovered volume.		Continued	Continued.	
		3.3.3 Review the pilot project and develop plan for expansion of paper recycling				In order to expand it, data based on the "recycling mechanism" is being compiled.	Continued.	To be continued
	3.2 Amount of pruning waste dumped at final disposal site is decreased	3.4.1 Develop a pilot project plan for pruning waste management		Established the operation management system of shredding machine and its installation site. At the same time the project implementation schedule was established.				
		3.4.2 Implement a pilot project for pruning waste management			Bought the crusher of pruned branches, and started a pilot project on the pruning waste.	Continued. Dominican side purchased 2nd shredding machine.	Continued.	
		3.4.3 Review the pilot project and develop a plan for expansion of pruning waste management				To expand from pilot project to practical continuous exercises, additional procurement of a larger shredder is being prepared.	3rd shredding machine is provided for the expansion of pruning waste management.	Expansion of pruning waste management is to be implemented.
Capacity Assessment (unmentioned in PDM)		Capacity of C/P	At first JET and C/P team established the evaluation items, and then the first capacity assessment was done by an external evaluator from Mexico.	C/P actively participated in the second capacity assessment cooperated with an external evaluator from Mexico, and shared the assessment results with JET.	-	C/P actively participated in the third assessment cooperated with an external evaluator from Mexico, shared the assessment results with JET.	-	Final assessment is in July 2012.
		Organizational and institutional capacity of ADN						

4 Plan of Operation, Comparison of Plan and Actual Progress

Plan of Operation (P/O) revised in October 2010 and actual progress in the P/O as of July 2012 is shown in the following table.

Table 4-1: Plan of Operation, Comparison of Plan and Actual

PLAN OF OPERATION (PO) Revised on 08-Oct-2010

Months		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Fiscal Year		FY 2009									FY 2010												FY 2011												FY 2012		
Calendar		7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6-7
1. Capacity of ADN on Integrated SWM planning is strengthened.																																					
1.1Review the current status of Integrated SWM and identify issues to be addressed	PO rev.oct2010																																				
	Actual jul2012																																				
1.2 Review and analyze the implementation status of 'the integrated SWM Plan (M/P)	PO rev.oct2010																																				
	Actual jul2012																																				
1.3 Revise/develop targets and action programs of the integrated SWM Plan towards 2011 and 2015	PO rev.oct2010																																				
	Actual jul2012																																				
1.4 Prepare training materials on SWM planning to support other municipalities	PO rev.oct2010																																				
	Actual jul2012																																				
1.5 Conduct training and workshops on SWM planning to support other municipalities using the above mentioned materials	PO rev.oct2010																																				
	Actual jul2012																																				
2. Solid waste collection system is consolidated through improvement of vehicle maintenance and public awareness.																																					
2.1.I Study current situation of the maintenance operation of ADN collection vehicles	PO rev.oct2010																																				
	Actual jul2012																																				
2.1.2 Develop an improvement plan of vehicle maintenance system	PO rev.oct2010																																				
	Actual jul2012																																				
2.1.3 Develop a procedure on the vehicle maintenance	PO rev.oct2010																																				
	Actual jul2012																																				
2.1.4 Implement the improvement plan	PO rev.oct2010																																				
	Actual jul2012																																				
2.1.5 Monitor the implementation and feedback to the maintenance procedure	PO rev.oct2010																																				
	Actual jul2012																																				
2.2.1 Study the current situation of waste discharge practices	PO rev.oct2010																																				
	Actual jul2012																																				
2.2.2 Develop a plan for improving waste discharge practices	PO rev.oct2010																																				
	Actual jul2012																																				
2.2.3 Develop materials for public awareness on waste discharge	PO rev.oct2010																																				
	Actual jul2012																																				
2.2.4 Implement the plan using the above mentioned materials	PO rev.oct2010																																				
	Actual jul2012																																				
2.2.5 Monitor the implementation and feedback to the plan	PO rev.oct2010																																				
	Actual jul2012																																				
3. 3Rs (Reduce, Reuse, and Recycle) approach is introduced to divert waste from final disposal site(s).																																					
3.1.1 Review the current situation of recycling activities on papers, glass, metal, plastic, and organic waste	PO rev.oct2010																																				
	Actual jul2012																																				
3.1.2 Study the feasibility of recycling of valuable materials	PO rev.oct2010																																				
	Actual jul2012																																				
3.2.1 Design a program for 3Rs introduction	PO rev.oct2010																																				
	Actual jul2012																																				
3.2.2 Develop materials for public awareness and promotion of 3Rs	PO rev.oct2010																																				
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3.2.3 Implement the program for 3Rs introduction	PO rev.oct2010																																				
	Actual jul2012																																				
3.2.4 Monitor the implementation and feedback to the program	PO rev.oct2010																																				
	Actual jul2012																																				
3.3.1 Develop a pilot project plan to expand current paper recycling activities	PO rev.oct2010																																				
	Actual jul2012																																				
3.3.2 Implement the pilot project for paper recycling	PO rev.oct2010																																				
	Actual jul2012																																				
3.3.3 Review the pilot project and develop plan for expansion of paper recycling	PO rev.oct2010																																				
	Actual jul2012																																				
3.4.1 Develop a pilot project plan for pruning waste management	PO rev.oct2010																																				
	Actual jul2012																																				
3.4.2 Implement a pilot project for pruning waste management	PO rev.oct2010																																				
	Actual jul2012																																				
3.4.3 Review the pilot project and develop a plan for expansion of pruning waste management	PO rev.oct2010																																				
	Actual jul2012																																				

5 Inputs of the Project

5.1 The Japanese Side

5.1.1 Assignment of the Japanese Experts

In line with the R/D signed on February 25, 2009 in Santo Domingo, eight (8) Experts of the Japanese Team were dispatched and their total assignment in Dominican Republic was 45.50 man-months during the Project period. Details are as shown in tables below.

Table 5-1: Experts Assignment in Japanese Fiscal Year 2009

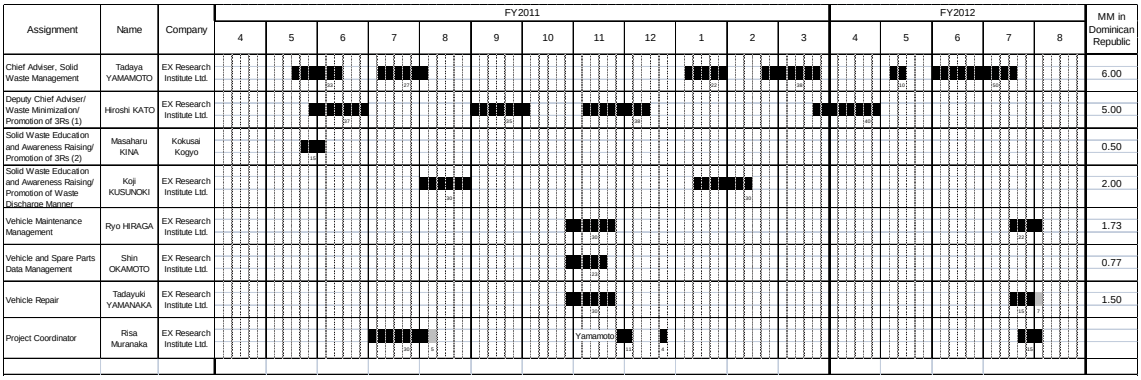
Assignment	Name	Company	FY2009 6	7	8	9	10	11	12	1	2	3	MM in Dominican Republic
Chief Adviser, Solid Waste Management	Tadaya YAMAMOTO	EX Research Institute Ltd.											4.33
Deputy Chief Adviser/Waste Minimization/Promotion of 3Rs (1)	Hiroshi KATO	EX Research Institute Ltd.											3.17
Solid Waste Education and Awareness Raising/Promotion of 3Rs (2)	Masaharu KINA	Kokusai Kogyo											1.00
Solid Waste Education and Awareness Raising/Promotion of Waste Discharge Manner	Ana Ximena Alegria Olivos	Kokusai Kogyo											
Solid Waste Education and Awareness Raising/Promotion of Waste Discharge Manner	Koji KUSUNOKI	EX Research Institute Ltd.											1.00
Vehicle Maintenance Management	Ryo HIRAGA	EX Research Institute Ltd.											2.00
Vehicle and Spare Parts Data Management	Shin OKAMOTO	EX Research Institute Ltd.											1.00
Project Coordinator (1)	Shin OKAMOTO	EX Research Institute Ltd.											
Project Coordinator (2)	Risa Muranaka	EX Research Institute Ltd.											

Note: Work in Dominican Republic
Company's own pay

Table 5-2: Experts Assignment in Japanese Fiscal Year 2010

Assignment	Name	Company	FY2010 4	5	6	7	8	9	10	11	12	1	2	3	MM in Dominican Republic
Chief Adviser, Solid Waste Management	Tadaya YAMAMOTO	EX Research Institute Ltd.													4.00
Deputy Chief Adviser/ Waste Minimization/ Promotion of 3Rs (1)	Hiroshi KATO	EX Research Institute Ltd.													3.00
Solid Waste Education and Awareness Raising/ Promotion of 3Rs (2)	Masaharu KINA	Kokusai Kogyo													2.00
Solid Waste Education and Awareness Raising/ Promotion of Waste Discharge Manner	Koji KUSUNOKI	EX Research Institute Ltd.													2.00
Vehicle Maintenance Management	Ryo HIRAGA	EX Research Institute Ltd.													2.00
Vehicle and Spare Parts Data Management	Shin OKAMOTO	EX Research Institute Ltd.													1.50
Project Coordinator	Risa Muranaka	EX Research Institute Ltd.													

Table 5-3: Experts Assignment in Japanese Fiscal Year 2011-2012



5.1.2 Counterpart Training in Foreign Countries

Five training courses in foreign countries, including one in Japan, have been conducted. The course titles and the number of trainees are as shown in the table below:

Table 5-4: Counterpart Training in Foreign Countries

Training Course	Participants	Time Period
Third Country Training Course in Argentine: Solid Waste Management in Buenos Aires Metropolitan Area and Campana Municipality	Oscar García Arias Hugo Pérez Sarraff Leomaris Henríquez Heisor Arias	From November 8 to November 15, 2009 (8 days)
Third Country Training Course in El Salvador: Solid Waste Management in San Salvador Metropolitan Area, ASINORLU inter-municipality Association and Suchitoto Municipality	Heisor Arias Alan Alarcon Amancio Pereyra Manuel Dajer	From November 23 to November 28, 2009 (6 days)
Group Training Course in Hiroshima, Japan: Integrated Solid Waste Management Technology	Alan Alarcon	From August 25 to November 21, 2010 (4 weeks)
Third Country Training Course in Cuba: Solid Waste Management in Havana City	José Miguel Martínez Oscar García Arias	From November 21 to November 26, 2010 (5 days)
Third Country Training Course in Mexico: CENICA's* Second International Training Course in Integral Waste Management focusing 3R's	José Miguel Martínez Leomaris Henríquez Ana Beatriz Pou Pablo Mejía	From February 20 to February 26, 2011 (5 days)

*CENICA: Centro Nacional de Investigación y Capacitación Ambiental (National Center for Research and Environmental Training)

Reports of Third Country Training Courses in Argentine, El Salvador, Cuba and Mexico elaborated by course participants are shown in Appendix.

5.1.3 Provision of Machineries and Equipments

The equipment to the value of USD 58,064 (JPY 4,716,650) was handed over to the Dominican Republic side during the Project period. Main items are as shown in the table below.

Table 5-5: Provision of Machinery and Equipment

(Unit: JPY)

	Item	No.	JFY2009 (2010.1-2010.3)	JFY2010 (2010.4-2011.3)	JFY2012 (2011.4-2012.7)	Total
1	Laptop computer	1	114,585		N/A	114,585
2	Printer	1	122,365		N/A	122,365
3	Projector	1	61,700		N/A	61,700
4	Brush Chipper	2		1,465,000	2,953,000	4,418,000
	Total	----------	298,650	1,465,000	2,953,000	4,716,650

Detail of the brush chipper is as follows:

a. Procured in FY 2010 (New Vermeer Brush Chipper BC600XL)

Description:
- 27 HP Kohler Gas engine - 6" cutting Capacity, disk style - Low oil pressure automatic shutdown - Fotation Tires- 18.5 x 8.5 - 8 - SmartFeed & AutoFeed - Telescoping tongue; 2" ball coupler hitch - Lockable tool/battery box; infeed table lower stop bar - Engine manufacturer standard warranty applies - Training on site - Examination of satisfactory performance - Operator/Parts manuals
 

b. Procured in FY 2011 (New Vermeer Brush Chipper BC1000)

Description:
- Cummins Engine with 85HP - B3.3TA Diesel, Turbocharged - 12" x 17" throat opening, 12" diameter cutting capacity - Hight Coolnat ad low Oil pressure automatic shutdow - Isolated cutter and engine housings - Spring loaded clutch - Live hydraulics - Variable speed duat vertical feed rollers

- SmartFeed system
- Telescoping trailer tonge
- Dual edged knives & infeed table with lower feed stop bar
- ST235/80R16 LRE Tires
- Operator/Parts manuals
- Engine manufacturer standard warranty applies
- Training on site

5.1.4 Local Expenditure

Local cost born by the Japanese side during the Project period amounted to USD 272,211 as shown in the table below.

Table 5-6: Local Expenditure

(Unit: JPY)

Major Budget Item	JFY2009 (Jun-Mar 2010)	JFY2010 (Ap-Mar 2011)	JFY2011-12 (Apr - Jul 2012)	Total
Employment Cost (Interpreter/Engineer)	2,587,040	3,543,849	4,000,000	10,130,889
Consumable goods	236,210	282,387	200,000	718,597
Travel and Transport	1,034,487	599,981	500,000	2,134,468
Publishing material		548,583	500,000	1,048,583
Rental	978,812	1,074,894	1,000,000	3,053,706
Local training	304,545	769,643	1,000,000	2,074,188
Machinery purchase	236,950	1,454,000	0	1,690,950
Report generation	14,000	836,000	1,000,000	1,850,000
Total in Japanese Yen	5,392,044	9,109,337	8,200,000	22,701,381
US$	58,255	111,456	102,500	272,211
(Exchange rate)	92.56	81.73	80.00	

*1: Japanese Fiscal Year

5.2 The Dominican Side

5.2.1 Allocation of Counterpart Personnel (C/P)

The Dominican Republic side nominated seven (7) persons for Joint Coordinating Committee (JCC) members and 11 persons for Technical Committee members as described in the R/D at the commencement of the Project. As for C/P the total number was 20 in the beginning of the

Project. It was increased during the implementation of the Project, and 26 C/P members are maintained after January 2012.

5.2.2 Provision of Land, Building and Facilities

Office space was made available for the Japanese Experts and the Project staff members in the 4th floor in DIGAUE, ADN.

In addition, the Dominican side arranged office appliances (desks, chairs, bookshelves, etc.).

5.2.3 Allocation of Local Cost

The Dominican side allocated local cost necessary for the Project activities comprising of salary and allowances of the C/P, and utilities (water and electricity).

5.2.4 Equipment

ADN procured a chipping machine in July 2011 and eight (8) dump trucks and a front loader in 2012. ADN also has a plan to purchase several compactor trucks in near future.

6 Sustainability after the Project

6.1 Indicator of the Overall Goal

Indicator of the Overall Goal was not clear in the PDM, therefore, revision of the indicator was proposed in "waste minimization target (2015) on revised M/P" and "Financial soundness target (2015) on revised M/P." Furthermore, in improvement in waste collection rate target (2015) on revised M/P, progress is made to the target year through establishment of data collection for necessary indicator. ADN is going to continuously work toward reaching the Overall Goal after the Project through enhanced increasing waste management.

a.1 Indicator "Waste minimization target (2015) on revised M/P"

ADN, in 2015 or before, starts a (pilot) project of waste minimization, utilizing both pruning wastes and organic wastes in the National District, having an agreement of using a space in a municipality in the Mancomunidad for producing compost or other materials.

a.2 Indicator "Financial soundness target (2015) on revised M/P"

ADN increases waste service tariff collection amount by improving the tariff collection rate (percentage to the total invoiced amount) and by increasing the number of service users, in 2015 compared to 2012.

a.3 Indicator "Waste collection rate target (2015) on revised M/P"

It is understood that the cleansing service coverage, in other words "collection rate", both in Circunscription-1 and Circunscription-2 today is practically established for their 100%, and it is also expected 100% for year 2015. Meanwhile, the cleansing service coverage in Circunscription-3 today is not deemed 100% due to difficult access area and informal squatters whose population for today and for future is also difficult to estimate.
In order to objectively verify the alteration of the cleansing service coverage, in other words "collection rate" in Circunscription-3 to year 2015, it is necessary to identify reliable data and to establish a practical monitoring method of "collection rate" using such reliable data.
DIGAUE should establish a method for "collection rate" estimation for Circunscription-3 utilizing such data that are particular to DIGAUE management. DIGAUE stated its intention to elaborate the estimation method.

6.2 Experience and know-how that C/P obtained through the Project

The experience and know-hows that C/P obtained through the Project, namely; ones related to collection vehicle maintenance and repair, PP management for waste discharge practice improvement, introduction of 3Rs activities, etc., are needed in many local municipalities for better solid waste management. ADN is going to transfer the knowledge and skills to them in collaboration with the Ministry of Economy, Planning and Development, the Ministry of Environment, the Ministry of Education and related institutions.

It is expected that the training materials prepared under the Project be updated as necessity rises in the future.

6.3 Further enhancement of C/P's capacities, both in quality and quantity

It is evident that enhancement of institutional capacity has been obtained. Therefore, it is necessary to continue the capacity development in solid waste management. For assuring technology and knowledge transfer by ADN mentioned above, it is necessary to further enhance capacities of C/P, both in quality and quantity. Establishment of the Environmental Secretary in ADN strongly support this activity.
Meanwhile, capacity enhancement of C/P in the field of vehicle maintenance is an urgent issue since ADN purchases collection vehicles in 2012. It is strongly expected to take necessary actions to strengthen the capacities of C/P in the fields (e.g. dispatch of a short-term expert or senior volunteer staff, etc.).

6.4 Collection service improvement and expansion of 3Rs activities

Based on the social survey conducted by JICA in 2012, in order to increase the satisfaction rate of the residents in terms of waste collection services, options are either to improve service quality or means of waste discharge from households. Therefore, public awareness raising, reducing wastes amount through expansion of 3Rs activities, as well as pruning waste disposal should be enhanced. ADN is willing to continue and expand these activities steadily in a practical scale.

In line with above, in order to grasp the citizens' opinions toward sound solid waste management, it is expected that ADN conduct a similar social survey that might help further improve their services effectively and efficiently.

6.5 Recommendations for sustainability and lessons learned

Recommendations and lessons learned on the sustainability of the Project through experiences of the Project management for past 36 months are;

- It is crucial to pay full attention to build rapport with the residents in the target area, in order to achieve a successful project for solid waste management. In case of the pilot project for waste discharge practice improvement implemented by C/P, execution of punctual and regular waste collection services were prerequisite to obtain trust and understanding from the residents. The pilot project was successfully implemented with the commitment and trust of the residents in the target areas.
- In order to maintain the positive effect of vehicle maintenance system established under the Project, spare parts procurement shall be executed without delay. It is important for ADN to ensure to provide necessary budget to procure spare parts.
- It is worth noted that C/P members have not moved/changed to other divisions during the Project period; thus same works/tasks were performed throughout the Project by the same personnel. This fact greatly influenced the achievement of the Project and capacity development.
- It is indispensable for ADN to make efforts to improve the fee collection rate and reduce unnecessary expense to secure financial soundness.
- Revised M/P should be reviewed for transfer/closure of current landfill site.
- Appropriate inclusion and feedback of information from stakeholders or social studies is a very important key when visualizing issues in waste management.

7 Joint Coordinating Committee (JCC) Meetings

In the course of the project implementation, Joint Coordinating Committee (JCC) meetings were hold from time to time to discuss issues and to reach consensus on them to make better orientation of the project advancement.

In total 5 JCC meetings listed below were hold where issues were discussed and consensus were reached. Those discussion and agreements were documented in Minutes of Meetings (M/M) as shown in following sections.

- First JCC meeting: 21st August 2009;
- Second JCC meeting: 26th July 2010;
- Third JCC meeting: 8th October 2010;
- Fourth JCC meeting: 14th June 2011; and
- Fifth JCC meeting: 11th July 2012.

M/M listed above are shown in the Annex.

In addition to M/M for JCC meetings, Memorandum of Understandings were prepared in the time of preparing/submitting Progress Reports to discuss and reach consensus any issues present at the time. This helped to gain commitment to the Project from the C/P side.

8 Project Design Matrix (PDM) Revision

8.1 Project Design Matrix (PDM) Revision

Revision of the Project Design Matrix (PDM) was discussed in the Mid-term Evaluation of the Project in October 2010. It was agreed to modify the PDM as shown in a table below. The former and revised PDM are shown below.

	Former PDM	Revised PDM	Background of revision
Verifiable Indicator 3.2	Amount of organic waste used for compost is increased	Amount of pruning waste dumped at final disposal site is decreased.	Because the Project aims not at introducing compost but at reducing waste dumped at final disposal site. And the pilot project is targeting at not all of organic waste but mainly at pruning waste.
Activities of the Project 3.4.1	Develop a pilot project plan for composting	Develop a pilot project plan for pruning waste management	
Activities of the Project 3.4.2	Implement a pilot project for composting	Implement a pilot project for pruning waste management	
Activities of the Project 3.4.3	Review the pilot project and develop a plan for expansion of compost operation	Review the pilot project and develop a plan for expansion of pruning waste management	

Table 8-1: Original PDM

TENTATIVE PROJECT DESIGN MATRIX (PDM)			
Project Design Matrix (PDM)			
Projeet Name: Project for Appropriate Waste Management in Santo Domingo de Guzman, National District			
Duration of the Project: 3 years			
Target Area: Santo Domingo de Guzuma, National District			
Target Group: Ayuntamiento del Distrio Nacional (ADN)			
Narrative Summary	**Verifiable Indicators**	**Means of Verification**	**Important Assumptions**
Overall Goal			
Targets of the Integrated Solid Waste Management (Integrated SWM) Plan (revised M/P) are substantially achieved by 2015	Collection rate target(2015) on revised M/P Waste Minimization target(2015) on revised M/P Financial soundness target(2015)en revoised M/P	RevisedM/P Report and data by ADN.	
Project Purpose			
Integrated SWM in Santo Domingo de Guzman, National District, is enhanced	1. Collection rate target on revised M/P 2. Waste Minimization target on revised M/P 3. Number of complaints received at the ADN call center 4. Satisfaction rate for collection service	Revised M/P Report and data by ADN Complaints record Report on survey for satisfaction rate	Sanitary landfill operation is introduced and continued at final disposal site
Outputs			
l. Capacity of ADN on Integrated SWM planning is strengthened	1.1 Revised M/P is drafted. 1.2 Training materials for SWM planning are prepared. 1.3 At least two training workshops for other municipalities are conducted by ADN.	1.1 Revised M/P 1.2 Training materials 1.3 Training workshop reports	Natural disasters do not affect the progress of the project
2. Solid waste collection system is consolidated through improvement on vehicle maintenance and public awareness	2.1 Information on vehicle maintenance is systematized 2.2 Number of records regarding negligent waste discharge is reduced	2.1 Maintenance report 2.2 Inspectors report	The government of Dominica Republic maintains or improves the current national policy principles regarding waste management
3. 3Rs(Reduce, Reuse, Recycle) approach is introduced to divert waste from final disposal site	3.1 Amount of used-paper recycling by ADN activities increased 3.2 Amount of organic waste used for compost is increased 3.3 Feasibility for other valuable resources is recognized 3.4 Number of communities (e.g.Juntas de vecinos) where 3Rs promotion programs are introduced	3.1 Recycling Promotion Center reports 3.2 Recycling Promotion Center reports 3.3 Survey reports 3.4 Recycling Promotion Center reports	Final disposal site continues receiving waste from SantoDomingo de Guzman,

TENTATIVE PROJECT DESIGN MATRIX (PDM)		
Activities of the Project	**Inputs**	**Important Assumptions**
1. Capacity of ADN on Integrated SWM planning is strengthened	**Japan side;**	
1.1Review the current status of lntegrated SWM and identify issues to be addressed	(1) Experts	Private contractors continue providing collection services
1.2 Review and analyze the implementation status of'the integrated SWM Plan(M/P)	(2) Training	
1.3 Revise/develop targets and action programs of the integrated SWM Plan towards 2011 and 2015	(3)Local costs	Counterpart personnels remain in their positions during the project
1.4 Prepare training materials on SWM planning to support other municipalities	(4) Machinery, equipment and materials	
1.5 Conduct training and workshops on SWM planning to support other municipalities using the above mentioned materials		Necessary budjet for the counterpart is secured during the project
	Dominican Republic side;	
2. Solid waste collection system is consolidated through improvement of vehicle maintenance and public awareness	(1) Counterpart personnel including administrator	
2.1.I Study current situation of the maintenance operation of ADN collection vehicles	(2) Office space and meeting rooms	**Precondition**
2.1.2 Develop an improvement plan of vehicle maintenance system	(3) Transportation of experts	
2.1.3 Develop a procedure on the vehicle maintenance	(4) Local costs	
2.1.4 Implement the improvement plan	(5) Site(s) for composting operation	
2.1.5 Monitor the implementation and feedback to the maintenance procedure		
2.2.1 Study the current situation of waste discharge practices		
2.2.2 Develop a plan for improving waste discharge practices		
2.2.3 Develop materials for public awareness on waste discharge		
2.2.4 Implement the plan using the above mentioned materials		
2.2.5 Monitor the iimplementation and feedback to the plan		
3. 3Rs (Reduce, Reuse and Recycle) approach is introduced to divert waste from final disposal site(s)		
3.1.1 Review the current situation of recycling activities on papers, glass, metal, plastic and organic waste		
3.1.2 Study the feasibility of recycling of valuable materials		
3.2.1 Design a program for 3Rs introduction		
3.2.2 Develop materials for public awareness and promotion of 3Rs		
3.2.3 Implement the program for 3Rs introduction		
3.2.4 Monitor the implementation and feedback to the program		
3.3.1 Develop a pilot project plan to expand current paper recycling activities		
3.3.2 Implement the pilot project for paper recycling		
3.3.3 Review the pilot project and develop plan for expansion of paper recycling		
3.4.1 Develop pilot project plan for composting		
3.4.2 Implement pilot project for composting		
3.4.3 Review the pilot project and develop plan for expansion of compost operation		

Table 8-2: Revised PDM

PROJECT DESIGN MATRIX (PDM)

Project Design Matrix (PDM)
Project Name: Project for Appropriate Waste Management in Santo Domingo de Guzman, National District
Duration of the Project: 3 years
Target Area: Santo Domingo de Guzman, National District
Target Group: Ayuntamiento del Distrio Nacional (ADN) **Ver.2 (Revised on 08-Oct-2010)**

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal			
Targets of the Integrated Solid Waste Management (lntegrated SWM) Plan (revised M/P) are substantially achieved by 2015	Collection rate target (2015) on revised M/P Waste Minimization target (2015) on revised M/P Financial soundness target (2015) on revised M/P	Revised M/P Report and data by ADN.	
Project Purpose			
Integrated SWM in Santo Domingo de Guzman, National District, is enhanced	1. Collection rate target on revised M/P 2. Waste Minimization target on revised M/P 3. Number of complaints received at the ADN call center 4. Satisfaction rate for collection service	Revised M/P Report and data by ADN Complaints record Report on survey for satisfaction rate	Sanitary landfill operation is introduced and continued at final disposal site
Outputs			
l. Capacity of ADN on Integrated SWM planning is strengthened	1.1 Revised M/P is drafted. 1.2 Training materials for SWM planning are prepared. 1.3 At least two training workshops for other municipalíties are conducted by ADN.	1.1 Revised M/P 1.2 Training materials 1.3 Training workshop reports	Natural disasters do not affect the progress of the project The government of Dominican Republic maintains or improves the current national policy principles regarding waste management Final disposal site continues receiving waste from Santo Domingo de Guzman, National District, during the project
2. Solid waste collection system is consolidated through improvement on vehicle maintenance and public awareness	2.1 Information on vehicle maintenance is systematized 2.2 Number of records regarding negligent waste discharge is reduced	2.1 Maintenance report 2.2 Inspectors report	
3. 3Rs (Reduce, Reuse, Recycle) approach is introduced to divert waste from final disposal site	3.1 Amount of used-paper recycling by ADN activities increased 3.2 Amount of pruning waste dumped at final disposal site is decreased 3.3 Feasibility for other valuable resources is recognized 3.4 Number of communities (e.g.Juntas de vecinos) where 3Rs promotion programs are introduced	3.1 Recycling Promotion Center reports 3.2 Recycling Promotion Center reports 3.3 Survey reports 3.4 Recycling Promotion Center reports	

PROJECT DESIGN MATRIX (PDM)

Activities of the Project	Inputs	Important Assumptions
1. Capacity of ADN on Integrated SWM planning is strengthened.	**Japan side;**	
1.1Review the current status of lntegrated SWM and identify issues to be addressed	(1) Experts	Private contractors continue providing collection services
1.2 Review and analyze the implementation status of the integrated SWM Plan(M/P)	(2) Training	
1.3 Revise/develop targets and action programs of the integrated SWM Plan towards 2011 and 2015	(3)Local costs	Counterpart personnels remain in their positions during the project
1.4 Prepare training materials on SWM planning to support other municipalities	(4) Machinery, equipment and materials	
1.5 Conduct training and workshops on SWM planning to support other municipalities using the above mentioned materials		Necessary budget for the counterpart is secured during the project
	Dominican Republic side;	
2. Solid waste collection system is consolidated through improvement of vehicle maintenance and public awareness	(1) Counterpart personnel including administrator	
2.1.I Study current situation of the maintenance operation of ADN collection vehicles	(2) Office space and meeting rooms	**Precondition**
2.1.2 Develop an improvement plan of vehicle maintenance system	(3) Transportation of experts	
2.1.3 Develop a procedure on the vehicle maintenance	(4) Local costs	
2.1.4 Implement the improvement plan	(5) Site(s) for composting operation	
2.1.5 Monitor the implementation and feedback to the maintenance procedure		
2.2.1 Study the current situation of waste discharge practices		
2.2.2 Develop a plan for improving waste discharge practices		
2.2.3 Develop materials for public awareness on waste discharge		
2.2.4 Implement the plan using the above mentioned materials		
2.2.5 Monitor the împlementation and feedback to the plan		
3. 3Rs (Reduce, Reuse and Recycle) approach is introduced to divert waste from final disposal site(s)		
3.1.1 Review the current situation of recycling activities on papers, glass, metal, plastic and organic waste		
3.1.2 Study the feasibility of recycling of valuable materials		
3.2.1 Design a program for 3Rs introduction		
3.2.2 Develop materials for public awareness and promotion of 3Rs		
3.2.3 Implement the program for 3Rs introduction		
3.2.4 Monitor the implementation and feedback to the program		
3.3.1 Develop a pilot project plan to expand current paper recycling activities		
3.3.2 Implement the pilot project for paper recycling		
3.3.3 Review the pilot project and develop plan for expansion of paper recycling		
3.4.1 Develop a pilot project plan for pruning waste management		
3.4.2 Implement a pilot project for pruning waste management		
3.4.3 Review the pilot project and develop a plan for expansion of pruning waste management		

8.2 Revision of Plan of Operation

Accordingly, revision of the Plan of Operation (PO) was discussed and agreed in the Mid-term Evaluation of the Project in October 2010. The former and revised POs are shown below.

Table 8-3: P/O before the Revision

TENTATIVE PLAN OF OPERATION (PO)

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Fiscal Year	FY2009									FY2010												FY2011												FY2012		
Calender	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
1. Capacity of AND on Integrated SWM planning is strengthened																																				
1.1Review the current status of lntegrated SWM and identify issues to be addressed																																				
1.2 Review and analyze the implementation status of'the integrated SWM Plan(M/P)																																				
1.3 Revise/develop targets and action programs of the integrated SWM Plan towards 2011 and 2015																																				
1.4 Prepare training materials on SWM planning to support other municipalities																																				
1.5 Conduct training and workshops on SWM planning to support other municipalities using the above mentioned materials																																				
2. Salid waste collection system is consolidated through improvement of vehicle maintenance and public awareness																																				
2.1.I Study current situation of the maintenance operation of ADN collection vehicles																																				
2.1.2 DeveIop an improvement plan of vehicle maintenance system																																				
2.1.3 Develop a procedure on the vehicle maintenance																																				
2.1.4 lmplement the improvement plan																																				
2.1.5 Monitor the implementation and feedback to the maintenance procedure																																				
2.2.1 Study the current situation of waste discharge practices																																				
2.2.2 Develop a plan for improving waste discharge practices																																				
2.2.3 Develop materials for public awareness on waste discharge																																				
2.2.4 Implement the plan using the above mentioned materials																																				
2.2.5 Monitor the îimplementation and feedback to the plan																																				
3. 3Rs (Reduce, Reuse and Recycle) approach is introduced to divert waste from final disposal site(s)																																				
3.1.1 Review the current situation of recycling activities on papers, glass, metal, plastic and organic waste																																				
3.1.2 Study the feasibility of recycling of valuable materials																																				
3.2.1 Design a program for 3Rs introduction																																				
3.2.2 Develop materials for public awareness and promotion of 3Rs																																				
3.2.3 Implement the program for 3Rs introduction																																				
3.2.4 Monitor the implementation and feedback to the program																																				
3.3.1 Develop a pilot project plan to expand current paper recycling activities																																				
3.3.2 Implement the pilot project for paper recycling																																				
3.3.3 Review the pilot project and develop plan for expansion of paper recycling																																				
3.4.1 Develop pilot project plan for composting																																				
3.4.2 Implement pilot project for composting																																				
3.4.3 Review the pilot project and develop plan for expansion of compost operation																																				

Table 8-4: P/O after the Revision

PLAN OF OPERATION (PO) Revised on 08-Oct-2010

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Fiscal Year	FY2009									FY2010												FY2011													FY2012		
Calendar	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
1. Capacity of ADN on Integrated SWM planning is strengthened.																																				
1.1Review the current status of lntegrated SWM and identify issues to be addressed		■	■	■	■	■	■	■																												
1.2 Review and analyze the implementation status of 'the integrated SWM Plan (M/P)					■	■	■	■	■																											
1.3 Revise/develop targets and action programs of the integrated SWM Plan towards 2011 and 2015									■	■	■	■																								
1.4 Prepare training materials on SWM planning to support other municipalities													■	■	■	■	■	■																		
1.5 Conduct training and workshops on SWM planning to support other municipalities using the above mentioned materials																			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2. Solid waste collection system is consolidated through improvement of vehicle maintenance and public awareness.																																				
2.1.I Study current situation of the maintenance operation of ADN collection vehicles		■	■																																	
2.1.2 DeveIop an improvement plan of vehicle maintenance system					■	■	■	■																												
2.1.3 Develop a procedure on the vehicle maintenance							■	■	■																											
2.1.4 lmplement the improvement plan										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2.1.5 Monitor the implementation and feedback to the maintenance procedure																							■	■	■										■	■
2.2.1 Study the current situation of waste discharge practices			■	■	■	■	■																													
2.2.2 Develop a plan for improving waste discharge practices					■	■	■																													
2.2.3 Develop materials for public awareness on waste discharge							■	■	■	■	■	■																								
2.2.4 Implement the plan using the above mentioned materials													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2.2.5 Monitor the implementation and feedback to the plan																							■	■	■										■	■
3. 3Rs (Reduce, Reuse, and Recycle) approach is introduced to divert waste from final disposal site(s).																																				
3.1.1 Review the current situation of recycling activities on papers, glass, metal, plastic, and organic waste		■	■	■	■	■	■	■																												
3.1.2 Study the feasibility of recycling of valuable materials						■	■	■	■	■	■																									
3.2.1 Design a program for 3Rs introduction										■	■	■	■	■	■																					
3.2.2 Develop materials for public awareness and promotion of 3Rs													■	■	■	■	■																			
3.2.3 Implement the program for 3Rs introduction													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3.2.4 Monitor the implementation and feedback to the program																							■	■	■						■	■	■			
3.3.1 Develop a pilot project plan to expand current paper recycling activities										■	■	■	■																							
3.3.2 Implement the pilot project for paper recycling													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3.3.3 Review the pilot project and develop plan for expansion of paper recycling																							■	■	■						■	■	■			
3.4.1 Develop a pilot project plan for pruning waste management		■	■	■	■	■	■	■	■	■	■	■	■																							
3.4.2 Implement a pilot project for pruning waste management													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3.4.3 Review the pilot project and develop a plan for expansion of pruning waste management																															■	■	■			

Appendix

A Achievements during the Project Period

A.1 Organizational Structure

A.1.1 Creation of Environmental Secretariat in ADN

DIGAUE's organizational structure has been strengthened during the implementation of the project, even though there are still limitations with the personnel. Such situation has not prevented, fortunately, that activities are conducted and improvements during the Project; i.e.: Pilot Project for discharge improvement, 3R promotion in Center for the Promotion of Recycling, and the Pruning Waste Management, in addition, to the continuous monitoring work for the cleansing service.

The Department for Environmental Management and Public Facilities has also continued to be operational although equally affected by personnel limitations. This Department are responsible for management for urban forest, environmental quality, and the Center for Environmental Information.

Fortunately, ADN created, through resolution No. 08 of the twenty first (21) of March, 2012, the Secretariat of Environmental Management and Risks which would complement the coordination functions that were performed by the General and Technical Secretariat in the Municipality.

Additionally, this Secretariat will coordinate activities of DIGAUE, Environmental Management and Public Facilities, and Risk Management, as well as use of public areas which will involve removing illegal publicity; all these areas have municipal link between them.

A.2 Ordinance and Regulation

A.2.1 Construction Debris Ordinance

With the Department of Urban Planning and Legal Counseling, DIGAUE prepared a draft ordinance about sustainable management of construction waste which is generated in the city by developers and contractors. It deals with the construction and demolition waste from their generation to final disposal. This tool will allow issuing an operation license to those who transport debris in order to comply with requirements previously defined and preventing illegal transportation and dumping of debris in public roads and idle land.

A.2.2 Ordinance for Big Generators

Similarly, DIGAUE prepared a draft ordinance for differentiated waste management for wastes which are generated in institutions, commercial entities, and industries that are classified as big generators by the municipal resolution for non-hazardous waste management when they discharge above 60 liters per property per day.

A.2.3 Ordinance for Temporary Storage for Non-Hazardous waste in Residential Buildings

Due to large vertical growth of the city, this draft ordinance is directed to regulate storage sites which should be included in project designs to be submitted to Urban Planning Department by developers and contractors. The ordinance defines minimum design specifications as a function of the number of housing units that will be constructed.

These three drafts ordinances were submitted to the Mayor, the General Secretary, and the Technical Secretary who decided to submit them to the Alderman Council which empowered

the Cleansing Committee to know about it, debate it, and amend it if necessary. It is a legal requirement to publish the draft ordinances in ADN´s web site which has been done already for the three cases.

A.3 Equipment Improvement for SWM

A.3.1 Vehicle Fleet

a ADN Services

ADN Services contractor renewed in 2009 part of the vehicle fleet, procuring twenty-one (21) 20 cubic yards compactor trucks which are still operational now. Between May and June 2012, ADN Services procured and put into service thirty (30) 25 cubic yard trucks which satisfy the current contract. The existing fleet of small compactor trucks which cover the Colonial Center and difficult access areas has not been renewed yet; the contractor only has 4 vehicles which operate with difficulty.

b Community Foundations

Community Foundations do not have sufficient vehicles. However, they have taken advantage of the few offers of used Japanese compactor trucks to renew their fleet. The case of ESCOBA should be emphasized because they have seven (7) compactor trucks between 4 and 6 cubic yards and three (3) dump trucks. There are similar number of trucks for each one of the four organizations; nonetheless, dump trucks and flatbed trucks which are not particularly convenient for cleansing service.

c Other Contractors

The Contractor Disposición Sanitaria Capital (DSC) which covers Ward II has not procured any vehicles recently. It should be emphasized that the vehicle fleet is composed of large capacity compactors, 20 and 25 cubic yards, as well as small compactors of 9, 6, and 4 cubic yards.

d ADN's Own Vehicles

ADN has thirty (30) used compactors which have been donated by Japanese Municipalities that can reach about twenty two (22) used compactors operating continuously, breakdowns are being repaired in the workshop, and 10% of this fleet will be discarded by the end of this year. Additionally, there are two (2) dump trucks and now with the integration of the Environmental Management Secretariat and Risks, there are two additional flatbed trucks available to transport branches. Moreover, ADN is expecting the arrival of eight dump trucks which were procured in public bidding and there is a second calling for bid to procure three (3) 6 cubic yard compactors because the first calling was declared deserted due to few permanent dealers in the local market.

A.3.2 Vehicle Workshop and Transfer Station

a Cleansing and Workshop Remodeling

There are some progresses in eliminating and/or reducing the number of discarded trucks occupying the workshop yard. Various parts from those discarded trucks could be used as spare parts to repair small 6 yards compactors, reused by other Municipalities in the country or eventually to be donated to sister cities. The reusable parts from the discarded trucks include; compactor bodies, hydraulic parts, engines and other parts. The work is conducted continuously, tough little by little since the safety measures and protection lessons learned within the framework of the project are observed.

b Wheel Loader Procurement

ADN procured a used wheel loader Caterpillar, model 928S, for the use in the Transfer Station. The wheel loader was obtained at an excellent price and in good mechanical conditions which operates at full capacity since July, 2012. Necessary maintenance measures are being applied to ensure its adequate use.

A.3.3 Final Disposal Infrastructure

a Weighbridge

Within the framework of the increment of necessary measures to control discharge in Duquesa sanitary landfill which is operated by a private concessionaire (Lajun Corporation), ADN renewed their contract on March 6th 2012 for another four (4) years. In this new contract, Lajun Corporation was requested a minimum investment plan for equipment which includes installing a second weighbridge, long enough to weigh trailers up to 103 cubic yards that transport wastes from the Transfer Station to Duquesa because the current weighbridge cannot weigh them. Furthermore, it should be installed a system capable to collect radio-frequency, camera and video information, and be also capable to have access in real time through the web. Lajun Corporation contracted a local dealer to provide the second weighbridge; this dealer is also in charge to give maintenance and calibrate the existing weighbridge. The installation is expected to be finished by August 2012.

b Bulldozer

Similarly, the investment plan included the purchase of removal and excavation equipment. The procurement of the equipments was already completed by Lajun Corporation with the purchase of four (4) bulldozers, one (1) wheel loader, and (1) excavator with an investment of US$900,000.00 in the local market, all of them used, and certified.

A.4 Achievements attained during the Implementation of the Pilot Projects

A.4.1 Adequate Discharge Pilot Project

During the elaboration of the Master Plan, a project to train the technical staff was implemented to enable them to coordinate works related to routes and frequency in sector 3 of the so called “Kilómetros” area. In the current phase, the pilot project for adequate discharge was developed successfully by linking the previous experiences with the coordinate action of neighbors who generate waste in order to create necessary trust between the parties involved. It was implemented successfully, but also some lessons have been learned which are very important to emphasize. The municipality should guarantee quality in the service which has to begin with the design of the route that should be closely followed and monitored in order to implement it with the quality that the citizen deserves; the informal frequency given to the citizen is complied. Only under these conditions, efforts to provide education and gain citizen’s trust produce any result. This lesson is also combined with the frailty on how trust gained can be lost.

A.4.2 Paper Recycling Pilot Project

Paper recycling pilot project was conducted in a school inside the sector where the pilot project for adequate discharge was being conducted and where collection was guaranteed, both in design of routes and frequencies. This way, it was eliminated any factor which could affect an adequate development. An important lesson was the initial over-estimation regarding expectations for generation of school paper. It seems the school system is not based on the use of materials different to books and boards; it is being ignored creative teaching elements which

give opportunities and different uses to paper in its different types, such as thin cardboard and construction paper.

An additional lesson from the experience in this project would be the convenience to assign efforts to recover paper in offices and commercial entities, not so much in schools; as well as to inform about bad practices which were observed next to the target school where a bottling company and several NGO's offered prices to the school in cash to receive recyclable materials such as PET and paper where some distortions were generated. It was created the sense that materials are collected because of receiving an award, if an award is not provided, then there is not separation.

A.4.3 Pruning Waste Management Project

There is no doubt this has been a remarkable project due to the complete activity foreseen since the phase to formulate the master plan. The plan consists in preventing to send branches and organic material from the city to the sanitary landfill and instead they are used as mulch in public areas. The success can be measured not only by the equipment procured by JICA which donated two (2) machines and ADN which purchased a third one, but also due to a better coordination derived from the integration of the Environmental Secretariat to attain the Project's achievements.

B Master Plan Revision

B.1 Outline of Master Plan Revision

The former M/P was developed in the JICA Development Study in 2007. The revision of the M/P should be based on any changes occurred in the circumstances of ADN or any new outcome identified through implementing this Project. Basic components of the former M/P such as its purpose, strategies, Action Programs should be sustained.
Specifically, the following processes are to be taken, confirming the progress and any issues found through implementing the M/P described in P/R (1) to P/R (3);

- To select Action Programs which are practical to be achieved by 2015 from the components of the former M/P.
- It is found from the PP of Improvement of Discharge Manner implemented in this Project that unless a good quality collection service (regular and scheduled time collection) is performed, discharge manner could not be improved. Thus, revised M/P focuses on improving the quality of collection service.
- To develop a concrete implementation plan for the selected Action Programs mentioned above consist of timetable, sections in charge, action plan of the section, budget provision etc.
- To establish rules and methods to implement Plan-Do-Check-Action (PDCA) cycle to ensure the effectiveness of the above plan.

The former M/P includes potential generation amount, inhibited generation amount and generation amount whose values are impossible to monitor. The purpose and meaning of applying these figures in former M/P are needed to be reexamined. And M/P progress should be monitored with parameters that are measurable.

Since the 2010 Census bulletin report[1] was released, the generation ratio and the structure of waste stream were reviewed and updated. In practice, in order to have a practical M/P that can be managed with parameters that ADN uses for monitoring, following are applied in M/P Revision;

- As for the Waste Stream, in order to have it monitored, it uses only numerical values that are obtained from the final disposal amount report and data from recycling activities initiated by ADN.
- Conditions for the forecast in the former M/P were not very clear. Furthermore, the 15% waste reduction target by 2015 was set toward non-measurable "potential generation amount." Therefore, as for the reduction to be targeted in the revised M/P, it only deals with waste reduction amount achieved through ADN recycling activities.
- Waste reduction amount by recycling activities implemented as a part of Corporate Social Responsibility (CSR) by private companies is not measurable, therefore, the revised M/P sets only qualitative goal for these sectors.
- Former M/P aimed material recovery at final disposal site to be zero (0) by 2015; however, the contract for the management of final disposal site is a concession contract given its management to that concession company by the Municipality of North Santo Domingo. That means it is impossible for ADN to refer to any activities of material recovery conducted inside the site. For that reason, the revised M/P admits the material recovery at the disposal site and only registers their collected amount.

1 http://censo2010.one.gob.do/index.php

According to the former M/P, Duquesa Landfill will be improved to an aerobic landfill or construct a new aerobic landfill by 2015. This issue will be re-examined after receiving conclusions and recommendations by the IDB study.

B.1.1 Analysis of the updated data and future forecast

a Incoming waste amount at final disposal site

It was recorded that daily average of incoming waste at Duquesa Landfill in 2010 was 3,572 ton/day, and 2,047 ton/day of them is brought from ADN.

Table B-1: Incoming waste amount at Duquesa Landfill in 2010

	A.D.N.	Alcarrizos	ASDE	ASDN	ASDO	P. Brand	Pantoja	Palmarejo	Total
Jan	62,439.28	3,887.78	29,245.48	8,488.49	7,959.42	549.48	369.06	12.20	112,951.19
Feb	58,405.43	3,320.86	23,142.87	5,276.59	7,521.02	704.36	224.06	5.12	98,600.31
Mar	64,487.34	3,856.52	24,028.08	7,578.04	8,553.07	720.00	182.10	35.12	109,440.27
Apr	59,990.61	4,725.95	22,189.01	6,806.88	8,086.81	765.07	32.36	8.80	102,605.49
May	64,581.80	4,332.89	24,949.56	6,039.35	8,672.46	751.23	30.24	21.07	109,378.60
Jun	61,274.99	4,823.80	24,919.53	7,203.06	9,177.08	829.72	-	16.35	108,244.53
Jul	64,293.95	3,466.68	24,424.91	6,228.82	9,187.08	797.66	1.27	-	108,400.37
Aug	62,026.07	3,641.85	25,214.57	7,796.25	8,965.35	462.28	-	0.54	108,106.91
Sep	60,703.22	2,834.23	23,812.77	10,704.48	8,547.54	258.07	952.14	-	107,812.45
Oct	66,438.63	2,664.84	25,506.49	7,245.92	9,311.19	165.58	1,059.66	-	112,392.31
Nov	60,529.22	3,319.49	24,620.59	14,725.71	8,951.04	802.42	1,071.52	-	114,019.99
Dec	61,945.33	4,312.32	25,715.61	8,297.98	9,550.51	913.59	1,115.92	-	111,851.26
Total	747,115.87	45,187.21	297,769.47	96,391.57	104,482.57	7,719.46	5,038.33	99.20	1,303,803.68
Monthly average (ton/month)	62,259.66	3,765.60	24,814.12	8,032.63	8,706.88	643.29	503.83	14.17	108,650.31
Daly average (ton/day)	2,046.89	123.80	815.81	264.09	286.25	21.15	13.80	0.27	3,572.06
Ratio	57.30%	3.47%	22.84%	7.39%	8.01%	0.59%	0.39%	0.01%	100.00%

Source: LAJUN Corporation, S.A.

On the other hand, in the former M/P, incoming waste amount at final disposal site in 2011 (the 2010 amount is undocumented) was estimated to 1,546 ton/day, which is 75% of the actual figure in 2011 revealing a large gap between the former M/P and actual situation.

b Population

The 2010 Census conducted 10 years after the last census shows 935,058 persons in National District and 2,359,237 persons in Santo Domingo except National District.

Table B-2 : Comparison between the former M/P and 2010 census

	2010 Census (bulletin report) (population)	Estimates in current M/P(population)	%
National District	935,058	1,052,544	88.8%
Santo Domingo	2,359,237	-	-
Total in Santo Domingo metropolitan area	3,294,295	-	-

The current National District was established in year 2002. Therefore, the 2010 Census is the first census of newly established National District. The National Statistics Office (Oficina Nacional de Estadística: ONE) estimates past population of the National District, whose area boundary was defined in year 2002, as show in below table.

Table B-3: Population Transition of Area of the National District

Year	Population	Remarks
1981	848,548	estimated by ONE
1993	904,430	
2002	913,540	
2010	935,058	preliminary figure of the 2010 Census

Other related population data are estimated by ONE, CONAPOFA[2] and the former Master Plan (JICA development study in 2006). These data and estimated future population based on each data are shown in below table.

Table B-4: Population Change and Estimated Future Population Based on Respective Data

Factor	Year	Modified Census**	ONE	CONAPOFA	JICA Development Study (2006)	Average (Census & ONE)
1	1981	848,548				
13	1993	904,430				
20	2000		954,540			
21	2001		971,018			
22	2002	913,540	987,692			
23	2003		1,004,302			
24	2004		1,020,719			
25	2005		1,036,717	980,653	980,653	
26	2006		1,052,277	994,627	994,627	
27	2007		1,067,482	1,009,045	1,008,800	
28	2008		1,082,455	1,026,239	1,023,176	
29	2009		1,097,218	1,050,465	1,037,756	
30	2010	935,058	1,111,838	1,111,838	1,052,544	
31	2011	941,860	1,126,306	1,125,507	1,067,543	1,034,083
32	2012	944,719	1,140,605	1,140,675	1,082,755	1,042,662
33	2013	947,579	1,154,708	1,155,843	1,098,185	1,051,144
34	2014	950,439	1,168,629	1,171,011	1,113,834	1,059,534
35	2015	953,299	1,182,348	1,186,179	1,129,706	1,067,823
36	2016	956,158	1,201,347	1,201,347	1,143,017	1,078,753
37	2017	959,018	1,216,515	1,216,515	1,157,919	1,087,766
38	2018	961,878	1,231,683	1,231,683	1,172,821	1,096,780
39	2019	964,737	1,246,851	1,246,851	1,187,723	1,105,794
40	2020	967,597	1,262,019	1,262,019	1,202,625	1,114,808

Modified Census**: Population in1981,1993 and 2002 is estimated for present ADN area.
ADN was created in 2002, and before 2002 present ADN area was part of Great Santo Domingo.
Modified Census** $y = 2859.7x + 853209$, y:population, x:factor, $R^2 = 0.9323$
ONE $y = 15168x + 655299$, y:population, x:factor, $R^2 = 0.999$
CONAPOFA $y = 15168x + 655299$, y:population, x:factor, $R^2 = 0.999$
JICA Development Study $y = 14902x + 606545$, y:population, x:factor, $R^2 = 0.9996$

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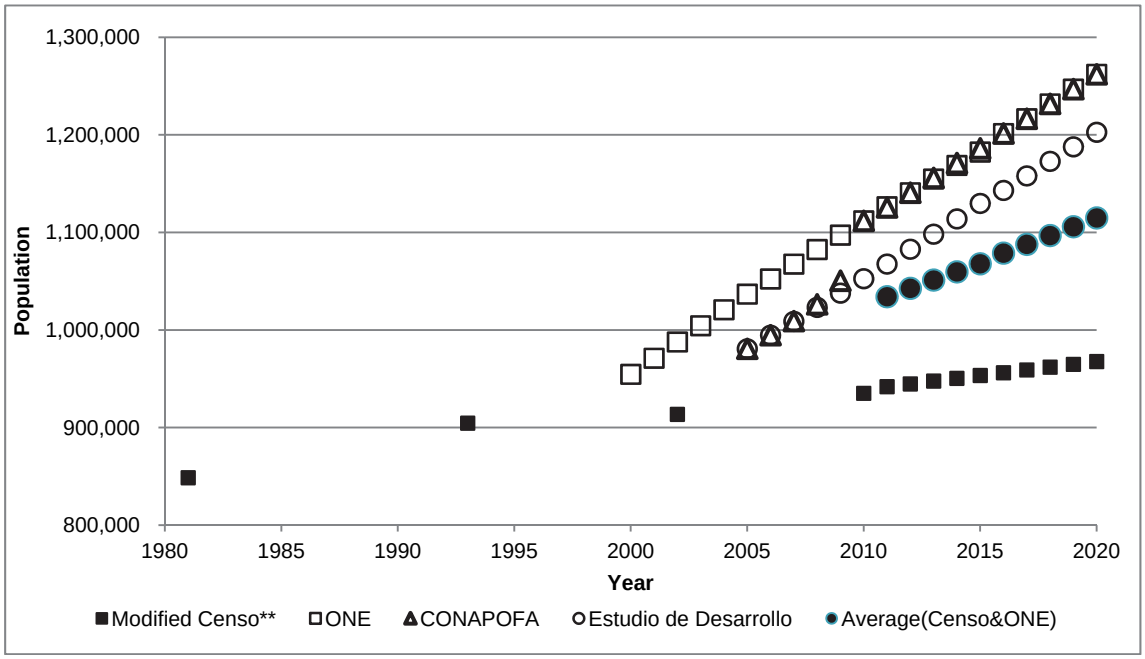


Figure B-1 : Population Change and Estimated Future Population Based on Respective Data

As shown above, data from ONE indicate the largest value, and Modified Census indicated the smallest value. Therefore, population for the Revised Master Plan is set on the middle value of ONE and Modified Census.

c Final disposal waste amount

The following table shows the population and final disposal waste amount at Duquesa Landfill in 2010. The population in the National District accounts for 28% of the Santo Domingo metropolitan area; whereas the waste amount from National District at Duquesa Landfill accounts for 57% of the wastes from Great Santo Domingo.

Table B-5 : Population and waste amount at Duquesa Landfill in 2010

	Population		Waste amount at Duquesa Landfill		Waste generation ratio (disposal amount at site/day/person) (g/person/day)
	2010 Census (bulletin report) (population)	%	Waste amount in 2010 (ton/day)	%	
National District	935,058	28.4%	2,046.9	57.3%	2,189
Santo Domingo	2,359,237	71.6%	1,525.2	42.7%	646
Metropolitan area total	3,294,295	100.0%	3,572.1	100.0%	1,084

Waste generation ratio in the National District is 2,189g/per capita/day and 646g/per capita/day in Santo Doming province, which shows a considerable gap between two figures. Besides, even though there is a record in the range of 2,000g/per capita/day in U.S.A during consumerism, considering the economic scale of Santo Domingo, 2,189g/per capita/day is an extraordinary high value.

Waste amount and composition survey (WACS) conducted by the JICA Development Study 2005-2006 showed that household generation ratio being 780g/per capita/day, and the former

M/P established that the National District generation ratio is 1.44kg/per capita/day which includes waste generation other than that of household.[3]

Generation ratio of 780g/per capita/day for household waste is most likely a reasonable value for the National District compared with other examples in Latin America and there might not be a greater change in today's household generation ratio in the National District. In applying this household generation ratio of 780g/per capita/day, disposal amount of household waste is calculated to be 729ton/day in 2010. Subsequently waste amount other than household waste in the National District in 2010 becomes 1,318ton/day.

In applying the estimated population of 980,653 in 2005 estimated by the JICA Development Study, generation ratio 780g/per capita/day gives 765ton/day of household waste in 2005. Subsequently waste amount other than household waste in the National District in 2005 becomes 648ton/day.

Table B-6: Comparison of waste amount at Duquesa Landfill between 2005 and 2010

unit: ton/day

	Year 2005	Year 2010
Household	765	729
Other than household	648	1,318
Total	1,413	2,047

In the former M/P, it is projected future generation amount with uncommon calculation formula[4]. The formula calculates the total generation amount by multiplying "1.44kg/per capita/day" generation ratio and the population. However, the ratio "1.44kg/per capita/day" is calculated by dividing total waste amount including household waste and other than household waste by population. The actual waste amount in 2010 is significantly higher than the forecast value in 2011 by the former M/P.

Therefore, in order to estimate total future waste amount at final disposal site, the revised M/P adopts i) a generation ratio of 780g/per capita/day for household waste, and ii) a GRDP based generation ratio for other than household waste.
GRDP of National District is calculated by multiplying GDP per capita (USD 5,231.60 per capita[5]) of Dominican Republic in 2010 by the population of National District (1,111,832 persons[6]) and it sums up USD5,816,691,681. Therefore, waste amount of other than household waste at final disposal site per one thousand US dollar GRDP becomes 227g/GRDP(thousand USD/y)/day.

3 It includes small amount of construction debris, branches, public areas cleansing, and bulky waste.
4 Normally household waste generation is calculated based on a waste generation ration and population number. And waste generation from business activities is, separately from household waste, estimated to calculate, in consideration of economic index such as GRDP, for example applying generation ratio per employee and multiplying number of employees. Then sum these two values up to conclude total waste generation forecast of a city.
5 http://www.bancentral.gov.do/estadisticas.asp?a=Sector_Real Producto Interno Bruto Percápita
6 At the time that GDP per capita is calculated, the total national population was 9,874000. That is different from 9,445,281 persons of 2010 Census but is close to the population estimates (9,884,371) of ONE. Thus, in calculating GRDP in National District herewith, the population estimate of 1,111,838 persons in ONE mentioned above is adopted.

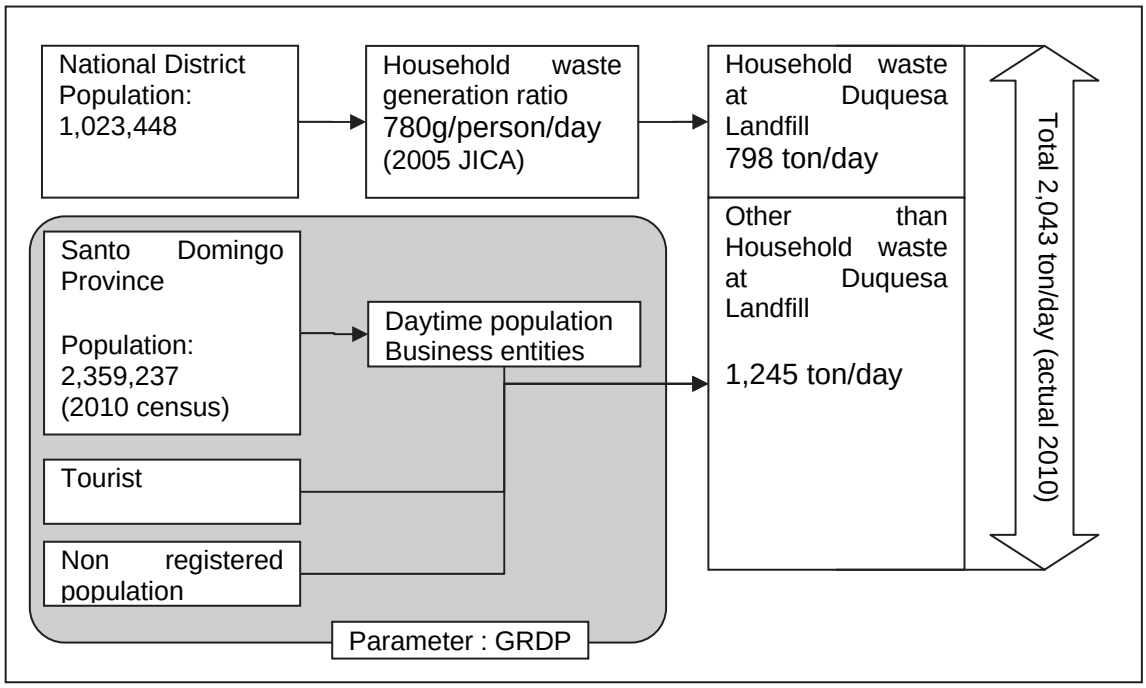


Figure B-2: Waste generation estimation model proposed

c.1 Future projection

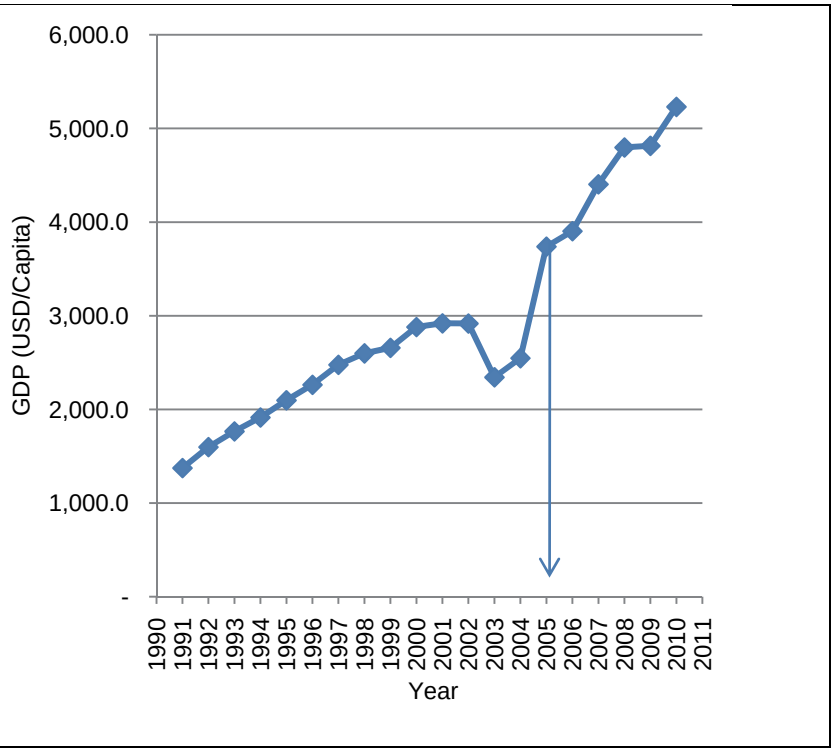
Future waste generation is estimated based on the abovementioned waste generation ratios, and population and GRDP in National District.

c.1.1 GRDP

GRDP is estimated by multiplying GDP per capita (unit: USD) by the population of National District. GDP forecast herewith employs only such data after 2005, the time when found the way out of the depression of the economy.

Table B-7 : Transition of GDP in Dominica Republic

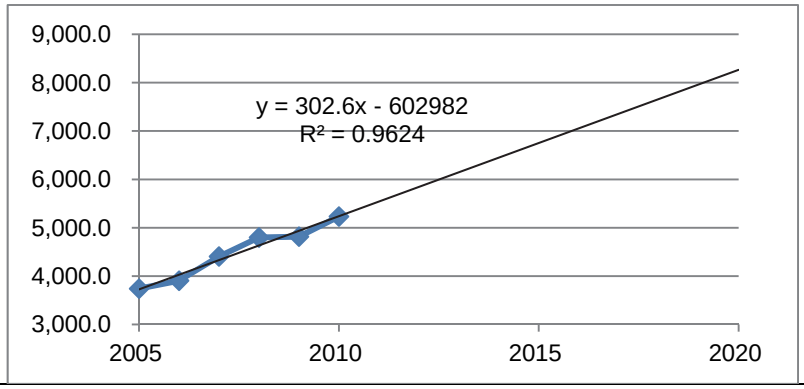
Year	GDP(USD/Cap.)
1991	1,374.3
1992	1,598.1
1993	1,766.3
1994	1,914.4
1995	2,098.1
1996	2,263.0
1997	2,477.1
1998	2,599.2
1999	2,658.2
2000	2,880.3
2001	2,920.0
2002	2,918.0
2003	2,344.1
2004	2,548.0
2005	3,739.1
2006	3,903.9
2007	4,404.5
2008	4,797.8
2009	4,815.6
2010	5,231.6



GDP per capita forecast based on the above data is shown below.

Table B-8 : GDP Forecast

Year	GDP (USD/per capita.)
2005	3,739.1
2006	3,903.9
2007	4,404.5
2008	4,797.8
2009	4,815.6
2010	5,231.6



GRDP forecast in National District based on the above GDP forecast is shown below.

Table B-9 : Forecast of Future GRDP in the National District

Year	GDP(USD/Cap.)	Population	GRDP (thousand USD)
2011	5,546.6	1,034,083	5,735,644
2012	5,849.2	1,042,662	6,098,740
2013	6,151.8	1,051,144	6,466,425
2014	6,454.4	1,059,534	6,838,656
2015	6,757.0	1,067,823	7,215,282
2016	7,059.6	1,078,753	7,615,562

Year	GDP(USD/Cap.)	Population	GRDP (thousand USD)
2017	7,362.2	1,087,766	8,008,354
2018	7,664.8	1,096,780	8,406,602
2019	7,967.4	1,105,794	8,810,304
2020	8,270.0	1,114,808	9,219,462

Haulage Amount to Final Disposal Site
Based on above, it is estimated haulage amount to final disposal site.[7]

Table B-10: Basic Number of Haulage Amount to Final Disposal Site

Year	Population	GRDP (thousand USD)	Household Waste (ton/day)	Other than household Waste (ton/day)	Total (ton/day)
2011	1,034,083	5,735,644	806.6	1,296.5	2,103.1
2012	1,042,662	6,098,740	813.3	1,378.6	2,191.9
2013	1,051,144	6,466,425	819.9	1,461.7	2,281.6
2014	1,059,534	6,838,656	826.4	1,545.8	2,372.3
2015	1,067,823	7,215,282	832.9	1,631.0	2,463.9
2016	1,078,753	7,615,562	841.4	1,721.5	2,562.9
2017	1,087,766	8,008,354	848.5	1,810.2	2,658.7
2018	1,096,780	8,406,602	855.5	1,900.3	2,755.8
2019	1,105,794	8,810,304	862.5	1,991.5	2,854.0
2020	1,114,808	9,219,462	869.6	2,084.0	2,953.6

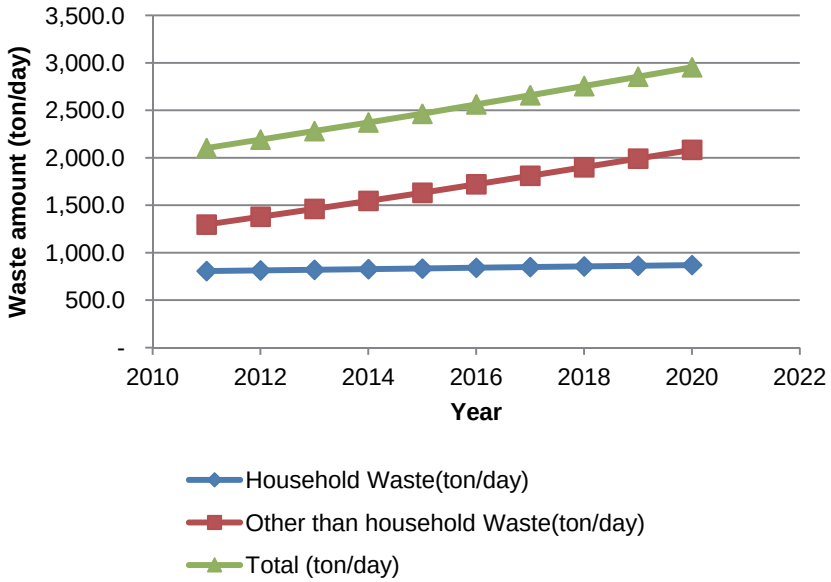


Figure B-3 : Haulage Amount to Final Disposal Site

B.2 Selection of Action Programs

Action Programs were listed in the former M/P. In PR (1) and PR (2), the implementing status and some issues were identified. Based on these findings, some Action Programs were

7 All the above information reflects an earlier evaluation, but does not include the latest data from ONE as of May 2012.

selected as significant Programs to achieve the overall goals of this Project by 2015, and then it is set a target year of each Action Programs.

Table B-11: Implementing Status, Issues and Target Year of former M/P

Item	Action Program recommended by former M/P		Present situation, observation (PR (1))	Revised M/P (PR (2))	By 2015	After 2015
Establishment of Legal Infrastructure	Program 101:	Establishment of a Basic Rule	The Regulation for the Service of Nonhazardous Municipal Solid Wastes Management was approved by the Municipal Council as Resolution No. 74-06: While it is true that such devices of this regulation improve local implementation of the national standard for these wastes management, while it is a major obstacle to full implementation that the municipal administration lacks sanction capacity.	ADN sent the Capital Law to the Congress of the Republic, which is very important among other tools to have an efficient management of the Capital city. If it is approved, it will grant sanctioning capacity through administrative means of municipal authority.	Done	Maintain
			In order to supplement some weaknesses in their actions, ADN has submitted to National Congress an initiative for the adoption of the Capitalization Law, a legal establishment that would attribute to the city of Santo Domingo de Guzman, National District, special conditions linked to the capitalization regime, and would establish the superscript sanctioning capacity, among other devices of great importance.			
			For this reason, it is understandable that, although efforts have not been made for broad dissemination of the regulation, the same is shown in the institutional portal, taught as a subject in the Municipal School of Leadership and also is included in the trainings conducted by the Environmental Information Center. The possibility of a popular edition with illustrations and diagrams with visual appeal is also examined, but there is not an available budget, due to cost increase in basic operations of the cleansing system, especially the collection.			
Strengthening of the Management Organization	Program 201:	Strengthening of Coordination among ADN Directorates	The financial administration of ADN is governed by a proper coordination among its components, under the leadership of Finance Director, to which the Budget Director reports, who not only makes but also controls budget execution throughout the fiscal year.	We have managed to establish, in an efficient and sustainable manner, a good coordination among different departments involved, basically, Environmental Management Department, Legal Advisor Department, Budget Department, and Financial Department.	Done	Maintain
			Today it has achieved an excellent integration of the DIGAUE with these key areas of resources contribution to ensure the cleansing system sustainability. The DIGAUE is required for the timely presentation of its annual budget. It is made so accurate and well supported to win the allocation of total resources requested. It is worth noting that each month provides a budget execution control to financial area, and tidiness and efficiency are established for these resources managed. (See attached 2010 budget proposal)			
			With regard to coordination with citizens, ADN has mechanisms linked with Neighborhood Associations and Community Actions under the Directorate of Human Development. Municipal School of Leadership was recently created. Also it operates a Customer Service Unit, which can be accessed by citizens via phone or through internet.			
			As for the Human Resources Administration, the DIGAUE is the largest employer, one in every three employees of ADN is in the DIGAUE. The staff is properly identified with a comprehensive record of personal and family information. Their wages exceed the minimum established by law and the Mayor has already announced that will be raised from 10 to 20% by 2010. They have social security coverage, which provides family health insurance and labor risks.			
			As for the link with the Directorate of Urban Planning, through the framework formulation of this project, it is being conducted that a proposal of ordinance to regulate the waste deposits in buildings, attending the construction boom in the city, especially in tall buildings.			
			The coordination with other cities has been undertaken significantly. Today we have the Mancomunidad Del Gran Santo Domingo, consisting of nine municipalities and the National District, which is chaired by ADN Mayor for its first period of conformation (2009 to 2011). This Mancomunidad has a population of over three million inhabitants. And the statute defines the spirit of integration for the search of solutions to common problems, including environmental management and in particular solid wastes issue is of primary importance .			

Item	Action Program recommended by former M/P		Present situation, observation (PR (1))	Revised M/P (PR (2))	By 2015	After 2015
	Program 202:	Reform of the Urban Cleansing Department of EMUCD	This Directorate has suffered some changes after delivered the Report of the Development Study (Master Plan), because the former Directorate of Environmental Management and Urban Cleansing was divided and transformed into the Directorate of Urban Cleansing and Directorate of Environmental Management. Later, about a year ago, the former was merged with the Directorate of Equipments and Transport, forming what is now the General Directorate of Urban Cleansing and Equipments. The current management team of DIGAUE understands that these conditions are given due to an eventual unification of the beautification areas, which is at present in charge of the Directorate of Environmental Management, as one Department of ADN.	Proposal: To establish a Cleansing, Public Facilities and Resources (Ornato), and Equipment Maintenance Department. This is done with the purpose to unify the inherent functions of the operational work in street, avenues, and public places cleansing.	Done	Maintain
			On the qualification of its human resource management, the DIGAUE has a team of young technicians, whose experience levels are not sufficient on the SWM issues, because this is not professional area in the country, but thanks to the JICA, The DIGAUE has more than 20 technicians who were trained abroad (Japan, Panama, Chile, Mexico, Argentina and El Salvador) in different areas of solid waste management, thereby strengthening the capacity of ADN in planning and execution of the SWM.			
			The process of contracts elaboration, operations inspection, tender preparation (now it is mandatory under the Law 340 on contract works and procurement of goods and services) as well as administrative and monitoring tasks are carried out with efficiency and professionalism by the DIGAUE Staff.			
	Program 203:	Establishment of Municipal Company	The Advisory Committee hold a meeting for its conformation and discussed some integration mechanisms in order to activate its members with the DIGAUE. Institutional reasons has prevented the mentioned Committee be opportunely convened. The DIGAUE hopes to do it for 2010 on the occasion of the revision of the current tariff system, which must be changed to reduce the gap of incomes versus expenditures of the cleansing system.	To comply with this program, we would propose: ● More institutional development inside ADN ● Discussion with involved actors. ● Acceptance of a new management model proposed by the Executive Branch (Mayor) to the Municipal Council.	Canceled	Reexamine (if necessary)
			As for the Municipal Companies, while it is true that it was planned the convenience of its establishment during the formulation of the Master Plan by the Development Study consultants, however it currently is not in the conditions for an action of this nature. It still lacks of: more institutional development inside the ADN; discussions with other actors involved; and gaining acceptance by the City Council members. In order for that it is required great efforts. And DIGAUE considers it will not be a good timing even for 2010.			
Towards Achievement of the Collection Goal (i.e. Collection Rate 100%)	Program 301:	Categorization and Definition of Collection Services	This program is focused on putting in order collection market in the National District, at this moment it is well defined by the DIGAUE, since a territory and wastes to be handled are demarcated for each actor. However, due to weaknesses of some contractors of ADN that do not have the required vehicle fleet, yet in practice they overlap some actors. So we can say that the company ADN Services is contracted to cover the entire district No.1, and a large part of district No.3 is shared by four community foundations, FUNSACO, BROOM, FUCOSAGUSCIGUA and FUNDSAZURZA that are responsible for the collection in the marginalized barrios along the banks of Ozama and Isabela rivers, that is a task that has been made to assume fully every day to improve their efficiency. There is an overlap of FUNDASAZURZA and the Market Service Collector SERTEX, in at least one of the markets that is the largest generation for territorial continuity. The enterprise Disposición Sanitaria Capital is responsible for the district No. 2 sharing with a small community foundation FUNDEMAPU.	It has been defined and categorized. Service to Big Generators in charge of contractors with Operation License would be a pending issue within the system.	Done	Maintain
	Program 302:	Design of Collection Routes	At present all the routes and frequencies have been designed, calibrated and implemented by our Operations and Inspection Department, which has trained and experienced personnel for this task and for sweeping routes. Routes monitoring is done in the field by the inspectors assigned to each macro-route and by the operation analysts using GPS systems from the central office. Exceptions from this control are the inaccessible areas that are served in a special way by the community foundations, to which the DIGAUE assists in the implementations of these routes, knowing in detail about the territory that they are in charge of.	All routes have been designed by technical staff from DIGAUE. These routes are monitored through GPS and on site there are supervisors. In case, it is needed a redesign, there are protocols between the respective staffs to look for solutions.	Done	Maintain
	Program 303:	Establishment of Collectio	Service to the urban and the marginal areas:	It is maintained the guideline of Program 303 in the Updated Master	Done	Maintain
			In the case of urban area service, contracts were renegotiated in 2006 that include parameters of service quality and other relevant technical			

Item	Action Program recommended by former M/P		Present situation, observation (PR (1))	Revised M/P (PR (2))	By 2015	After 2015
		n Service Structure	references, but the contractors have not yet agreed to comply with certain aspects and this is reflected in weaknesses in the system. On the other hand in the marginal areas, community companies were transformed to Foundations in 2007 and operate successfully in sectors under their responsibility. Service to Large Generators: Currently maintaining the four companies have exclusive contracts for collection of large generators (Klinetec, Limpieza y Aseo Urbano, Servicios Industriales Nin y Compañía Técnica de Limpieza), and in addition to this, ADN serves with its own units (blue compactor trucks). It is a project for next year to start with the Operation License establishment for collection service to large generators. Service to Markets: The same contract is maintained for the company SERTEX that collects markets in National District. Sweeping: The sweeping and cleaning public areas are made with logistics, personnel and equipment of ADN. It is performed manually and has not yet been tendered or contracted companies for this service as recommended by the Master Plan. Special Service: Trucks leased under the DIGAUE management are used for the bulky waste collection. As for branches and debris collection, there is a unit that receives different cases, either via the control system (photos of branches and debris on public roads) or through requests that users make to the Billing and Charge Department.	Plan. In addition to this, it is planned the introduction of an operation license for the service of big generators.		
	Program 304:	Establishment of Contract Auditing System	The procedures are defined for executing the control of private companies' contracts. The weakness we have is that although the control manual have been created and revised, an agreement is not yet reached with the companies for signature. There is a control system provided in the three (3) districts, each controller must ensure the compliance of 9 to 11 routes that conforms a macro-route. This system allows to serve in almost real-time the complaints given by citizens through the Billing and Collections Department, which are referred to the DIGAUE electronically, and these in turn are referred to the corresponding contractor via mail and to the controller via telephone, the complaint must be resolved in that same day.	It is maintained the guideline of Program 304 in the Updated Master Plan. In addition to this, it will be materialized the discussion about the monitoring contract which signature is included in the contract.	Done	Maintain
	Program 305:	Expansion of Collection Data Management	There are digital databases for Transfer Station and Duquesa weighbridge data. As for routes data, there are several time and motion report through GPS, control report, and in addition to this, the contractors send a report to route database, but the latter has not been systematized yet, because of personnel and equipment limitation and the DIGAUE hopes to have them beginning of 2010. It is worth to mention that the Duquesa data arrive via email every day where they are fed into a database and control charts. As for transfer station data, they are handled online from the DIGAUE and also received via email. An organized record of these operations since 2003 to date is available and those data are necessary for various analysis, including cost planning in the annual budget.	Data management for the collection system has been achieved both in Duquesa and the Transfer Station. The installation of a radio frequency in the Transfer Station jointly with double weighbridges and expanded capacity to weigh every type of vehicles in Duquesa completes data management for the collection service.	Done	Maintain
	Program 306:	Reform of ADN Direct Operation	The Directorate of Equipment and Transport was merged with the Directorate of Urban Cleansing. Therefore DIGAUE is in charge of rules for operation and maintenance of collection units, and the vehicle maintenance management theme in the project with JICA. The rules of operation and maintenance have not been systematized yet. Many operations are conducted and depend more practices on daily application, than its unification in a procedures manual. This is expected to be one of the major contributions of the project. Regarding the execution of pre pilot project by the municipality in 2005-2006, it achieved its goal of being a reference laboratory for enterprises operations, the controlling of the service quality, and the relationship with the community. However, the territory that has a very successful development is covered by the collection services by the concession to the ADN Services, who served on a regular basis since 2007.	Present own units by DIGAUE are used to provide collection service to schools, hospitals, institutions, and some commercial establishments and for emergency.	Done	Maintain
	Progra	Communi	As for information dissemination on cleansing system that allows		Done	Maintai

Item	Action Program recommended by former M/P		Present situation, observation (PR (1))	Revised M/P (PR (2))	By 2015	After 2015
	m 307:	cation with Citizens	citizens to contribute to the delivery of adequate and timely manner, the DIGAUE believes that this project should redefine this action program. In addition to the information dissemination such as the previous channel by Billing and Collections Department, I have seen today as one more measure to be used in this sense. Strengthening of the Environmental Information Center, the re-launch of the Cleansing School and the recent creation of the Municipal School of Leadership, as well as alliances with other entities that work on the issue of citizen education are more binding mechanisms than Triple-A and the collector companies, entity over which the formulation of the master plan to develop prior actions. The latter are to participate and further addressed complementary in the framework of a completely different strategy. The schedule of activities prepared by the team in charge of Leomaris Henriquez technically assisted by the JET member and has included the citizen observatory additionally to conduct a baseline survey in the middle of 2010 will undoubtedly be a good help.			n
	Progra m 1301:	Improve ment of collection quality	---	New item (Proposed on the revised M/P) Daily on time and fixed period collection	Done	Maintai n
Toward s Achiev ement of the Final Dispos al Goal (i.e. Sanitar y Landfil ling)	Progra m 401:	Improve ment of the Current Disposal Operation	ADN still uses the Duquesa landfill as final disposal site that is located in Santo Domingo Norte and is managed under a concession by the company LAJUN Corporation. The operation and access to Duquesa have improved significantly; although the tonnage received daily by the landfill has increased extraordinarily. LAJUN Corporation is undertaking a project with BIONERSIS, for biogass capture of Duquesa Landfill in the Framework of Clean Development Mechanism, and another project with the company BOLLEGRAAF the installation of a wastes separation plant, where 1,200 tons will be daily treated in order to improve environmental conditions of the landfill and to prolong service life of the landfill and to improve operating conditions of the informal recyclers.	ADN pays for the landfill administration at US$3.09 per ton. The operation of a new landfill would imply operation costs higher than the current ones which could be covered by the municipalities, either directly or through a subsidy of the Environmental Ministry. The range of price for adequate management in Central America and the Caribbean is approximately between 15 and 25 US dollars per ton.	Done	Maintai n
	Progra m 402:	Landfill Site Selection	Although it has not yet been determined the site to be used as landfill after running out of landfill life of Duquesa, which is estimated to be used for about 10 years. In 2008 the Mancomunidad de Gran Santo Domingo was established, integrating the surrounding municipalities to the National District, and in this framework technicians will be trained to discuss the appropriate potential sites for final disposal. With the creation of the Mancomunidad Del Gran Santo Domingo, the search for alternatives to a landfill now takes another magnitude. The discussion of this issue will be in the context of a community of over 3 million people and generates over 4,000 tons/day, but now it has more political strength by being comprised of nine municipalities and the National District, as ADN mayor chairs the Mancomunidad. The Japanese fund support to the IDB has pledged assistance to the Mancomunidad and this initiative will specially be used to define the national politics of solid waste management from the SEMARENA. This project, to be started in middle of 2011, will be conducted by a consultant hired by the IDB supported by a technical management unit which is expected to have the base in ADN in view of its capacity and the chairmanship of the Mancomunidad.	At the end of 2010, it will begin the study for Master Plan for Great Santo Domingo which is financed by the Japanese fund of IDB that will produce, among other results, the selection of three candidate sites. Results of this study are expected until the end of 2011.	To be re-examined in accordance with IDB study recommendations	
	Progra m 403:	Construct ion and Operation of a New Transfer Station	It has not been discussed until now the convenience of the construction of a second Transfer Station. The existing one located in Villas Agricolas sector is transferring about 850 tons of solid waste daily, having the capacity gradually increased if it is optimized the type of units utilized. It is to say that a greater use of small compactor trucks and improvement in the large trucks used for the transfer transport. The economic feasibility of a second Transfer Station with its	Economic feasibility for a second Transfer Station is very linked with operations located in or shared with peripheral municipalities which will be object of study inside the theme of the Mancomunidad of		

Item	Action Program recommended by former M/P		Present situation, observation (PR (1))	Revised M/P (PR (2))	By 2015	After 2015
			localization is closely linked with the issue of co-operations with surrounding municipalities which will be studied within the theme of the Mancomunidad of municipalities.	municipalities of Great Santo Domingo.		
Towards Achievement of the Waste Minimization Goal (i.e. Minimization Rate 15%)	Program 501:	Generation Control	The part of environmental education to date is carried out by the following sections of the ADN: Environmental Information Center, Municipal School Leadership (includes in its program with the neighborhood associations the part of urban cleansing) and Cleansing School. We hope that this project will strengthen the environmental education and information, which for years has maintained a low profile. It is still not applied the fee per volume generated by large generators, although the polluter-pay-principles is a goal for DIGAUE, the current tariff system does not allows it. It is coordinating with the Revenue Directorate to modify the system in the middle of 2010. The Revenue Directorate to date has shown greater interest in attracting more customers, which has been progressively achieved.	Most citizens do not conduct waste minimization practices (e.g., purchase responsibly, separate recyclable materials). It is not applied a fee for volume generated, however, "polluter pays principle" is basic principle of DIGAUE, the fee system does not allow it.	Review procedure and clarify role of ADN	Done
	Program 502:	Discharge Control	Actually there is the Recycling Promotion Center that has so far led a pilot project for the recycling of paper in collaboration with the company Moldeados Dominicanos S.A., institutions, and neighborhood associations, and it seeks to expand to privates and public schools and other generators of such material. Then, it is planned to involve other enterprises that want to use other materials (cardboard, plastic). In the case of colmados, they maintain reuse system with manufacturers of beers, sodas and malts, who gather glass bottles as the reverse logistics. There is also recycling initiatives promotion in the training offered by the Environmental Information Center, in the training at the Municipal School of Leadership and private enterprises that have joined the policy of Producer Extended Responsibility. In this sense, it is worth noting that the company PEPSICO has announced a donation of US$ 50,000.00 for a source separation project, and sale of recyclables with the Community Foundations, ADN contractors serving marginalized sectors located in the northern part of the city. This donation is being channeled through the Dominican Institute for Integral Development (IDDI).	Program 502: Discharge Control To promote recycling initiatives in companies, institutions, and commerce through the Recycling Promotion Center.	Review procedure and clarify role of ADN	Done
	Program 503:	Resource Recovery (Composting)	Compost production is under examination on a feasibility study, which will test on a pilot project with pruning waste the next year and then incorporate the market waste. It is expected that this will be one of the major adaptation project, because the DIGAUE considers it is possible to minimize some costs of transport and final disposal for organic wastes originated from both green wastes and market wastes. JICA acquired the shredding machine for pretreatment (shredding green waste (branch, etc.)) of a composting in October 2010. The shredding machine was transferred to DIGAUE for the execution of the pilot project. The 1st pilot project(shredding green waste) was started November 2010.	It is foreseen as a pilot project for the Project for Appropriate Waste Management in Santo Domingo de Guzman, National District, Dominican Republic.	Review procedure and clarify role of ADN	Done
Towards Achievement of the Financial Goal(Subsidy/ Cost Rate 30 - 50%)	Program 601:	Increase of Income	Since June 2004, the Revenue Directorate holds an outsourcing contract for managing billing and tariff collection that is in charge of a company called Triple A Dominicana. The billing is divided into five strata and it is currently distributed 120,000 bills monthly among households and commercial customers. The tariff collection management has increased steadily in the first five years of this contract, generating bills levels above 55% in the global sense, being above 75% in areas of higher tariff revenue. It has also started in some of the slums (barrios) with collection scheme by Community Foundations Escoba and Funsazurza that also provide waste collection services. However, the gap has been widening between the cost of cleaning system and fees collected by billing and waste collection, due to increased costs to maintain their sustainable operation, while tariff rates remain the same as in the 2004. It is not yet charged per volume generated to large generators.	Fee billing levels are higher than 60% in a global sense; it is above 75% in high income fee sectors.	Done	Maintain
	Program 602:	Reduction of Expenditures	In this part, due to the huge increase of the waste collection amount since 2006 to date, costs and expenses of DIGAUE have increased. The outsourcing contract for billing and tariff collection of waste has already been reformulated and expanded its coverage period. This renegotiation addressed the issue of honorary fees and any contracts the terms of actual validity satisfy both parties, the Revenue	Sustained increment of solid waste; consequently, costs and expenditures have increased in the Urban Cleansing Department.	Done	Maintain

Item	Action Program recommended by former M/P		Present situation, observation (PR (1))	Revised M/P (PR (2))	By 2015	After 2015
			Directorate is responsible for its execution.			
			The cost structure and its monitoring for the cleansing system is conducted in a thorough and permanent manner by DIGAUE and it can be seen year after year the increasing efficiency in the collection, even despite the national currency value decline with the time passage. In the past 5 years the waste collection has almost doubled, the service quality has been improved, staff has been increased, and ADN has increased its own vehicle fleet although the costs in real currency values have increased dramatically.			
	Program 603:	Subsidy to the Poor	ADN will spend this year about RD$ 1,050,000,000 and citizens will contribute approximately RD$ 200,000,000. It is observed that ADN subsidizes more than RD$ 800,000,000 in the service of solid waste collection, both for the poverty group and other groups living in the National District.	ADN financial management has deficit for the issue of SWM vs. contributions of citizens. There are not still institutional conditions to propose neither a focalized subsidy nor its reduction.	Done	Maintain
			Unfortunately, the ADN financial management was deficient for the SWM issue versus citizens' contribution. The subsidy that we applied has increased while the contribution made by the central government has remained static for the last three years. The DIGAUE understands that there are no institutional conditions to plan for focusing or reducing subsidy issue as raised in the formulation of the Development Study (Master Plan).			

B.3 Implementing Plan of Action Programs

B.3.1 Identify the goals and objectives by 2015

The following table shows the Expected Results, Achievement Schedule and present Implementation Status of each Action Programs. Other than Action Programs with status of "Completion" will be the main target of the revised M/P.

Table B-12: Action program of current M/P and implementation status

Strategies	Action Program	Expected Result	2006-08	2009-11	2012-15	Implementation Status 2011
1.Establishment of Legal Infrastructure	101: Establishment of a Basic Rule	Enactment of the "Regulation on Non-hazardous Waste Management"	◆			Completion
2.To strengthen the management organization	201: Strengthening of Coordination among ADN Directorates	Functions of the Directorates regarding MSWM are clarified	◆			Completion
	202: Reform of the Urban Cleansing Department of EMUCD	Necessary numbers of qualified personnel are assigned in DIGAUE	◆			Completion
	203: Establishment of Municipal Company	A Municipal Company is established			◆	Canceled
3. Towards Achievement of the Collection Goal	301: Categorization and Definition of Collection Services	Deferent services are well categorized and defined	◆			almost Completion
	302: Design of Collection Routes	Collection routes are designed	◆			Completion
	303: Establishment of Collection Service Structure	Contracts with the private sector are revised or newly made	◆			almost Completion
	304: Establishment of Contract Auditing System	New collection services are implemented	◆			almost Completion
	305: Expansion of Collection Data					Completion

Strategies	Action Program	Expected Result	2006-08	2009-11	2012-15	Implementation Status 2011
	Management					
	306: Reform of ADN Direct Operation					almost Completion
	307: Communication with Citizens					Communicate Continuously
	1301: Improvement of the quality on waste collection service	Regular and scheduled time collection		New proposal		
4. Towards Achievement of the Final Disposal Goal	401:Improvement of the Current Disposal Operation	Operation of Duquesa disposal site is improved	◆			In execution
	402: Landfill Site Selection	A new landfill is constructed and operated if necessary			◆	Study in execution
	403: Construction and Operation of a New Transfer Station	A transfer station is constructed and operated if necessary			◆	Depend on results of 402
5. Towards Achievement of the Waste Minimization Goal	501: Generation Control	Environmental education is conducted by the Environmental Information Center	◆			In execution by CPR & CIA
	502: Discharge Control	Recycling activities are conducted at supermarkets, colmados and/or schools	◆			In execution by CPR
	503: Resource Recovery (Composting)	Composting is carried out targeting the market waste	◆			PP in execution
6. Towards Achievement of the Financial Goal	601: Increase of Income	Income from collection service charge is increased	◆			In execution
	602: Reduction of Expenditures	Commercial service fee for billing and bill collection is reduced	◆			In execution
	603: Subsidy to the Poor	Subsidy is applied to the poor communities. Total amount of subsidy is reduced	◆			In execution

The targets by year 2015 are clarified based on this evaluation of present situations and implementation status, as shown in below table.

Table B-13: Achievement Target by year 2015

Strategies	Action Program	Expected Result	Implementation Status 2011	Achievement target by 2015
1.Establishment of Legal Infrastructure	101: Establishment of a Basic Rule	Enactment of the "Regulation on Non-hazardous Waste Management"	Completion	Maintain & improvement
2.To strengthen the management organization	201: Strengthening of Coordination among ADN Directorates	Functions of the Directorates regarding MSWM are clarified	Completion	Maintain & improvement
	202: Reform of the Urban Cleansing Department of	Necessary numbers of qualified personnel are	Completion	

Strategies	Action Program	Expected Result	Implementation Status 2011	Achievement target by 2015
	EMUCD	assigned in DIGAUE		
3. Towards Achievement of the Collection Goal	301: Categorization and Definition of Collection Services	Deferent services are well categorized and defined	almost Completion	Maintain & improvement
	302: Design of Collection Routes	Collection routes are designed	Completion	
	303: Establishment of Collection Service Structure	Contracts with the private sector are revised or newly made	almost Completion	
	304: Establishment of Contract Auditing System	New collection services are implemented	almost Completion	
	305: Expansion of Collection Data Management		Completion	
	306: Reform of ADN Direct Operation		almost Completion	
	307: Communication with Citizens		Communicate Continuously	
	1301: Improvement of the quality on waste collection service	Regular and scheduled time collection	PP	Completion
4. Towards Achievement of the Final Disposal Goal	401:Improvement of the Current Disposal Operation	Operation of Duquesa disposal site is improved	In execution	Completion
	402: Landfill Site Selection	A new landfill is constructed and operated if necessary	Study under way	Completion
	403: Construction and Operation of a New Transfer Station	A transfer station is constructed and operated if necessary	Depend on results of 402	Completion
5. Towards Achievement of the Waste Minimization Goal	501: Generation Control	Environmental education is conducted by the Environmental Information Center	In execution by CPR & CIA	Continued
	502: Discharge Control	Recycling activities are conducted at supermarkets, colmados and/or schools	In execution by CPR	Continued
	503: Resource Recovery (Composting)	Composting is carried out targeting the market waste	PP in execution	Maintain and operation
6. Towards Achievement of the Financial Goal	601: Increase of Income	Income from collection service charge is increased	In execution	Continuous improvement
	602: Reduction of Expenditures	Commercial service fee for billing and bill collection is reduced	In execution	Continuous improvement
	603: Subsidy to the Poor	Subsidy is applied to the poor communities. Total amount of subsidy is reduced	In execution	Continuous improvement

B.3.2 Contents of the Action Programs

With regard to the Action Programs to be achieved by 2015 that are extracted from the former M/P, their contents and progress to date are shown in the table below.

Table B-14: Contents of the Action Programs to be achieved by 2015

Strategies	Action Program	Expected Result	Situation till 2011	
3.Towards Achievement of the Collection Goal	1301: Improvement of the quality on waste collection service	Regular and scheduled time collection	Direct	Strengthening collection vehicle maintenance and prepare procurement of new collection vehicles
			Private	Strict control of contract conditions
4.Towards Achievement of the Final Disposal Goal	401:Improvement of the Current Disposal Operation	Operation of Duquesa disposal site is improved	It began reconstruction of existing access road by central government.	
	402: Landfill Site Selection	A new landfill is constructed and operated if necessary	It began to study on selection of appropriate landfill sites by IDB-JCF (Japanese Found for Consultancy Service). It result will be concluded in May 2012.	
	403: Construction and Operation of a New Transfer Station	A transfer station is constructed and operated if necessary	Depending on the result of the above study.	
5.Towards Achievement of the Waste Minimization Goal	501: Generation Control	Environmental education is conducted by the Environmental Information Center	It is executed by collaboration with Environmental Information Center and Recycle Promotion Center.	
	502: Discharge Control	Recycling activities are conducted at supermarkets, colmados and/or schools	It is executed by Recycle Promotion Center initiative in expanding the prior pilot project.	
	503: Resource Recovery (Composting)	Composting is carried out targeting the pruning waste	It is executed on pilot scale for basic data collection to expand for a full-scale project.	
6.Towards Achievement of the Financial Goal	601: Increase of Income	Income from collection service charge is increased	Fee billing level is higher than 60 on the whole and it is above 75% in high income sectors.	
	602: Reduction of Expenditures	Commercial service fee for billing and bill collection is reduced	Until 2010, there was a continued increase of solid waste; consequently, costs and expenditures have increased in the Department of Urban Cleansing. However, the generation amount has stabilized since 2011. In any event, it is important to strengthen the efforts to reduce solid waste amount by 3R activities.	
	603: Subsidy to the Poor	Subsidy is applied to the poor communities. Total amount of subsidy is reduced	ADN financial management has deficit for the SWM services vs contributions of citizens. There are not still institutional conditions to propose neither a focalized subsidy nor its reduction.	

B.3.3 Action Programs Execution Timetable

The execution timetable for the action programs taking into account progress of the former M/P is shown in below table.

Table B-15: Execution Plan of the Action Programs

Strategies	Action Programs	Expected Result		2012	2013	2014	2015
3.Towards Achievement of the Collection Goal	1301: Improvement of the quality on waste collection service	Regular and scheduled time collection	Direct	■	■	▭	▭
			Privet	■	■	▭	▭
4.Towards Achievement of the Final Disposal Goal	401:Improvement of the Current Disposal Operation	Operation of Duquesa disposal site is improved		■	▭	▭	▭
	402: Landfill Site Selection	A new landfill is constructed and operated if necessary		Depending on IDB study			
	403: Construction and Operation of a New Transfer Station	A transfer station is constructed and operated if necessary					
5.Towards Achievement of the Waste Minimization Goal	501: Generation Control	Environmental education is conducted by the Environmental Information Center		■	■	■	■
	502: Discharge Control	Recycling activities are conducted at supermarkets, colmados and/or schools		■	■	■	■
	503: Resource Recovery (Composting)	Composting is carried out targeting the pruning waste		■	▭	▭	▭
6.Towards Achievement of the Financial Goal	601: Increase of Income	Income from collection service charge is increased		■	■	■	■
	602: Reduction of Expenditures	Commercial service fee for billing and bill collection is reduced		■	■	■	■
	603: Subsidy to the Poor	Subsidy is applied to the poor communities. Total amount of subsidy is reduced		■	■	■	■

■ Improvement takes place ▭ Activity is maintained

B.3.4 Execution Plan of the Action Programs

a 1301: Improvement of the quality on waste collection service

It is found from the PP of Improvement of Discharge Manner implemented in this Project that unless the good-quality collection service (regular and scheduled time collection) is performed, discharge manner could not be improved. Therefore, collection quality should be improved by 2015.

b 401: Improvement of the Current Disposal Operation

Operation and maintenance of the Duquesa landfill site is conducted under the concession contract by Santo Domingo Norte Municipality with LAJUN (private company), therefore, measures for improvement will include modification of contract conditions when renewal of the contract takes place taking into account the contract amount. An urgent issue is access road improvement. In a rainy season and/or rain time it is very difficult to access to the landfill site mainly due to poor access road conditions i.e.; unpaved and with insufficient storm water drainage, and so on. It is the first priority of the improvement.

c 501: Generation Control

CPR endeavors the generation control based the recycle mechanism designed in this project.

d 502: Discharge Control

CPR endeavors the discharge control based the recycle mechanism designed in this project.

e 503: Resource Recovery (Composting)

It is to formulate a plan for expanding activities of the pilot scale to permanent and constant scale based on the experiences on the pilot project. Then it is executed based on that plan.

f 601: Increase of Income

Collected fee amount is drastically increased in year 2011 because of new tariff imposed. Furthermore, fee collection rate is a little increased. In addition to that, ADN needs to make an effort to improve the fee collection rate.

Table B-16: Transition of Fee Income

Year	Annually (RD$)	Monthly (RD$)	Ratio (annually)	Ratio (monthly)	Period
2009	210,327,973.39	17,527,331	100.0%	100.0%	12 Month (Jan. to Dec)
2010	221,269,181.46	18,439,098	105.2%	105.2%	12 Month (Jan. to Dec)
2011	302,861,446.89	27,532,859	144.0%	157.1%	11 Month (Jan. to Nov.)

g 602: Reduction of Expenditures

Make an effort to a reduction of expenditure by reducing waste generation and/or discharge amount in promoting the 3R activities.

h 603: Subsidy to the Poor

Present cleansing service budget is consisted with three sources where one-third is from the central government subsidies, and others are service fee and general expenditure of the ADN. ADN should make an effort to increase the fee collection rate, and the subsidy to the poor should be covered by the central government subsidy.

B.3.5 Execution Cycle of the Action Programs

Executions of the action programs are to be complied with PDCA (Plan, Do, Check and Action) cycle. PDCA cycles make up two cycles that are a long term (annual) cycle and a short term (routine) cycle. Purpose of the annual cycle is execution of the action program, and the short term cycle is an improvement day-to-day operation. Short term cycle period should be one or two weeks, such as the existing weekly meeting on every Friday and/or CPR bi-weekly meeting. Concept of the annual cycle is shown in below figure.

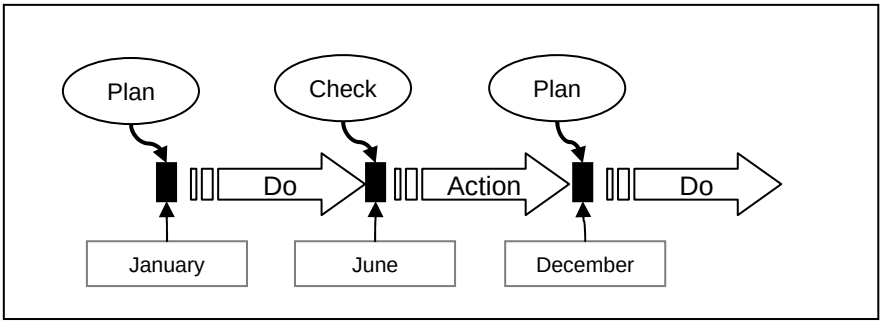


Figure B-4 : Concept of PDCA Cycle

The first annual cycle is defined that the annual plan as "P" for execution of the action programs as the revised master plan commencement in early January 2012. Check as "C" will be conducted six months after (May or June). After that, it will take an improvement action as "A" if necessary. Finally, look backs the year and prepares "P" for next year in December 2012. After year 2012, in every year it repeats the same cycle.
Furthermore, these activities will be disclosed on web page of the ASEO URBANO for promoting better understanding by citizen.

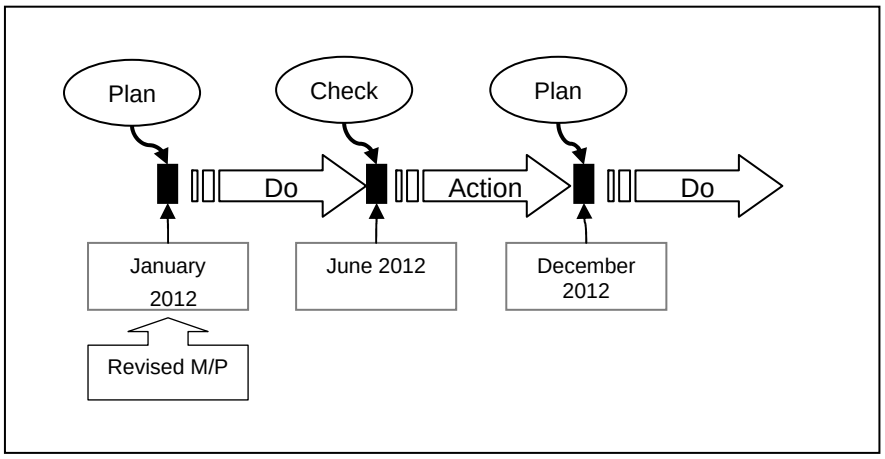


Figure B-5 : First PDCA Cycle Schedule

B.4 Monitoring of the Action Programs Implementation

B.4.1 Revision of the Waste Stream

Waste stream is a good quantitative monitoring tool for the state of implementation of the action programs. However the waste stream established in the former master plan study is not convenient to that purpose; therefore it is necessary to work for revising the waste stream.
Waste stream defined in the former M/P is shown below. It is composed of several non-measurable items and some assumptions that result in too complicated stream to adopt in a practical waste management.

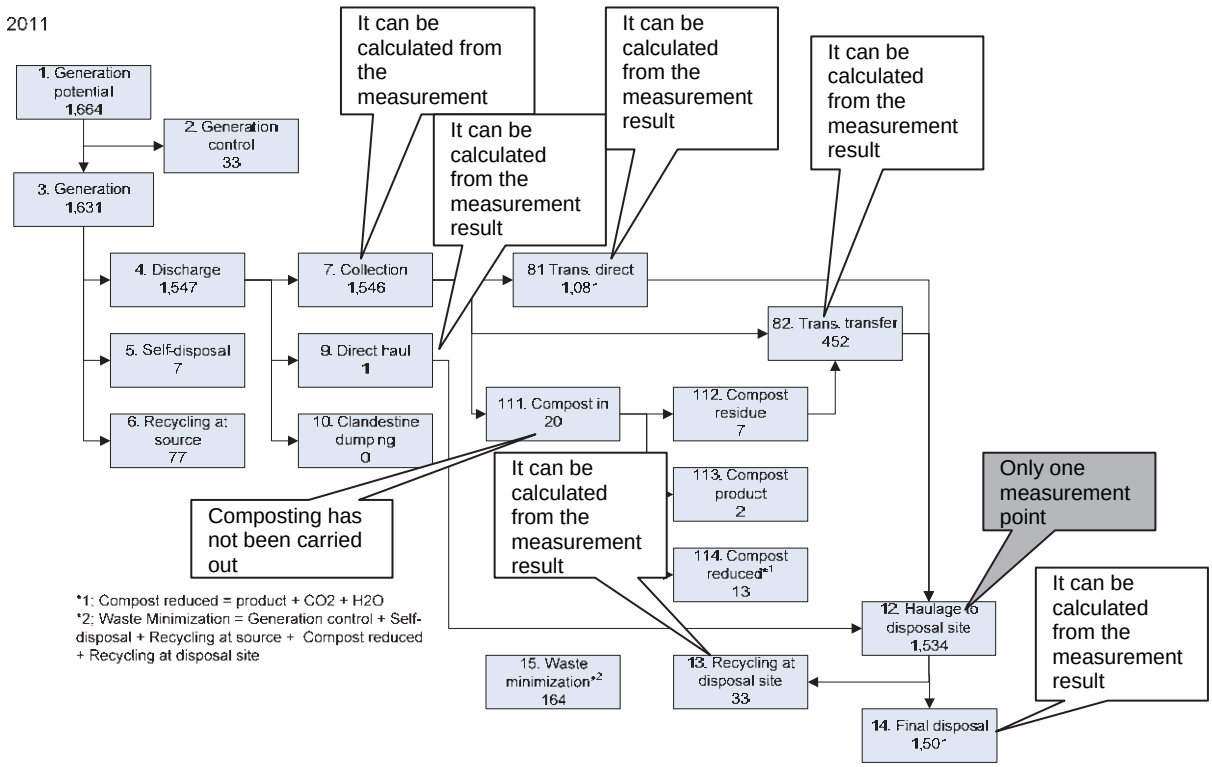


Figure B-6: Waste Stream in the former M/P

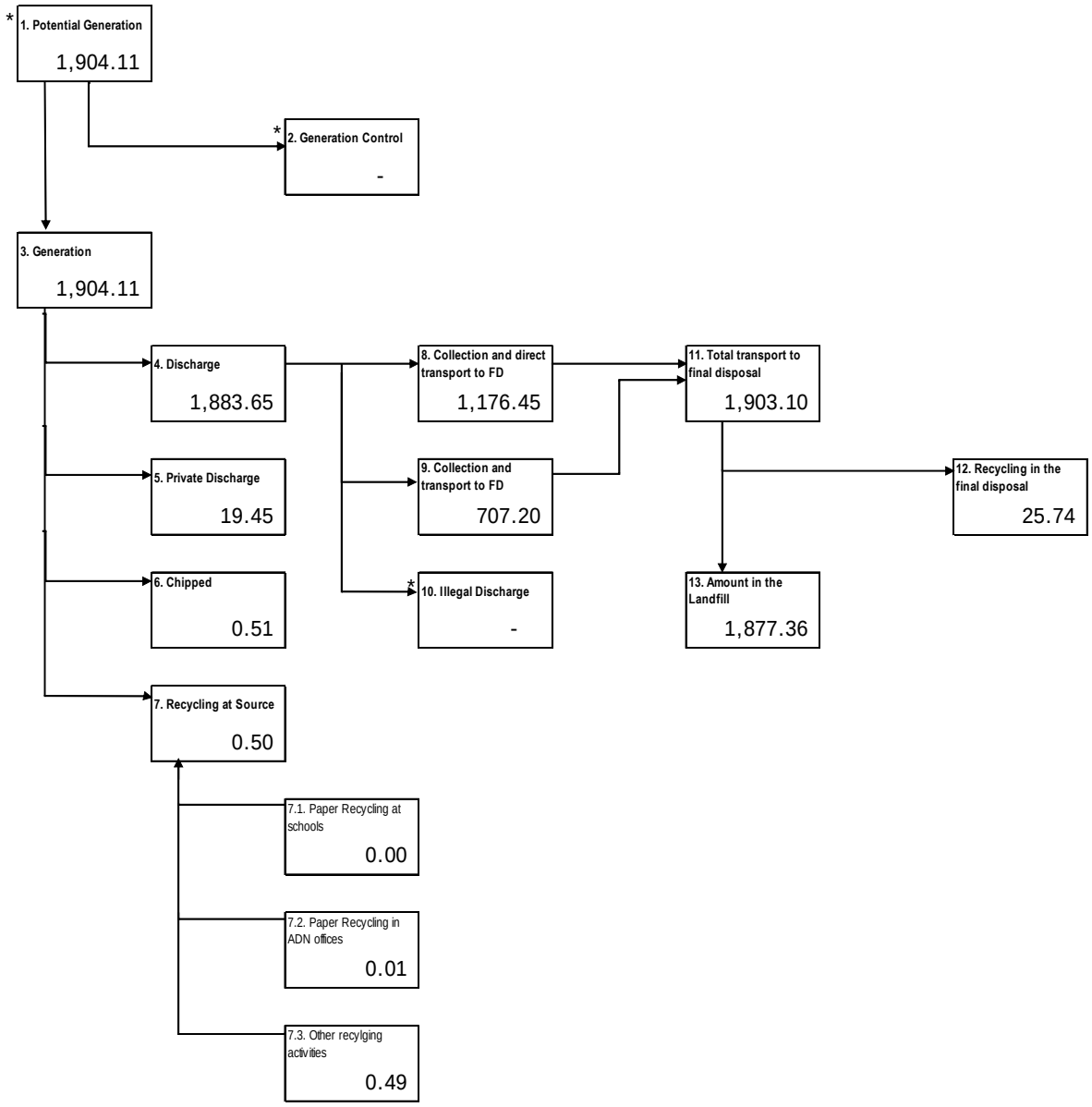
Although "7.Collection", "81.Trans direct", "82.Trans transfer", "9.Direct haul", "12.Haulage to disposal site" and "13.Recycling at disposal site" are the measurable items, actual measurement is carried out only at the entrance of Duquesa Landfill recording the waste disposal amount by the type of vehicles and classified into "81. Trans direct", "82.Trans transfer" and "9.Direct haul". Also "13.Recycling at disposal site" can be measured since 2010 at the segregation facility at Duquesa Landfill installed with the intermediation of LAJUN; inside its facilities materials are recovered by waste pickers.

Recycling activities near the generation source in waste stream vary widely: paper collection activity at schools initiated by this Project; paper collection at ADN and its related offices; recyclable material collection at supermarkets as a part of Corporate Social Responsibility (CSR) activity of private companies; material collection such as plastic, glasses, aluminum cans and steel cans by waste pickers in city streets; and collection of waste battery, bulky waste such as refrigerators and washing machines by certain entities. However amount of used paper collected at schools and ADN offices is the only measurable item in the recyclable waste stream for the time being[8].

8 Recycling Promotion Center (CPR) established inside ADN/DIGAUE has started a Pilot Project for gathering recycling information on collected amount of recyclable materials by recycling companies located inside ADN area and its suburbs, including their address, name of operators and so on and produces quarterly statement. However it requires more time to improve the quality of the statement due to the shortage of human resources in CPR (all of the staffs of Recycling Promotion Center have other assignments and there is no full-time staff appointed exclusively to this activity.).

Taking into account the above, it is revised the waste stream shown in below figure. (The values shown in the figure is just sample data and do not correspond to the actual values.)

Figure B-7: Waste Stream for Revised Master Plan



Observaciones:

* Se requiere determinar la metodología para el monitoreo del Potencial de generación, Control de generación y Descarga clandestina

Table B-17 : Data Input Table for the Revised Waste Stream

Año	Período	Total de días	3.Generación	6.Reciclaje en la fuente			7.Astillado	4.Descarga			11. Transporte al sitio de disposición		
					61.Reciclaje de papel en la escuela	62.Reciclaje de papel en las oficinas del ADN			8.Recolección	9.Transporte directo		12.Reciclaje en el sitio de disposición final (% de la cantidad del ADN)	13.Cantidad en el relleno
			4+6+7	61+62	CPR	CPR	Amancio	8+9	DB(DF)	DB(ET)	12+13	LAJUN	LAJUN
2011					61	62	7		1,200	800		100	1,900

B.5 Target Waste Reduction Amount

Waste haulage amount to the final disposal site is quite different between forecast in the former M/P and actual amount in 2011. The forecast amount in the former M/P is 1,534ton/day and the actual haulage amount is 1,925 ton/day (average value of January to October 2011). Therefore, target waste reduction amount in the revised M/P target year is modified based on the actual haulage amount in 2011.

Waste haulage amount to the final disposal site estimated based on generation ratio in 2011 is 2,103ton/day and actual being 1,925 ton/day. Actual amount is 91.5% of the estimated amount. In other words, it can be interpreted that waste reduction of 8.5% is achieved in 2011. Based on this, target reduction ratio in the revised M/P is set up 8.5% for estimated amount.

Table B-18: Target Waste Reduction Amount in 2015

Year	Original M/P (ton/day)	Actual (ton/day)	Estimated amount (ton/day)	Ratio (Actual/ Estimated)	Target amount(ton/day)
2005	1,413	1,405	-	-	-
2008	1,500	1,709	-	-	-
2011	1,534	1,925	2,103	91.5%	-
2015	1,494	-	2,464	91.5%	2,255

B.6 Draft Final Disposal Development Plan

B.6.1 IDB Study

The site selection study of the new final disposal site for Gran Santo Domingo Area is under implementation at this moment financed by IDB Japanese Trust Fund for Consultancy Services. Outline of the intermediate results of the study described below.
The basic evaluation was based on geological, geotechnical, weather, hydrology, and hydro-geological criteria. Additional, exclusion criteria such as distance from Greater SD centers, absence of potential social conflicts, and access were considered.
Consequently, three candidate sites were pre-selected: Duquesa (current site), el Veintidos (Santo Domingo Norte), and Mal Nombre (Santo Domingo Norte). See following figure.

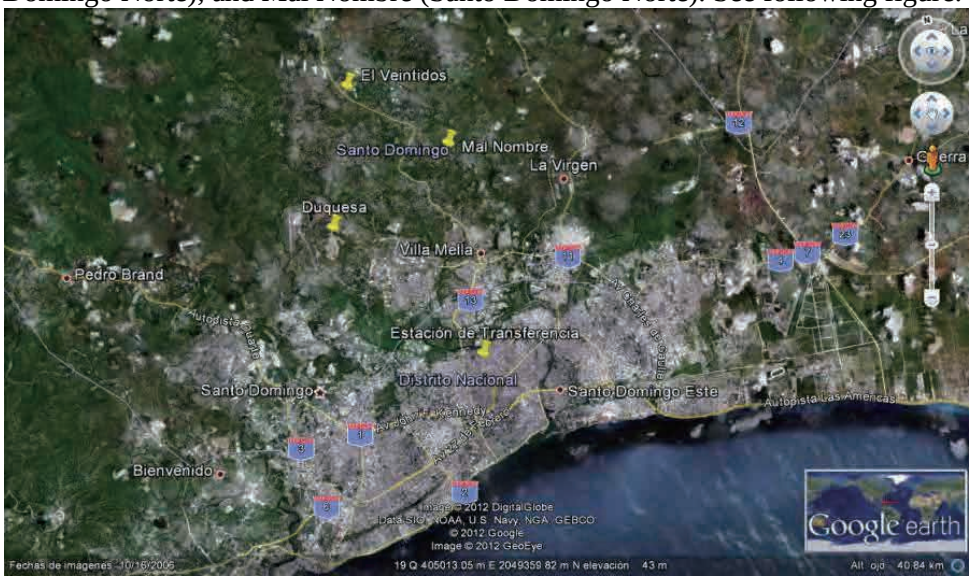


Figure B-8 : Location of Candidate Sites

For the transfer system there are two scenarios proposed with $65m^3$ transport trucks.

Scenario 1	Transfer stations will be constructed in San Cristobal, Boca Chica, San Antonio de Guerra, Santo Domingo Este, and current transfer station at the National District. The remaining municipalities will have to transport directly to the final disposal.
Scenario 2	Six transfer stations are to be constructed in San Cristobal, Boca Chica, San Antonio Guerra, Santo Domingo Este, Santo Domingo Oeste, and Pedro Brand. The current transfer station of ADN should be expanded to 1,500 tons/day.

The study will be completed in June 2012, if on schedule. However, it is concerned that run late due to the delay of make consensus in the Mancomunidad de Ayuntamientos de Santo Domingo.

B.6.2 Draft Final Disposal Development Plan

ADN intended to prepare the final disposal development plan which includes development of a new sanitary landfill site and appropriate closure of the Duquesa controlled dumping site. Duquesa controlled dumping site is the shared use with the 11 municipalities in the Santo Domingo Metropolitan area at the moment. The 10 municipalities (members of Mancomunidad de Ayuntamiehentos de Santo Domingo other than ADN) has the same intention of shared use.

Under such circumstances, it is necessary to establish some benchmarks to prepare the final disposal development plan. Therefore, this report clarifies an outline of necessary work items for the preparation of the final disposal development plan, such as technical system, institutional system and schedule.

B.6.3 Outline of the Plan

a Organization arrangement

It should organize the special task force for new sanitary landfill development and appropriate closure of the Duquesa controlled dumping site. The special task force is in charge of the technical matter. Ideally, the task force should be independent from the political situations which might affect the 11 municipalities in the Santo Domingo Metropolitan area.

b Feasibility study

The feasibility study should consist of following items;

- field investigations (topographical survey, geological survey, hydrological survey, environmental survey, etc.),
- preliminary design of facilities,
- environmental study,
- technical evaluation, and
- financial evaluation.

The study results should provide useful materials for environmental impact assessment procedure, stakeholder meeting, and explanation to investors, etc.

c Environmental impact assessment

Environmental impact assessment should be carried out based on the applicable laws and regulations in the Dominican Republic and related international financing institutions. Additionally, the study includes social impact study.

d Land acquisition

The land acquisition procedure should start by finishing the feasibility study at latest.
Examination of available fund
It will be decided to fund source(s) for the project based on the examination of fund resource(s), availability and condition(s) of a funding.

e Basic design

It should be defined in the basic design the specifications of the new sanitary landfill site development, including those for the construction and installations works, operation and maintenance works, etc. The technical specifications and necessary drawings for tender should be prepared in the basic design.

f Bidding

Tender will be carried out based on the basic design.

g Detailed design

The contractor selected by the tender, will prepare the detailed design, including work schedule, drawings, technical calculations and technical specification of the works, etc.

h Construction and installation works

Contractor will start the construction and installation works, after getting approval and/or permission from the special task force of the project.

i Preparation of appropriate closure plan of the Duquesa dumping site

It should prepare the appropriate closure plan, including monitoring plan of post closure for the Duquesa controlled dumping site by finishing construction and installation works of the new sanitary landfill. The plan will start after completion of the new sanitary landfill.

j Closure of the Duquesa dumping site

It will start the closure works based on the closure plan and execute post closure monitoring.

Table B-19: Draft Schedule of the Final Disposal Development

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
IDB study													
Organization arrangement (establishing execution body for landfill development)													
Feasibility study (site survey and conceptual design)													
Environment impact assessment													
Land acquisition													
Examination of available fund													
Basic design and prepare TOR for the new disposal site development													
Bidding for the new disposal site development													
Detailed design													
Construction													
Preparation of Duquesa closure plan													
Duquesa closure work													
Monitoring work to Duquesa													
Duquesa CDM project period													

C Improvement of Vehicle Maintenance Management

C.1 Present Condition and Problems on Vehicle Maintenance

In the initial instance of the Project, regarding the ADN owned collection vehicles, the C/P and JET examined the present situations and problems of the below listed topics.

C.1.1 Present Condition of Organization, Personnel Structure, Law / Regulation on Vehicle Maintenance

- Organizational chart
- Officers, Technicians, Engineers, Mechanics, Workers and their respective duty on Vehicle Maintenance Work
- Officers, Clerks, Accountings, Workers and their respective duty on Procurement Work of Tools, Parts, Oil, Consumptions, etc.
- Direction, Command and Report System in the organization on Vehicle Maintenance Work and Procurement Work
- Team structure of mechanics, their duties, technical fields (overhaul, welding, painting, etc), working condition (place, working hour, day-off, etc.)
- Any Law / Regulation / Guideline for Vehicle Check/Maintenance
- Operation manual of the Workshop (Definitive one or in the project)

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- The workshop is divided by work areas, there are 3 shift Works, including the weekends.
- There is no any law/regulation for vehicles check/maintenance
- There is not any workshop operation Manual.

C.1.2 Present Situation of Workshop Facility, Equipments, Stock House/Room for Tools, Parts, etc

- Map / drawing of the premises of the workshop
- Drawing of the building. Ground floor drawing, Elevation drawing, Electric wiring, Pipe layout
- Layout of Office, Maintenance Yard, Stock house, Oil storage house, etc.
- Wastewater control system, e.g. Waste oil separation system

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- There are no drawings necessary for vehicle maintenance.

C.1.3 Present Situation of Condition/Operation of Collection Vehicles

- Types of Vehicles
- Condition of the Vehicles, and Breakdown Frequency and Repair Record
- Location of Garage, Condition of Garage
- Feature of collection service, collection-point, interval, items, dustbins, etc.
- obstacles that may disturb collection service

- Damage of vehicle by bad operation
- Each crew member are assigned to same vehicle or not
- Daily checkup
- Record of the breakdown vehicle
- records of vehicles repair in the workshop
- Cause of damage to the breakdown vehicle and its record

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- It has some problems such as a lot of junk trucks, limiting the working available space.
- In most cases drivers are assigned to drive the same units, only in cases of breakdown they drive other vehicles.
- Washing is done weekly, but any written record is not kept on these daily checks or washing, only if a fault is detected and it is repaired, then it is included in the repair record of the unit.
- Written record is kept of the breakdowns that occur in each units, but they are not recorded on computer.
- Most of breakdowns are generated in the electrical and electronic system (damage to electrical branch wires) caused by rats, problems with sensors, computers. Also, the compaction system chain, followed by clutch failures. They are registered manually in a record book; there is not a system that allows us to obtain the accurate recording of each of them.

C.1.4 Present Condition of Check and Maintenance of Vehicles

- Procedure of Repair of Vehicle
- Procedure of Check and Maintenance of Vehicles
- Breakdown Repair only?
- Regular Preventive Maintenance
- Regular Check System of the Vehicles
- Possible Repair / Maintenance field in ADN Workshop
- Impossible Repair / Maintenance field in ADN workshop
- Technical capacity of Mechanics
- Existence of domestic Private Maintenance Dealer, their Technical capacity
- Procedure of Consignment of Maintenance of vehicle to Private Dealer
- Workshop/maintenance manual of each vehicle

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- When a fault is found in the review or daily operation of the vehicles, it is notified and the head of workshop assigns mechanics for attention to the problems. There is no written report or a work order at the workshop, at the time of carrying out the repair it is written in the record book.
- Maintenance is performed, but it lacks a database system that enables us to keep the correct dates for such maintenance, but is done periodically.
- A review is performed daily prior to daily cleaning service, but there are not written records of this review.
- There are no such manuals either in Spanish or English.

C.1.5 Present Situation of Management of Equipment, Tools, Parts, Consumables, etc.

- Outline of Stock Inventory Management
- Stock Inventory Record: Kinds & No. of Equipments, Tools, Parts, Consumables, etc.
- Stock Place, Inventory Check, Inventory Adjustment, Supply of Items
- Procedure of Lost Control of Items
- Procedure of Allocation of Tools to each mechanic / mechanic team
- Problems of existing equipments/items
- Necessary replacement/procurement method of equipments/ items How to supply parts?

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- At the time of requesting a consumable, a parts request form is filled, for control of the stock, where this form is kept physically, but not digital.
- There are shelves for placement of parts and tools; the size of the space is appropriate, other conditions such as ventilation, fire systems, no appropriate sign indication.
- Most of the pieces and parts that are in stock are for units already out of service (green compactors) hence the inventory at 80% is obsolete.
- A written report is performed to the safety personnel; this in turn performs an investigation and notifies the results thereof.
- There are deficiencies in the amount of the necessary tools, which are given to the mechanics, by signing a record book to keep track of them.
- There are no tools necessary for the completion of work, and it is difficult to control them.
- In the case of lubricants, fuel and tires, the supply is done through a public bidding process, where a competition is performed with the specifications required by the ADN, and all enterprises contestants submit their proposals. Evaluation is given for the choice of best of all.
- In the case of other equipments and materials, they are purchased through the budget allocation that is an operational fund assigned to the equipment department.
- The purchases required by the General Directorate of Urban Cleansing and Equipments are made quarterly following the law 340-06 of public procurement and contracting, either by bidding or price comparisons, depending on the amount of the asset to be acquired.
- It is through a program (AVACOM) used by this municipality, where each item has to be previously created with an assigned code.

C.1.6 Present Situation of Record, Account Book, Manual

- Attendance Record Book of workers
- Operation record described/checked by driver/collector
- Account book of Vehicle
- Operation Record, Check & Maintenance record of Vehicle
- Record of purchase / supply of Vehicles / Equipments
- Account book of Equipments, Tools, Parts, Oil, Grease, Fuel, Consumables, etc.
- Add up record/book, monthly record, year book
- Manuals for operation / maintenance for each vehicle

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- First attendance is controlled in the manual format of attendance and then it is digitized for carrying out the records. Today a mechanical clock is installed to control employee attendance. It started to be used from January 2010.
- These records are not used, each route is assigned to the driver, and then is monitored through inspectors and GPS system which checks the route, distance and fuel consumption, and weight for each trip is recorded in the database of Transfer Station.
- No records are kept of the daily revision of vehicles, only when damage repair is conducted.
- These records of weights and trip numbers are recorded through the Transfer Station system.
- There are no Operation Manuals.

C.1.7 Present Situation of Supply of Vehicles and Necessary Items

- Procedure of Supply/Replacement of Vehicles
- Life of Vehicle (How do you decide the termination period of the vehicles?)
- Budget requirement procedure
- Supply schedule
- Scrap vehicle management
- Supply Route (domestic/abroad, purchase/grand-in-aid, etc.)
- Explanation / Training / Manual at delivery of vehicle / equipment

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- There is no plan for replacement.
- There is no procedure to tell us until what year vehicles can operate. They will remain in operation while it is efficient, and operation and maintenance costs are sustainable within the system.
- There is no schedule established for vehicles supply, but there is for consumables.
- To scrap it, and then make a public bidding as scrap for official release to the General Directorate of National Goods.
- Currently the collection units are those donated by Japanese Municipalities and the Government of Japan through the Society for Promotion of Japanese Diplomacy (SPJD).
- No training took place and just a few manuals in Japanese were given.

C.1.8 Present Situation of Management System in Workshop

- Management system of Workshop
- Manager’s task on workshop management
- Management and Activities for safety work
- Law / Ordinance on Occupational Health and Safety
- Uniform, safety gears for workers
- Health Activity and Occupational Health Management
- Manual for safe maintenance work
- Record & Statistic of occupational accidents
- Management of stock control of tools, parts, consumables, etc.
- Condition of Stock & Arrangement of tools, parts, consumables, etc.
- Keep clean activities for stock of tools, parts, consumables, etc.
- TQC / QC activities (Total Quality Control / Quality Control)
- Risk prevention activities
- Training for Workshop Activities Management
- Safe operation training for drivers and collectors

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- Signs have been placed with certain safety standards to be accomplished and meeting to explain the issue, but there has been no training or other types of activities.
- Previously, there was not uniform for workshop workers; but there were some gloves, safety glasses and welding mask. The safety equipment is minimal.
- There is no any Operation Manual.
- No records are kept of work accidents.
- In the case of consumables such as tires, lubricants, fuels are needed, an application form is filled and they are requested to the warehouse.
- There are no 5S activities.
- Tools and parts cleansing procedures are not formulated.
- There are cleaning workers for warehouse but tools and parts cleaning works are not included in their works.

C.1.9 Present Situation of Budgetary system for vehicle acquisition and maintenance

- Outline of actual budgetary system for acquisition and maintenance (Budget planning, Budget requirement, budget execution procedure)
- Budgetary Ordinance / Regulation / Rules
- Record of budget and expenditure for vehicle maintenance of last year

a Findings

In examining the present situations and problems of the above, primary findings of are as follows.

- The ADN total budget is divided by work programs. The budget of the General Directorate of Urban Cleansing is through the ADN Budget Office which coordinates and monitors the requirements and execution.

C.2 Preparatory Works for Improvement of Vehicle Maintenance

A series of discussion were held among C/P and JET in order to solve the problems found through the examination of the present conditions aforementioned. It is determined to expedite improvement in (1) Vehicle Book-Log Formulation, (2) Daily and Regular Inspection Establishment, (3) Stock Management including Spare Parts Management, (4) Occupational Safety and Health Management, and (5) Database for Vehicle Management and maintenance.

On the other hand, since it is planned the vehicle workshop transfer, examination is given on (6) Vehicle Workshop Transfer.

C.2.1 Vehicle Book-Log Preparation

Objective

The main objective of this task is to create a service maintenance life sheet for vehicles which would have to be:

- Easy to understand present condition of each ADN collection vehicle
- Easy to refer history of repair & maintenance of each vehicle
- Easy to grasp tendency of trouble to prepare more efficient maintenance

In the design of Vehicle Maintenance Service Life format, it would register preventive and corrective historical maintenance activities; this sheet will be a record document of collection

and maintenance activities being important data for the database, it contains the following information:

- Vehicle specification.
- ID number, chassis number, body number, body manufacturer, fabrication year, loading capacity, engine number, others.
- Register the vehicle condition & repair history (and/or maintenance program).
- Date of each record.
- History of damaged part and how it is repaired, repair maintenance, and others.

ADN
Ayuntamiento del Distrito Nacional
Dirección de Aseo Urbano y Equipos
Hoja de Vida Vehiculos

FICHA	Fabricante Carrocería	CHASIS	CAJA	Año	Modelo	Tipo de Motor	Capacidad	No. Caja

Sección	Área de Mantenimiento
Motor	Válvula, varilla de levantamiento
	cadena de distribución, correa
	Retén de Aceite del Árbol de Leva
	Culata
	Distribuidor
	Tapa del Distribuidor
	Cable de Alta Tensión
	Punto, Condensador, rotor
	Bujía/Chispero
	Resorte de Ignición
	Carburador
	Correa del Ventilador
	Filtro de Aceite
	Filtro de Aire
	Filtro de Combustible
	Bomba de Combustible
	Radiador
	Manguera de Caucho
	Bomba de Agua
	Junta de la Bomba de Agua
	Refrigerante de Vida Superlarga
	Escape
	Boca del Inyector
	Bujía de Calentamiento
Transmisión	Transmisión
	Sello del Aceite de la Transmisión
	Aceite de Transmisión
	Balineras/cojinete del disco del Embrague
	Placa de presión del Disco del Embrague
	Manguera, tubería del Disco del Embrague
	Disco Principal del Embrague
	Operador del Disco del Embrague
	Aumentador Presión (Booster) del Disco Cloche
	Junta Universal
	Diferencial
	Sello de Aceite del Diferencial
	Aceite del Diferencial
	Sello de Aceite del Cubo de la Rueda
	Balineras/Cojinete de las Llantas
	Rodillo de Cambio
Dirección Hidráulica	Terminal de Tracción
	Banda de la Dirección Hidráulica
	Bomba de la Dirección de Control
	Manguera, tubería de la dirección de control
	Aceite de la Caja del Control de Dirección
Suspensión	Resorte
	Casquillo de Resorte

Fecha	Odómetro

Leyenda: inspeccionado **V**, Desarmado e inspeccionado **W**, Reparado **R**, Cambiado **X**, Ajustado **A**, Apretado **T**, Lubricado **O**, Limpiado **L**, Frente Derecho F/D, Frente Izquierdo F/I, Trasero Derecho T/D, Trasero Izquierdo T/I

	Sección	Sistema de Frenos										Sistema Electrónico									A/C				Carrocería (Compactador)									Nota							
	Área de Mantenimiento	Disco Frontal	Juego de Pinza de Freno Frontal	Zapata ó forro para freno	Manguera/tubería para Freno	Tambor del Freno	Master de Freno	Cilindro del Freno de la Llanta	Aumentador de Presión del Freno	Aceite de Freno	Freno de Mano	Freno de Escape	Alternador	Motor de Arranque	Batería	Parlantes (speaker)	Lámpara de Combinación Delantera	Lámpara de Combinación Trasera	Luces	Limpia Brisas brazo/cepillo	Medidores	Cable Métrico	Gas	Rodamientos de Aire Acondicionado	Correas	Condensador	Evaporador	Manguera/tubería	Toma de Fuerza	Interruptores Eléctricos	Manguera, tubería hidráulica	Bomba Hidráulica	Cilindro Hidráulico	Filtro	Caucho para evitar esparcimiento de residuos	Caucho para contener el agua residual	Tapón para el agua residual	Superior/Inferior pasador/camisa	Camisa, Pasador de cilindro							
Fecha	Odometro																																									
Leyenda	Inspeccionado **V**, Desarmado e inspeccionado **W**, Reparado **R**, Cambiado **X**, Ajustado **A**, Apretado **T**, Lubricado **O**, Limpiado **L**, Frente Derecho F/D, Frente Izquierdo F/I, Trasero Derecho T/D, Trasero Izquierdo T/I																																									

Figure C-1: Example of Vehicle Book-Log

C.2.2 Daily Inspection and Regular Inspection

The establishment of daily inspection and regular inspection is one of the main tasks and it is where more efforts have been developed to attain the objectives.

a Objectives

- Create sound condition and minimize damage of vehicle by introduction of preventive maintenance
- Improve present inspection, repair, maintenance work

The current maintenance system was studied in order to understand how the maintenance activities are carried out. It is found that the principal task to be defined is when an efficient maintenance should be provided. A preventive, corrective, and condition based maintenance is performed, rather than based on regular time periods and dates, but it should improve with the implementation of the maintenance plan.

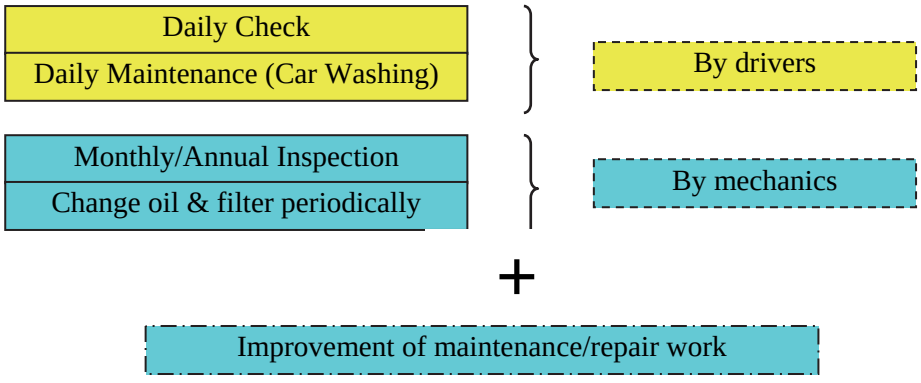


Figure C-2: Image of Maintenance and Repair

As part of the procedures, a daily check format for the units was designed where a general vehicle check is performed before the operation itself. It is carried out the elaboration of verification sheets for monthly, 3 months, and annual checks taking into account all issues which should be reviewed during those periods.

Ayuntamiento del Distrito Nacional
Dirección de Aseo Urbano y Equipos
Formulario Verificacion Diaria de Unidades

Fecha
Turno
Nombre

Marque: √ Buenas Condiciones X Malas Condiciones

No.	Ficha	Hora Salida	Frenos	Embrague	Temperatura	Aceite	Bateria	Sistema Hidraulico	Neumaticos	Vidrio Frontal	Vidrios Laterales	Limpia Vidrios	Bocina	Retrovisores	Luces	Sistema de Escape	Pintura	Limpieza		Chofer	Ruta	Comentarios
1																						
2																						
3																						
4																						
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Figure C-3: Format of Vehicle Daily Inspection

C.2.3 Stock Management

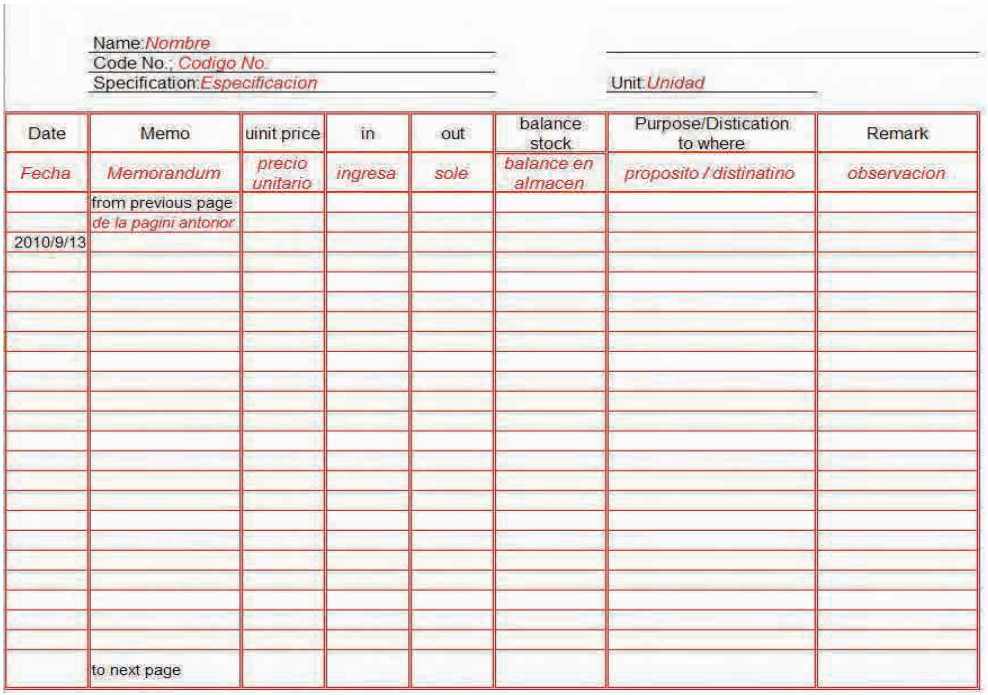
a Objectives

- Necessary equipments/materials can be found and use speedy and smoothly.
- More effective work and better environment by well put-in-order arrangement of equipments and clean condition of storehouse

An analysis was conducted on the flow of spare parts and consumables in the vehicle workshop to find improvement points and to establish synchronization mechanism with the Data Base.
It was examined to plan to introduce 5S (Japanese principles) and recommendations are made for the safe storage of consumables like oils and tire tubes. It was established an accounting book for spare parts stock which initially would be implemented for main 41 items.

Table C-1: Spare Parts Stock Management

1	Brake liquid	22	Tires 245 / 65 / R17
2	Oil 10w30	23	Tires 165-60-R14/tubes (kia)
3	Oil 15w40	24	Tires 22.5x11R
4	Oil 25w60	25	Tires 24.5x11R
5	Engine Oil 60	26	Tires 1100-20/tubes
6	Engine Oil 40	27	Tires 600-14/tubes
7	Hydraulic Oil 68	28	Tires 650-14/tubes
8	Oil for Automatic Transmission ATF	29	Tires 700-16/tubes
9	Differential Grease	30	Tire 10-16-5
10	Thick Grease	31	Tire 17.5x25
11	Liquid Grease	32	Tire 22.5x80x18
12	Grease remover	33	Tire 17.5 L x 24
13	Battery Liquid	34	Tire 315-80R-225
14	Coolant 50x50	35	Tires 165-60-R14/tubes (kia)
15	Tires 235 / 60 / R17	36	Tires 235-70-R16/tubes
16	Tires 275 / 65 / R17	37	Tires 265-70-R16
17	Tires 275 / 65 / R17	38	Battery 11/12
18	Tires 275 / 65 / R17	39	Battery 17/12
19	Tires 275 / 70 / R16/tubes	40	Battery 15/12
20	Tires 185 / R14C / tubes	41	Battery 13/12
21	Tires 265 / 70 / R 15		



Name:*Nombre*
Code No.: *Codigo No.*
Specification:*Especificacion*
Unit:*Unidad*

Date	Memo	uinit price	in	out	balance stock	Purpose/Distication to where	Remark
Fecha	*Memorandum*	*precio unitario*	*ingresa*	*sole*	*balance en almacen*	*proposito / distinatino*	*observacion*
	from previous page						
	de la pagini antorior						
2010/9/13							
	to next page						

Figure C-4: Guideline for the Format of Warehouse Inventory

C.2.4 Spare Parts Management

One of the main limitations regarding spare parts management is the procurement of electrical spare parts for the compactor units which ADN has. The JET helped to procure the spare parts which are needed to be replaced and could not be found in the local market. Additionally, it was also created the procedure to look for different alternatives when it is needed to replace once again these spare parts.

Figure C-5: Pictures of Procured Parts

a How to order damaged electrical parts

Information necessary to purchase spare parts is as follows:

- ID number of damaged parts (relay, sensor, switch)
- To take pictures in the case of the control panel circuit board
- Body number of compactor truck
- Make a sketch of the truck and indicate the location of spare part damaged in the sketch.
- If damaged part is not original, the original one should be ordered. This is because it was found the similar parts were exchanged between trucks.
- It is dangerous to exchange parts (sensors / relay / switch) between trucks.

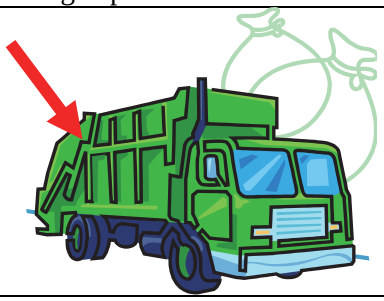
Control panel circuit board	Location of Plate with the Body number
	
Damaged part will be installed here	Plate with Body number
	

Figure C-6: Damaged Electrical Parts

C.2.5 Occupational Safety and Health

a Objectives

- Make zero/decrease both accidents and injuries in collection work and vehicle maintenance work.
- Secure safety of workers and improve waste collection service and maintenance work of collection vehicles.

With assistance of the counterpart, it is developed a plan to establish an occupational safety and health system. Specific tasks are being developed in this regard.

- Establish organization (Safety and Health Committee/Meeting) to promote various safety & health activities
  - ✓ In this committee will be included personnel of the Human Resources department for this plan to serve as model in other areas of ADN.
- Check of risks at collection service field and vehicle maintenance shop
  - ✓ It is implemented safety patrols in order to share the experiences by JET.
- Case study on accidents and injuries in collection service & maintenance work
  - ✓ JET provided materials of case studies on accidents which have taken place in Japan. It is studied documents of case studies in Osaka Zero Accident Plan, and recent accidents related to compactor trucks in Japan.
- Prepare safety guideline of collection and maintenance work
  - ✓ Training regarding the safety guideline will be conducted in the final stage of this project.
- Studies and training for workers
  - ✓ Training of how to use fire extinguishers and first aid are to be included.
- Implementation of safety activities such as TBM (Tool Box Meeting), KYT (Kiken Yochi (Risk Prediction) Training)

Figure C-7: Presentation for Compactor Truck Safe Operation

C.2.6 Develop preliminary database for vehicle maintenance / management

A database for vehicles maintenance management is developed. The data base has to be as simple as possible and developed in generalized office software and freeware in order to ensure the continuous use of the data base after the Project is finalized in 2012.
The items to be managed in the database include maintenance interval and operating time for each vehicle, damage and repair history of each vehicle, and those items recommended after discussion among the JET and C/P. We have worked a preliminary outline of the basic components of database as shown below with the following objectives:

1. To have a systematic control and a maintenance schedule required in the urban cleansing compactors.
2. To organize a book keeping to allow following up of compactors maintenance, depending on the type of maintenance (Preventive, Corrective and Predictive).
3. To recognize common breakdowns of the compactors.
4. To have operations scheme that can make a follow-up for maintenance of the compactors in good conditions.
5. To control maintenance cost for each compactor.
6. To have a control of time spent for maintenance of the compactors.
7. To have a control of usage of diesel, fuel, parts and lubricants.
8. To have facility to keep accurate and measurable information of the preventive, corrective and predictive maintenances that has been given to the ADN Urban Cleansing compactors.

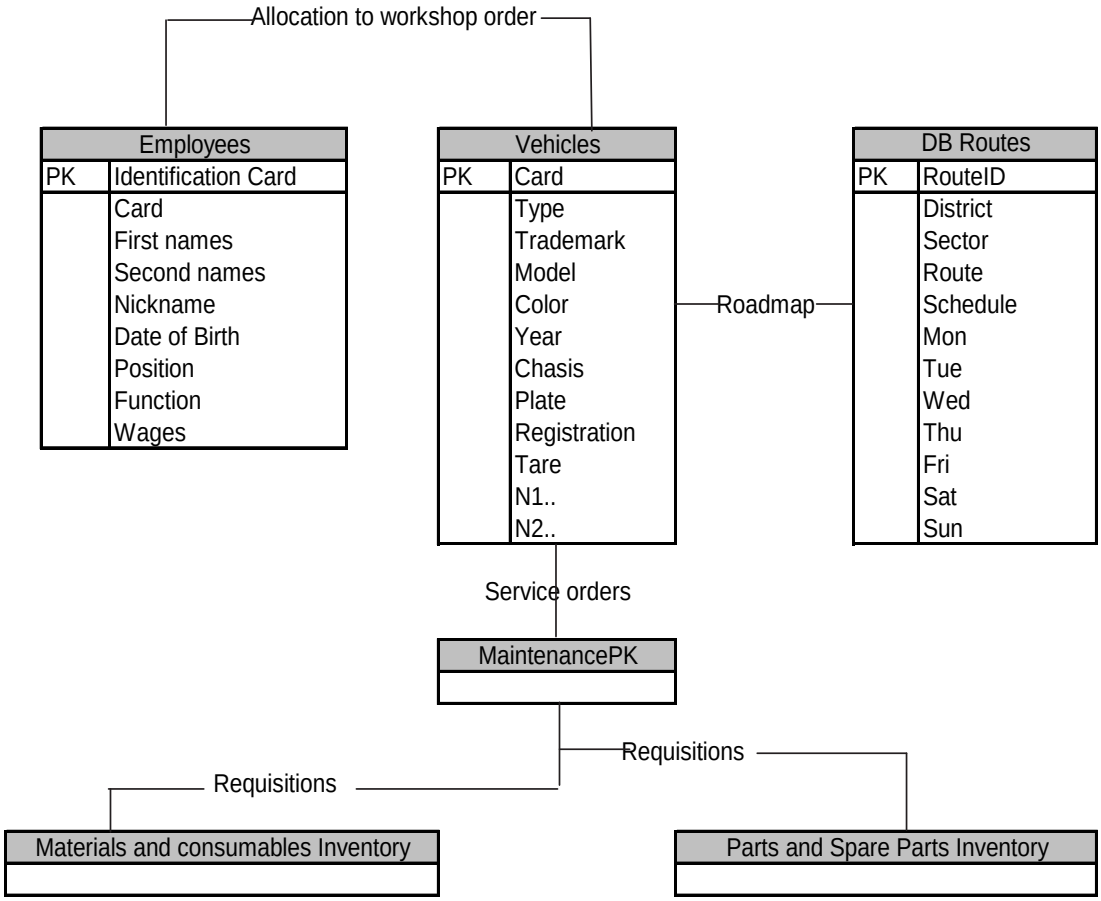


Figure C-8: Preliminary database for vehicle management

C.2.7 Database Management

a Objectives

- To grasp present condition of vehicles and parts soon and accurately
- To prepare necessary items on shelves always
- For efficient purchase of necessary items
- For prompt and accurate repair / maintenance of vehicles and increase operation ratio
- To make analysis easier for further improvement

It was studied all information which would be registered in the data base and there is progress in the design of formats which would be input into it. It was designed a preliminary DB to keep a historic record of the units in Microsoft Access.

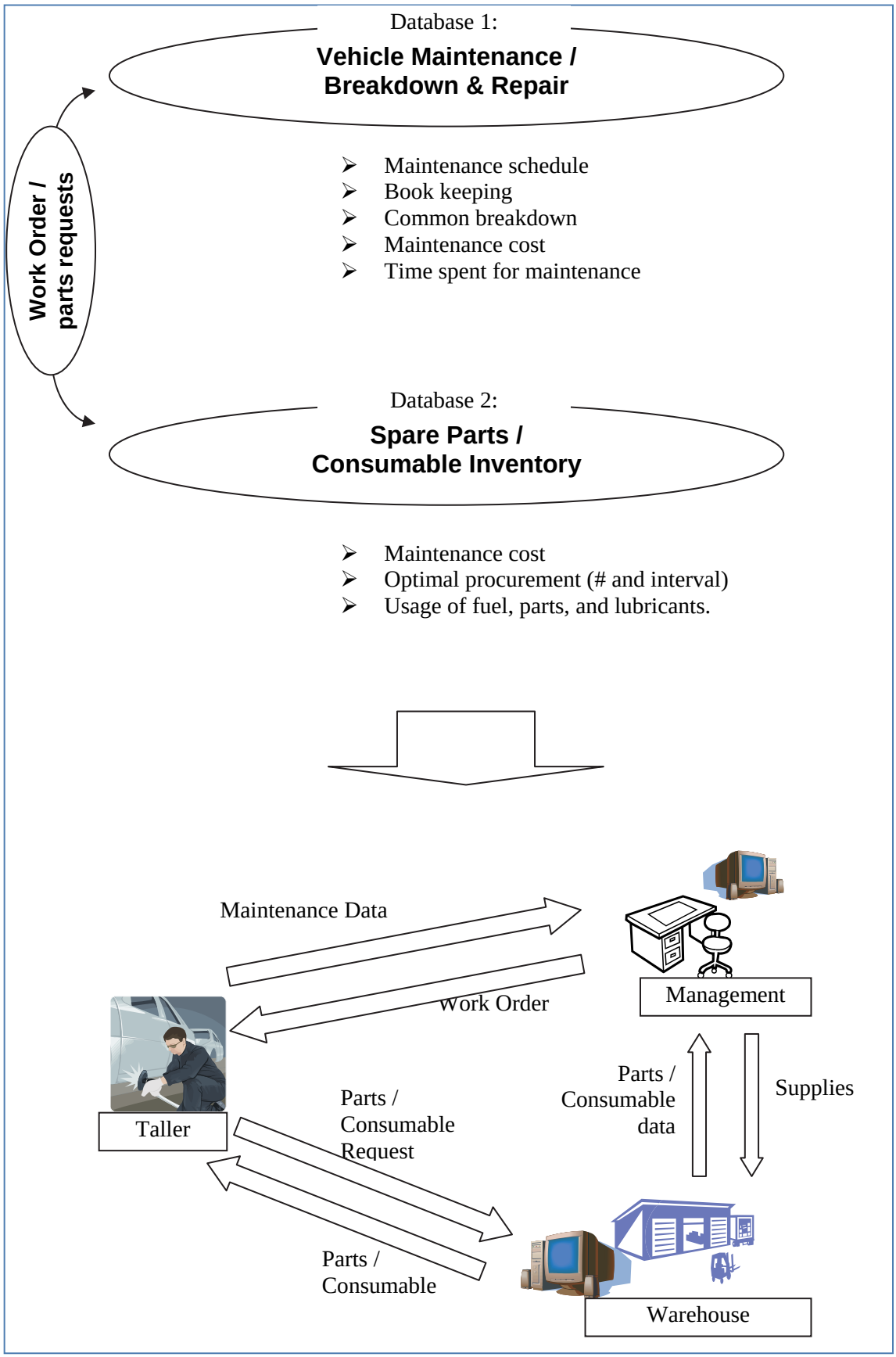


Figure C-9: Preparation of Data Base

b Maintenance Data Base

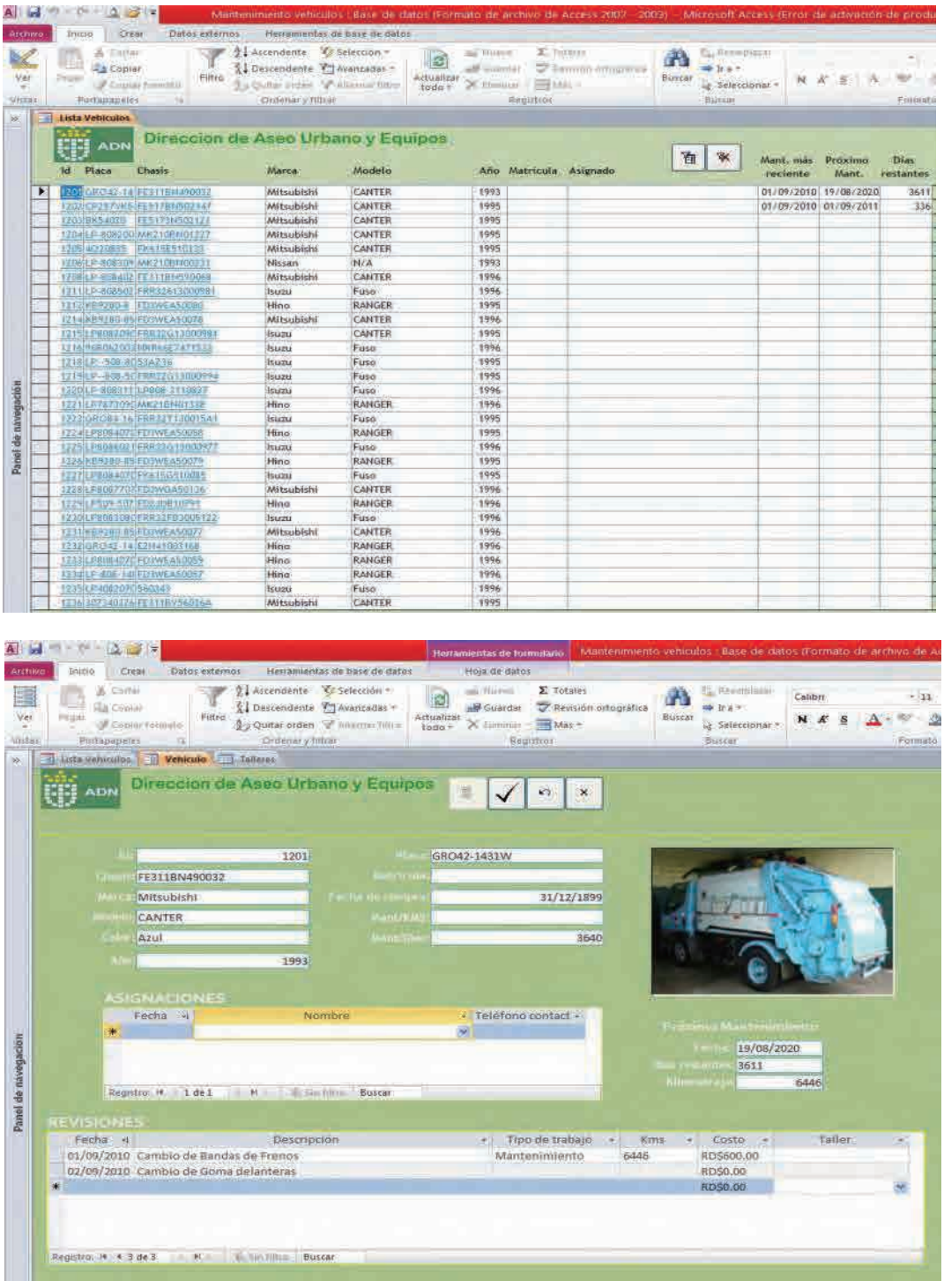


Figure C-10: Maintenance Data Base

It was analyzed how data would be registered in the DB and how it would be the information flow; before the implementation phase, it is required to review the formats which are being used and which will be necessary to input into the DB. It was already designed the daily check format and it is worked on the preventive maintenance format and the work order format is reviewed.

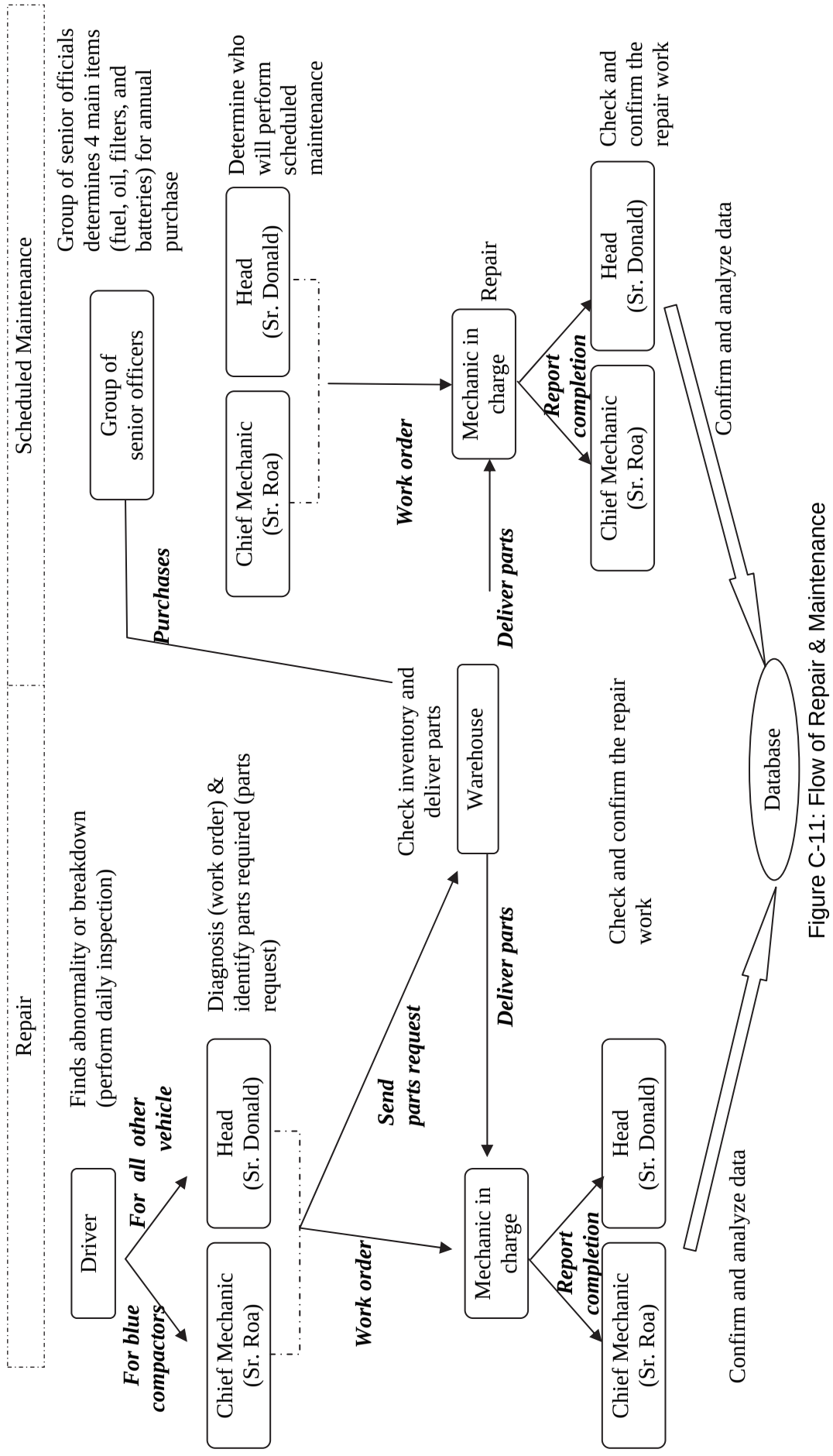


Figure C-11: Flow of Repair & Maintenance

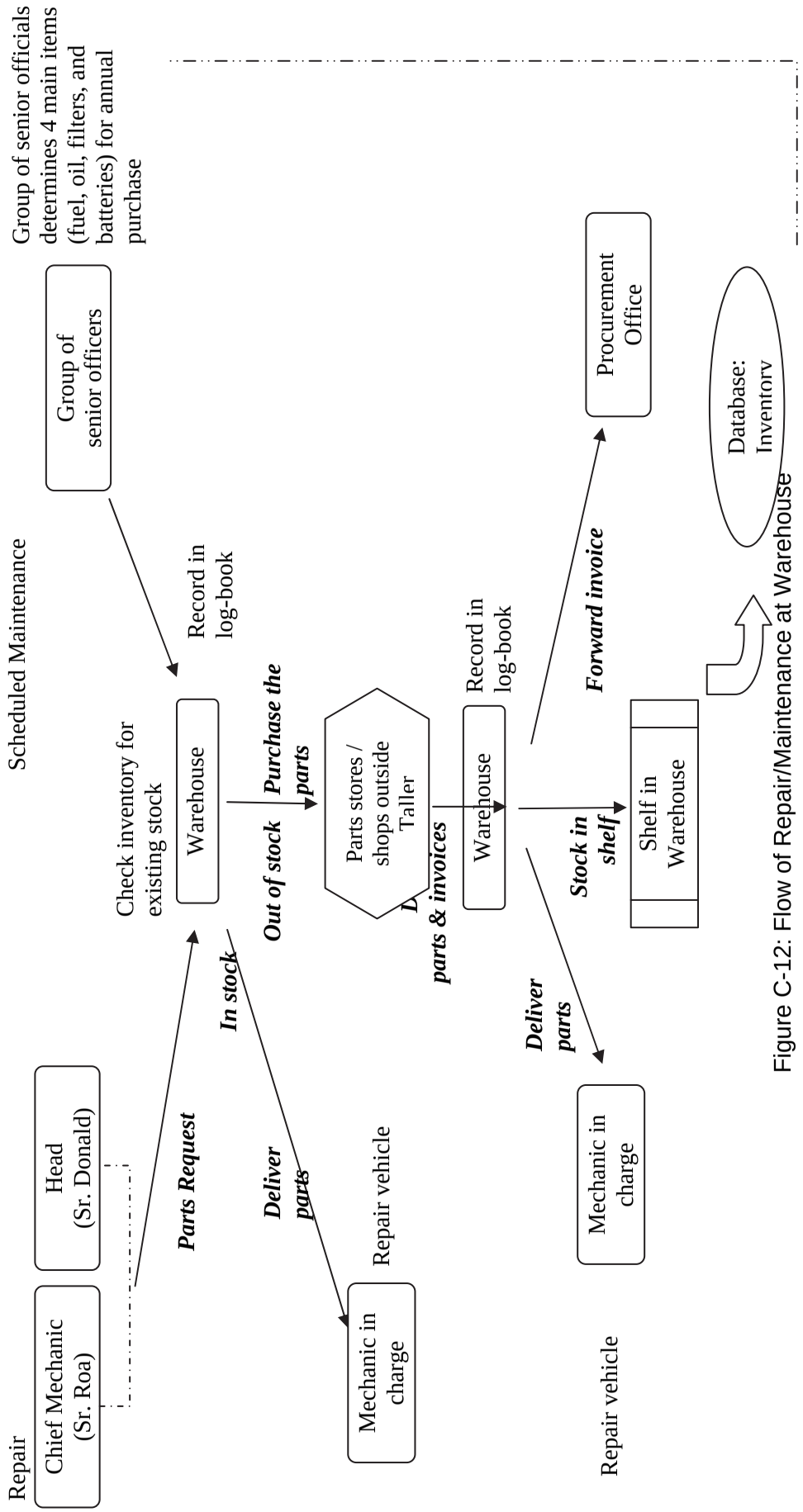


Figure C-12: Flow of Repair/Maintenance at Warehouse

C.2.8 Preparation of Vehicle Workshop Transfer

a Objectives

- To make sure that necessary maintenance of collection vehicles can be done at new workshop/current improved workshop.
- Create better environmental condition at new workshop without unnecessary parts and put in order by conducting cleaning activities.
- Prepare rational layout for better maintenance work
- For smooth transfer from existing Vehicle Workshop to the New One/current improved workshop.

It was conducted a survey for space required in the new vehicle workshop, taking into account issues recommended by the JET. Measurements of the current areas were conducted and layout for the new facilities was prepared considering these needs.

Other issues were discussed and considered for implementation:

1. Parking space for compactor trucks should be prepared out from new workshop, because available area of new workshop/current improved workshop is not enough to accommodate all ADN compactor trucks.
2. At first, divide “maintenance area” and “parking space / vehicle flow area” clearly. Because there are many accidents, for example, moving truck hits the vehicle, which is jacked-up for maintenance work, and might injure the mechanic.
3. Design vehicle flow area (moving pass), by refering “Trace of compactor truck”.
4. Consider to create/prepare “pit” for check & maintenance of bottom of the vehicle.
5. Design the location of compressor.
6. Design the location of vises. (At least 2 vises are necessary.)
7. Panel beating area and welding area should be located at same area.
8. Design the location of tool/equipment stock room.
9. Fire prevention;
   - Oil storage room should be separated from combustible items stock room (for example; tires) and from welding area.
   - Oil storage room should be separated from welding area.
   - Oil storage area should have fireproof building
   - Painting area should be separated from welding area.
   - Painting area should have enough ventilation.
10. Noise prevention;
    - Panel beating area should be inside of the building
11. Car washing;
    - Location should be decided by considering drainage pass.
    - Consider to prevent water pollution. (how to separate waste and oil from water.)

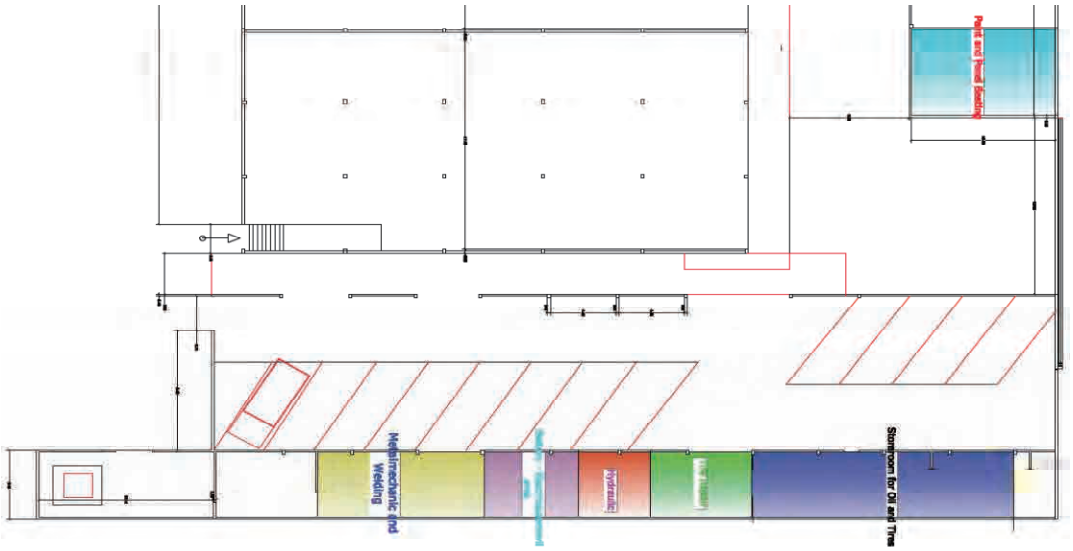


Figure C-13: Tentative layout of new workshop

C.2.9 Work Schedule of Activities for the Improvement Plan

Activities	Responsible	2010 1	2	3	4	5	6	7	8	9	10	11	12	2011 1	2	3	4	5	6	7	8	9	10	11	12	2012 1	2	3	4	5	6	7	8	9	10	11	12
Vehicle Management																																					
Design of the booklog for every vehicle	Oscar Garcia			■	■																																
Design for the Daily Check Sheet (Check List)	Oscar Garcia			■	■																																
Design for the Training for Occupational Safety	Jose Kranwinkle										■	■	■																								
Design for the Training for the Operation of Vehicles	Manuel Roa						■	■	■																												
Design for the Training for Collection Service Quality	David Rodriguez								■	■																											
Design the System for Car Washing Schedule	Manuel Roa									■																											
Beginning of the program to train for Occupational Safety	Jose Kranwinkle													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Beginning of the program to train for the Operation of Vehicles	Genaro Rosario										■	■	■																								
Begining of the Program for Continuous Car Washing	Manuel Roa										■	■	■																								
Maintenance System																																					
Design Preventive Maintenance System	Manuel Roa					■	■	■	■	■																											
Evaluation of the Format for the Work Order	Oscar Garcia					■																															
Design of the inspection format (monthly, yearly)	Manuel Roa					■																															
To Register Repair Procedures	Luis Checo			■	■																																
Design Training Program for Mechanics for every area	Donald Alvarez							■	■																												
Evaluate Needs for Tools per Area	Donald Alvarez										■	■																									
Implement a Preventive Maintenance System	Genaro Rosario								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Begin Program to Train Mechanics	Donald Alvarez													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Instalaciones / Gestion de Repuestos																																					
Inventory Verification	Genaro Rosario			■	■	■	■																														
Verify the procurement Flow for Spare Parts and Consumables	Genaro Rosario			■	■	■	■																														
Training on Occupational Safety	Jose Kranwinkle														■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Data Base to Manage Vehicles and Maintenance																																					
Study on items to be recorded	Oscar Garcia		■	■	■	■	■	■																													
Study on the Data Base Scheme	Oscar Garcia						■	■																													
Preparation of the Formats for the Vehicle Operation	David Rodriguez								■	■	■																										
Preparation of the Formats for Vehicle Maintenance	David Rodriguez								■	■	■																										
Preparation of the Formats for Spare Parts	David Rodriguez								■	■	■																										
Preparation of other Formats	David Rodriguez									■	■	■																									
Data Base Design	Oscar Garcia											■	■	■	■	■	■	■	■																		
Record Data Base	David Rodriguez																		■	■	■																
Test of Operation & Adjustments	Oscar Garcia																				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Elaboration of the Operation Manual for the Data Base	Oscar Garcia																		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Training the Operator	Oscar Garcia																				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Beginning of Operation	Oscar Garcia																					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Others																																					
Evaluation of Space Requirements by Areas	Luis Checo		■																																		
Evaluation of Equipments and Materials to be Transferred	Luis Checo			■	■																																
General Evaluation of New Space by Talleres	Genaro Rosario																																				
Required Constructions to Habilitate the New Space	Genaro Rosario						■	■	■	■	■																										
Distribution of New Spaces	Genaro Rosario				■																																
Cleaning	Luis Checo					■	■																														
Transfer to New Talleres	Luis Checo					■	■	■	■	■																												

Figure C-14: Schedule of Maintenance Plan Activities

Until the end of 2010, the work schedule is followed without much inconvenience except for the activities related to the vehicle workshop transfer, because these activities are related to the procurement of the new site and the process is delayed more than expected.

C.3 Actions for Improving Vehicle Maintenance System

The following improvement actions took place in order to plenary concretize the contents of vehicle maintenance system, sequent to the aforementioned preparatory works.

C.3.1 Vehicle Book-log

It was designed a vehicle book-log according to recommendations by the expert team and the control is done in digital and paper by Equipment and Transportation offices. It is worked to link the DB in digital manner because the format is in Excel and the DB in Access.

C.3.2 Preventive Maintenance System

The following types of maintenance were defined, the tasks included for each one and their frequency.

a Preventive Maintenance I

This maintenance is conducted monthly as a general check for the vehicle; the activities included in this type of maintenance are the following:

Table C-2: Activities for Preventive Maintenance I

1	Car Washing
2	Fuel System
2.1	Change Fuel System Filter Element
2.2	To check fuel leakage
3	Valve Control System
3.1	To check condition and tension in belts
4	Lubrication System
4.1	To check oil leaks in joints or connection between pipes and hoses.
4.2	Cleansing of centrifugal oil filter
5	Cooling System
5.1	To check condition of hoses in the system
5.2	Cleansing of engine block ventilation filter
6	Electrical and ignition systems
6.1	To check cleanliness, tightness, and general condition of terminals and cables in the battery
6.2	To check density of electrolyte
6.3	To check electrolyte level
6.4	To check charge
6.5	To check the condition of cables and terminals in the starter, alternator and regulator
6.6	To check operation of wiper
6.7	To verify operation for headlights, emergency lights, and parking lights.
6.8	To check head light aiming
6.9	To check operation of horn
7	Steering System
7.1	To check steering wheel free play
7.2	To check adjustments of joints in articulated bars, trunnions, and steering knuckle
7.3	To check condition and operation of power steering
8	Transmission system
8.1	To check brake pedal free play
8.2	To check gearshift play
8.3	To check operation of clutch, differential, and gear box
8.4	To check operation of electro-air valve
8.5	To check play between bearing and bar
8.6	To verify noise and strokes during the operation
9	Break System

9.1	To check operation of regulating pressure valve
9.2	To check adjustment of safety valve and its operation
10	Suspension system
10.1	To check condition and pressure of tires, condition of valve stem
10.2	To check for leaks in hydraulic shocks
10.3	To check for blows or damage on the tires
10.4	To check for nut tightness in tires
11	Body (cabin and platform)
11.1	To check attachment of cabin and safe dump
11.2	To check tight adjustment of rear-view mirror
11.3	To check door locks, glasses, condition of step and attachment, seats, and condition of floor.
11.4	Condition of fender
11.5	Condition and tightly adjustment of silent-block.
11.6	To check adjustment of engine, box, and radiator
11.7	There is not friction between flexible conduits and pipes for the steering and fuel system.
11.8	Tightly adjustment of chassis on top of chassis
11.9	Condition of structure on top of chassis
12	Dashboard and lights
12.1	Condition and operation of clocks and indicator lights
12.2	Correct readings
12.3	To conduct operations according to lubrication guideline
12.4	To check operation of headlights
12.5	To check operation of rear lights

A format designed for control is being used which is also used to load the data to the maintenance DB.

b Preventive Maintenance II

This maintenance is conducted quarterly and it is a more specific checking of the vehicle. Activities included in Preventive Maintenance I are conducted for this type of maintenance; these activities are as follows:

Table C-3: Activities for Preventive Maintenance II

1	Total Operations of Preventive Maintenance I
2	Fuel System
2.3	To check condition and adjustment of pipes and connections
2.4	To check adjustments of several inlets and exhaust
2.5	Adjustment and cover of fuel tank
3	Valve Control System
3.2	To check valve calibration
4	Lubrication system
4.3	To check tightening of high pressure pipes
5	Cooling System
5.3	To check adjustment of cooling fan and water pump
5.4	To check condition and cleanliness of Radiator Core
6	Electrical and ignition system
6.1	To check adjustment of starter and alternator
6.2	To verify that there are not any noise in the starter
7	Steering System
7.1	To verify condition and cleanliness of filters in hydraulic pump of power steering: Clean Breather.
8	Transmission System
8.1	To verify play and tighten transmission bar.
8.2	To verify if it there is any stroke when shifting gear.
9	Break System

9.1	To check air-tightness of break keys, pipes, hoses, and chambers
9.2	To check operation of compressor
9.3	To check wearing down of brake shoes
9.4	To regulate breaks
9.5	To check adjustments of safety valves and its operation
9.6	To check break operation
9.7	To bleed air bubbles
9.8	To check hoses for air pockets in break cylinders
10	Suspension system
10	To check the rubber bumpers
10	To Verify if there is any leaf damage in the leafspring
10	To verify adjustment of binding in leafspring.
11	Body

A format designed for control is being used which is also used to load the data to the maintenance DB.

c Preventive Maintenance III

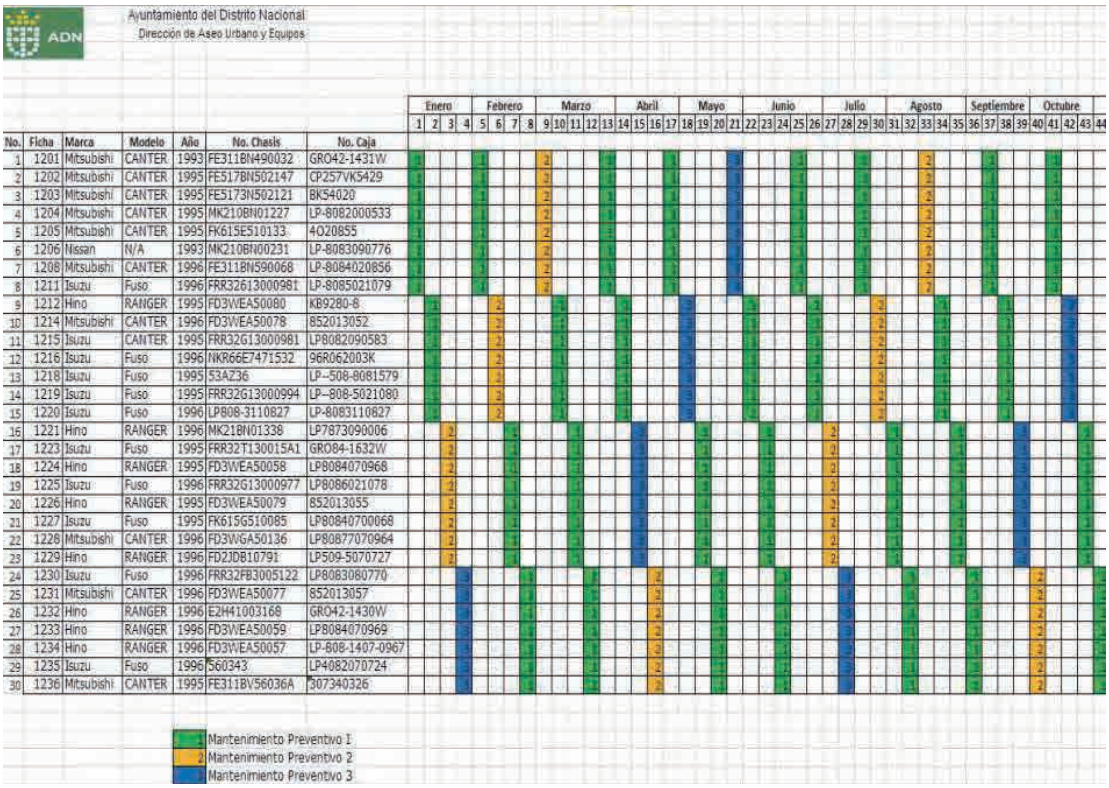
This maintenance is conducted quarterly; it is a more detailed and specific one for the vehicle. In addition to the activities conducted for this maintenance, Preventive Maintenance I and II activities are also carried out for this maintenance. The activities conducted are as follows:

Table C-4: Activities for Preventive Maintenance III

1	Total activities for Preventive Maintenance I and II
2	Fuel System
2.1	Tightened screws for cylinder heads.
2.1	To check condition and operation of injection pump.
2.3	To drain fuel tank, if necessary clean it.
2.4	To disassemble and check injection pressure in injectors, their capability to pulverize and air-tightness.
2.5	To check cylinder compression
2.6	To check condition of turbocharger
3	Valve Control System
3.1	Work corresponding to injection order.
3.2	To tighten cover block and calibrate valves.
4	Lubrication system
4.1	To check oil pressure
5	Cooling System
5.1	Cleanliness of the core radiator
6	Electrical and ignition system
6.1	To check condition of alternator
6.2	To check condition of starter
7	Steering System
7.1	To check condition and adjustment of pitman arm
7.2	To check condition and adjustment of ball joint
7.3	To verify that there are not neither vibrations nor resistance to lateral turns.
No.	MECHANICAL OPERATIONS
8	Transmission System
8.1	To check the condition of the flanges that attach the camshaft
8.2	To check the play in the differential gear
9	Break System
9.1	To check sliding of pistons in the break chamber
9.2	To clean automatic regulating filter for air
10	Suspension System
10.1	To Check play in frontal and rear wheel

10.1	To Check play in frontal and rear wheel
10.2	Rotate tires

It was elaborated a maintenance program taking into account 3 maintenance types for each one of the vehicles.



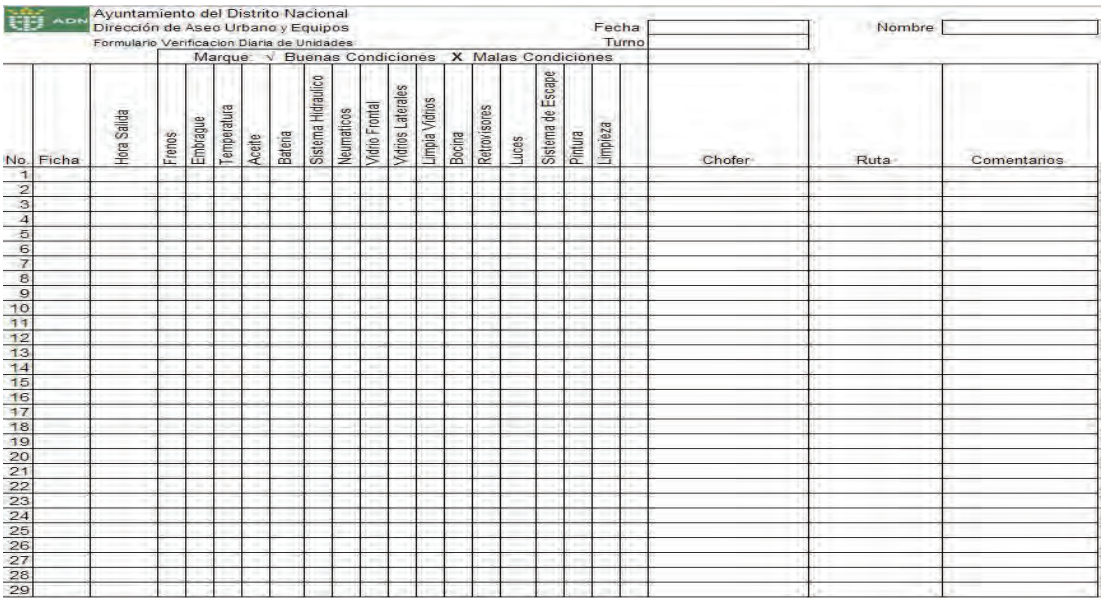
Ayuntamiento del Distrito Nacional
Dirección de Aseo Urbano y Equipos

No.	Ficha	Marca	Modelo	Año	No. Chasis	No. Caja
1	1201	Mitsubishi	CANTER	1993	FE311BN490032	GRO42-1431W
2	1202	Mitsubishi	CANTER	1995	FE517BN502147	CP257VK5429
3	1203	Mitsubishi	CANTER	1995	FE5173N502121	BKS4020
4	1204	Mitsubishi	CANTER	1995	MK210BN01227	LP-8082000533
5	1205	Mitsubishi	CANTER	1995	FK615E510133	4O20855
6	1206	Nissan	N/A	1993	MK210BN00231	LP-8083090776
7	1208	Mitsubishi	CANTER	1996	FE311BN590068	LP-8084020856
8	1211	Isuzu	Fuso	1996	FRR32613000981	LP-8085021079
9	1212	Hino	RANGER	1995	FD3WEA50080	KB9280-8
10	1214	Mitsubishi	CANTER	1996	FD3WEA50078	852013052
11	1215	Isuzu	CANTER	1995	FRR32G13000981	LP8082090583
12	1216	Isuzu	Fuso	1996	NKR66E7471532	96R062003K
13	1218	Isuzu	Fuso	1995	53AZ36	LP--508-8081579
14	1219	Isuzu	Fuso	1995	FRR32G13000994	LP--808-5021080
15	1220	Isuzu	Fuso	1996	LP808-3110827	LP-8083110827
16	1221	Hino	RANGER	1996	MK21BN01338	LP7873090006
17	1223	Isuzu	Fuso	1995	FRR32T130015A1	GRO84-1632W
18	1224	Hino	RANGER	1995	FD3WEA50058	LP8084070968
19	1225	Isuzu	Fuso	1996	FRR32G13000977	LP8086021078
20	1226	Hino	RANGER	1995	FD3WEA50079	852013055
21	1227	Isuzu	Fuso	1995	FK615G510085	LP80840700068
22	1228	Mitsubishi	CANTER	1996	FD3WGA50136	LP80877070964
23	1229	Hino	RANGER	1996	FD2JDB10791	LP509-5070727
24	1230	Isuzu	Fuso	1996	FRR32FB3005122	LP8083080770
25	1231	Mitsubishi	CANTER	1996	FD3WEA50077	852013057
26	1232	Hino	RANGER	1996	E2H41003168	GRO42-1430W
27	1233	Hino	RANGER	1996	FD3WEA50059	LP8084070969
28	1234	Hino	RANGER	1996	FD3WEA50057	LP-808-1407-0967
29	1235	Isuzu	Fuso	1996	560343	LP4082070724
30	1236	Mitsubishi	CANTER	1995	FE311BV56036A	307340326

Enero Febrero Marzo Abril Mayo Junio Julio Agosto Septiembre Octubre

1 Mantenimiento Preventivo 1
2 Mantenimiento Preventivo 2
3 Mantenimiento Preventivo 3

Figure C-15: Program for Three Different Types of Maintenance



Ayuntamiento del Distrito Nacional
Dirección de Aseo Urbano y Equipos
Formulario Verificacion Diaria de Unidades

Fecha
Turno
Nombre

Marque √ Buenas Condiciones X Malas Condiciones

No	Ficha	Hora Salida	Frenos	Embrague	Temperatura	Aceite	Bateria	Sistema Hidraulico	Neumaticos	Vidrio Frontal	Vidrios Laterales	Limpia Vidrios	Bocina	Retrovisores	Luces	Sistema de Escape	Pintura	Limpieza		Chofer	Ruta	Comentarios
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Figure C-16: Daily Check Format

C.3.3 Occupational Safety and Health

The main objective is to promote the occupational safety and health in the workplace; JET prepared a guideline to promote safety:

a Risk check patrol of workshop (monthly or every 2 months)

- Patrol by committee / meeting members for risk finding
- Discussion how to minimize the risks among members
- Setup countermeasures to reduce risks
- Inform to the workers about countermeasures

b Data / information of accidents / injuries of collection & workshop work

- Prepare report system from workers to the committee / meeting about accidents / injuries during working hours
- Record the data and analyze them by committee / meeting members
- Discussion how to minimize accidents / injuries & setup countermeasures
- Inform / train workers about analysis and countermeasures

c Guideline preparation

- Emergency guideline (If an accident happens, how to do)
- Check points of ordinary work
- How to handle machine tool
- Repair / maintenance working procedure

d Workers' Training

- Training materials preparation
  - ✓ Japanese data / information
  - ✓ Private company data / information
  - ✓ Above items of a. b. and c.
- Explanation / training to workers by committee member(s)
- Hazard / risk prediction training

One of the most important activities which was conducted in the Risk Finding Patrol consisted of identifying risks; the JET explained the points which should be taken into account to conduct this activity:

Table C-5: Procedures of Risk Finding Patrol

1st Round (Grasp present/actual situation)	
1. Risk finding patrol at field	
	Decide area for patrol/check
	Prepare paper and pen for memo
	Tell workers to behave as usual (Never act perfect not like usual)
	Start patrol as a group
	Try to find out risks as many as possible, and take memos
	Listen to the workers about risks if necessary
2. Point out risks by members in office room	
	Express risks by each member as many as possible
	Write them on a black / white board
	Never criticize others' point out
	Discussion how to solve them will be at next round
2nd Round (Investigating the reality)	

	Discuss what is the cause of each risk
	Discuss not only visible causes, but also hidden causes and underlying causes
3rd Round (Setup countermeasures)	
	Discuss how to remove / minimize each risk
	Discuss how to do it by each member
4th Round (Set targets)	
	Choose / conclude the countermeasure
	Put a first priority on feasible countermeasure

To write a report about these risk finding patrols and make them periodically in each one of the areas is ideal to establish a risk control system.
Additionally, operation models for machine and tools were elaborated by the JET to be prepared for other activities.

C.3.4 Spare Parts Stock and Warehouse Management

After choosing 41 items to begin stock control and management; it is in the process to create a format for stock control by using the model introduced by the JET.

Name *Nombre*
Code No. *Codigo No.*
Specification *Especificacion*
Unit *Unidad*

Date	Memo	uinit price	in	out	balance stock	Purpose/Distication to where	Remark
Fecha	*Memorandum*	*precio unitario*	*ingresa*	*sole*	*balance en almacen*	*proposito / distinatino*	*observacion*
	from previous page *de la pagen anterior*						
2010/9/13							
	to next page						

Figure C-17: Format Sample Sheet for Stock in Warehouse

C.3.5 Data Base Management

It was prepared a book-log, a maintenance work schedule, and types of maintenance required for each vehicle; additionally, it began the process to load data to the maintenance DB system.

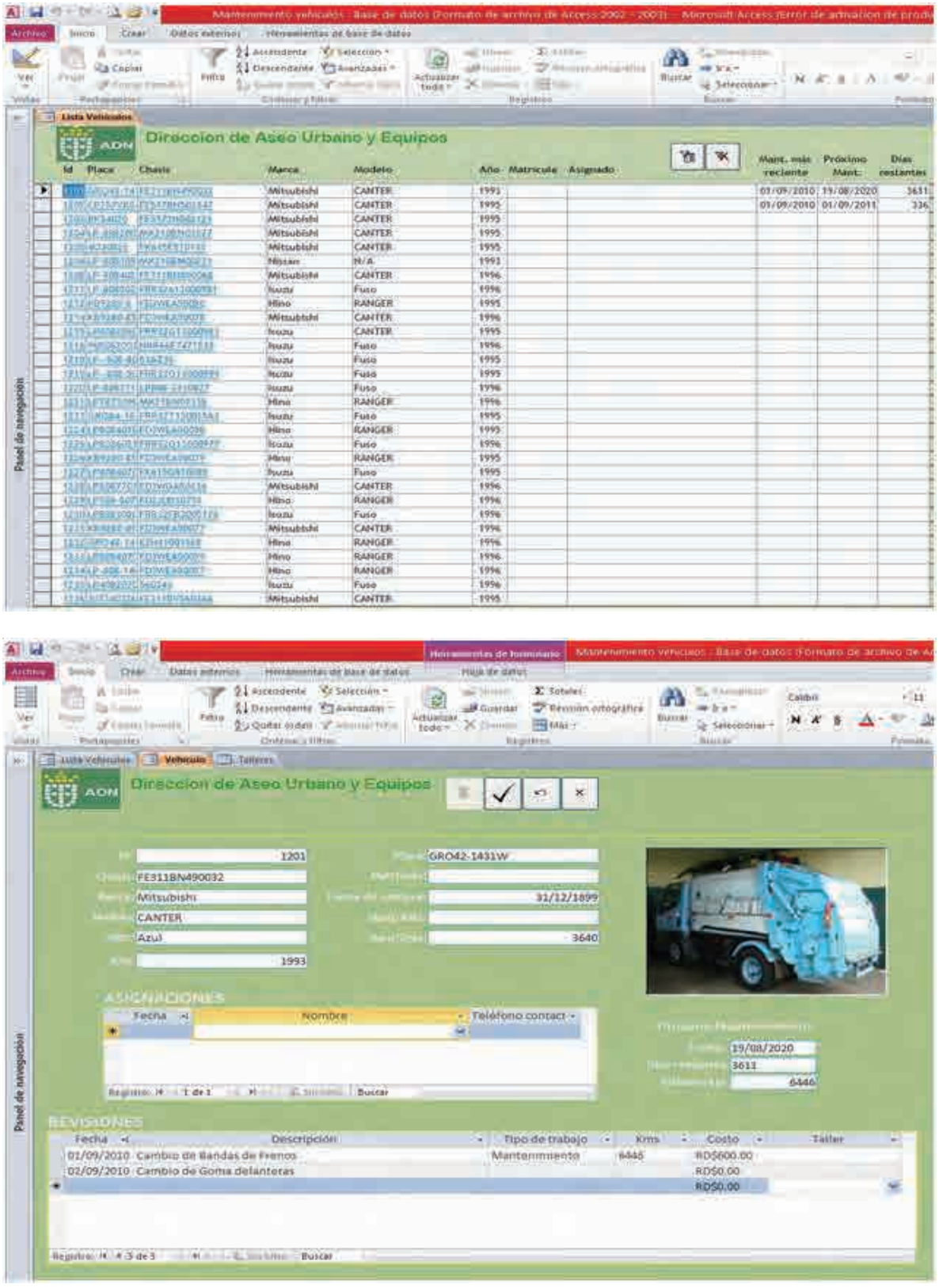


Figure C-18: Data Base Maintenance

C.3.6 Vehicle Workshop Transfer

This activity underwent a modification with respect to the works conducted previously because a new space for vehicle workshop has been defined in the beginning of year 2011. The vehicle workshop will be located in the same site, but using just one-third (1/3) of the current space. This decision will prove beneficial, according to discussions between C/P and JET, because current facilities are convenient and more suitable for vehicle workshop.

Measurements of the current site were taken in the new site defined for vehicle workshop, taking into account recommendations by the JET. Additionally, measurements of each specific current workshop were made and a layout for the new spaces was defined taking in consideration their special needs.

Other issues were also discussed for implementation:

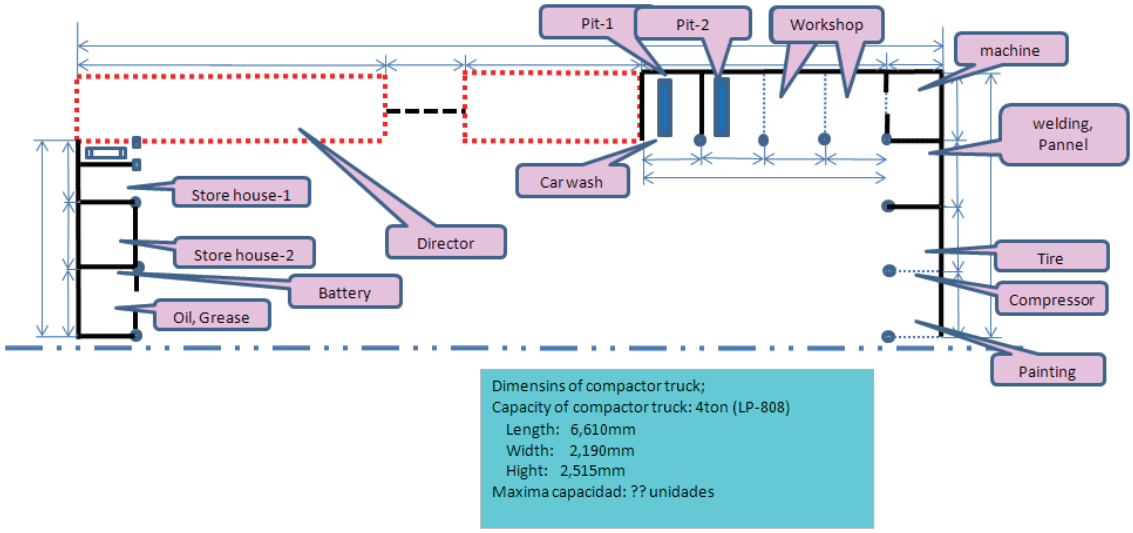


Figure C-19: Vehicle Workshop Layout Plan

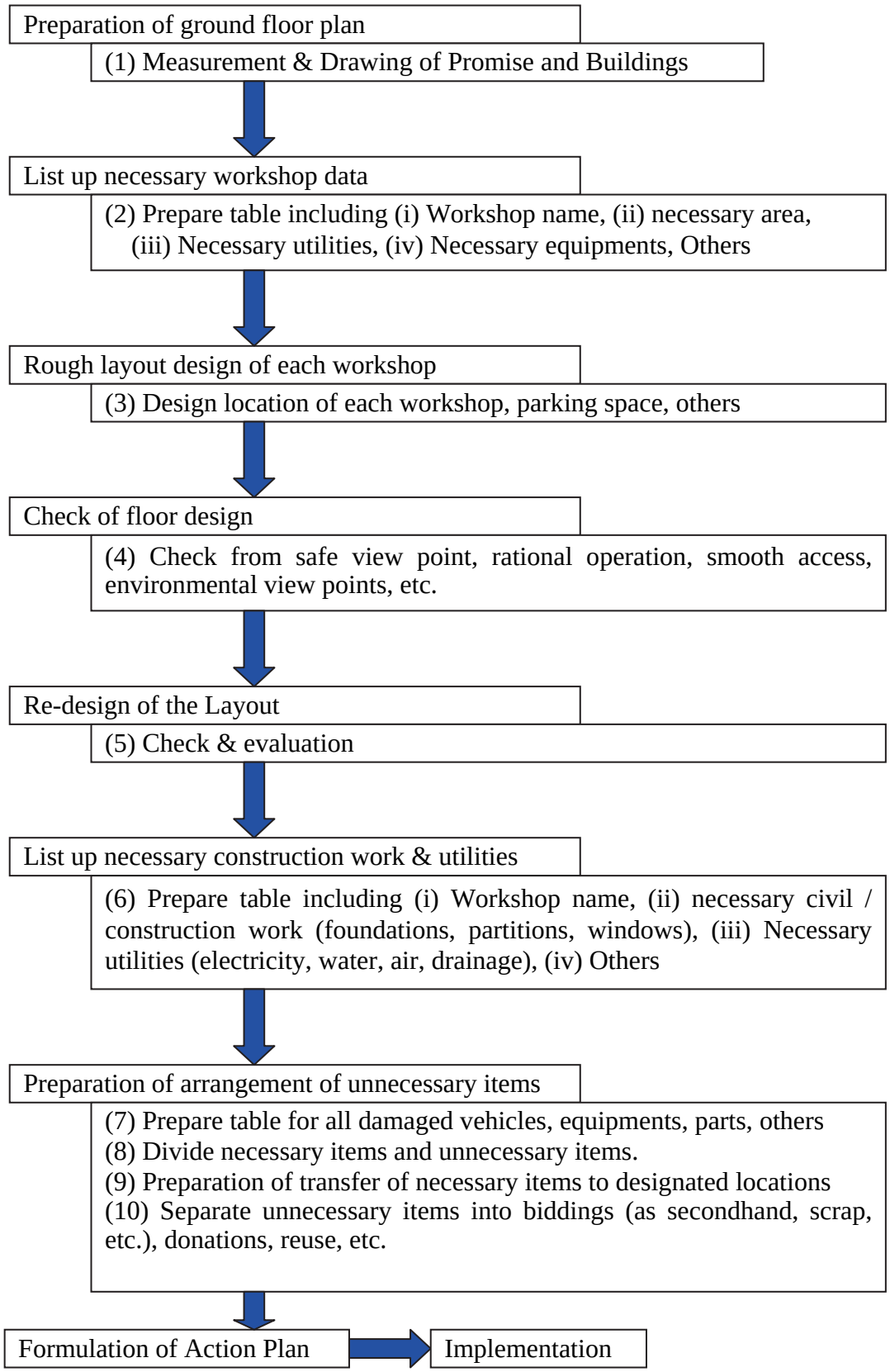


Figure C-20: Procedure to Modify the Vehicle Workshop

C.4 Vehicle Repair OJT

It has been conducted actions for improving the vehicle maintenance system. Meanwhile, it is most necessary to develop capacities of damage inspections and repair techniques of collection vehicles. ADN owned collection vehicles are Japanese made compactor vehicles. It requires very specific and high technology knowledge for conducting appropriate damage inspection and repair works for those compactor vehicles. Therefore, the Japanese vehicle repair expert in addition to JET conducted repair OJT of compactor vehicles including practical repair works.

C.4.1 OJT on Inspection of electrically damaged vehicle

a Background

Most difficult repairs of Japanese compactor truck are originated from electric and hydraulic trouble of loading and discharging system of compactor trucks, because Japanese compactor trucks have full-automatic loading and discharging system by using many sensors and relays which are connected by complicated sequence diagram that makes users and maintenance men difficult to understand how to read the sequence diagram as well as acquisition of damaged parts.

JET and DIGAUE teams discussed and decided the compactor truck (No. 1235), which is seriously damaged by electric troubles, as OJT target to develop the capacity of ADN mechanics by mastering how to conduct trouble analysis and how to repair them by Japanese expert.

JET has prepared necessary information and materials to repair the target vehicle, while DIGAUE maintained the target vehicle to be able to operate smoothly as much as possible.

b Preparation for check

b.1 Check and repair of chassis and body of compactor truck

As engine should be operated to check loading / discharging system, because hydraulic pump which supplies oil to cylinders for discharging and loading actions is operated by engine power through mission.

So, DIGAUE´s mechanics prepared new battery, tires, engine and hydraulic oil, and tuned-up the engine in good condition.

b.2 Necessary information and knowledge of the electric sequence diagram

It is very necessary to prepare an electric and hydraulic sequence diagram and color cord to check and repair electric trouble of compactor trucks.
Above items were prepared by JET in Japan, and JET hold a seminar to let Counterpart mechanics understand how to read both hydraulic and electric sequence diagrams and color code.

b.3 Necessary instruments, parts and tools

To check electrical damage, tester and electrical tools were prepared by both JET and C/P. And also damaged electrical parts were prepared by JET in Japan for replacement.

c Checking procedure

c.1 Electric wiring check

All switch boxes should be removed and switches are checked by tester. As there are many electric wirings and finally connected to the electric circuit board, so all wire couplings were disconnected for wiring check.

As it takes long time to remove all wire terminals, wiring check was done by using needle of sawing machine to insert to the electric wire instead of removal of wire terminals.
Electric wiring test was done by tester to check continuity, resistance and insulation condition.

c.2 Electric circuit board check

After disconnection of terminal of the circuit board, the electric circuit board was checked on (1) relay (exciting coil check), (2) diode (tester check by changing positive and negative terminal), and (3) total view of it.

c.3 Sensor check

Proximity switches were checked by approaching steel material, and lead switches were tested by approaching magnetic. The proximity switch has LED light which ensure action by ocular check.

c.4 Problems found through the Inspection OJT

By above check, below problems were found.

- PTO (Power Take Off) circuit was missing.
- Damage of Tail gate switch in the cabin
- Spools of solenoid valves were stick.
- Tail-gate-lock actions were inadequate
  - ✓ Water invasion into solenoid valve for tail-gate-lock, and the valve was stick.
  - ✓ "Tail gate Lock release circuit" was missing.
  - ✓ Non function of manual switch of tail gate lock by wrong wiring.
  - ✓ Metal fittings to catch tail gate lock hooks were not properly adjusted.
- Many wrong wirings at mid and rear portion of the body
- Troubles of circuit board
  - ✓ Trace of burnt
  - ✓ Some diodes were burnt out

C.4.2 OJT on Repair of electrically damaged vehicle

a Change of parts

Damaged switches, sensors, etc. were changed to new parts.

b Correction of wirings

Wrong wirings were corrected as original sequence diagram.

c Maintenance of direction valves

- All direction valves were hard to move due to long time non-operation, so by manual pushing the spools of the direction valves, smooth action was recovered.
- But, one of the direction valves (for tail gate hook operation) was not able to move, so it was disassembled to clean up (water inside), then it was able to be operational.
- Modify wirings
- As PTO circuit was missing, new PTO circuit was designed and installed.
- As existing circuit for "tail gate hook release" was not described on the sequence circuit diagram obtained in Japan, a new circuit was designed and installed to operate it.
- (One new relay was installed near the fuse box in the cabin.)
- As there were many modifications of electric wirings to race engine when hydraulic equipments are operational, existing suspicious wirings were cut and new circuit to accelerate engine was designed and installed. Because it was impossible to check all miss-modified wirings, which were complicated very much and was time-consuming work to check them one by one.

- "Tail gate interlock circuit", "manual operation of tail gate hook" and "micro switch which detects 100% close of tail gate" might have wrong wirings, so new electric wirings were connected as the electric sequence diagram.
- As existing circuit board was damaged, new one was replaced for proper action with necessary modification. (By modifying wirings as mentioned above, unnecessary diodes were removed.)

C.4.3 Other OJT, Lectures, Mini-workshops

a Daily Check Implementation

As daily check of collection vehicle before daily collection service is very important to minimize accidents and troubles by finding problems before growing up to big damages. And the daily check should be done by drivers by themselves, because the drivers should know the condition of their trucks.

JET conducted a training for drivers to enhance their pride and motivation as professional drivers, and explained importance of daily check of their vehicles, and finally instructed them how to check their vehicles by using one of a compactor truck.

After demonstration by JET, C/P explained them also the importance of daily check to let them devote in their work.

b How to use new measurements

After above training, JET continually explained how to use (1) timing light and (2) engine analyzer for efficient and accurate vehicle check and maintenance, and instructed mechanics how to use them by providing information.

c Safe and health control

JET explained mechanics in ADN workshop about safe handling of tools and machines, namely lathe, upright drilling machine, grinder, welding work, hummer work, spanner wrench, driver, chisel, file and vise.

JET instructed them how to use them safely and efficiently at workshop and explained about their experiences on accidents occurred by mistakes in Japan.

d Training to electrical mechanics through OJT

One electrical mechanic was attended to learn how to check and repair electric troubles throughout the check and repair period. He was very eager to learn, and JET gave enough explanation about electrical technology as well as check and repair behavior to the maintenance man.

e Preparation of manual

As all mechanics of the Counterpart should learn about electric system for further troubles, JET has prepared a manual how to check electric troubles and how to repair them by referring this activity.

f Information of maintenance of 3 types compactor truck in ADN

It is very necessary to have electric and hydraulic sequence diagram, to check and repair of compactor trucks, JET provided 3 kinds of information obtained in Japan, for further maintenance by the counterpart.

g Mini-workshop

2 trainings were conducted about electric system of compactor truck, namely (1) fundamental knowledge of electric system, and (2) how the check and repair works were proceeded. As far

(1) training was conducted prior to the check and repair work, and (2) was done after finishing the work, and that are mentioned later clause in detail.

g.1 Fundamental knowledge of electric system of compactor truck

Before implementation of repair of compactor truck, necessary fundamental knowledge of electric system should be learnt. So, JET conducted training for counterpart mechanics prior to check and repair work on 1st November 2011.
Check and repair of electric system of compactor truck

g.2 As only one electrical mechanic has attended throughout the check and repair work on electric system of the compactor truck, his obtained information and experiences should be disseminated to all counterpart mechanics.

So, JET explained the process, problems and how to check and repair the target damaged vehicle to the counterpart mechanics by using power point with pictures taken during check and repair work. After the lecture, JET demonstrated to operate No. 1235 truck to show them the location and function of switches, sensors and each action of compactor truck.

During the training, JET explained and offered (1) prepared manual on check and repair of electrically damaged vehicles, and (2) information of 3 types of compactor trucks to develop their capability to repair other types of vehicles.

C.5 Improvement of vehicle maintenance management

For 3 years from 2009, under JICA technical cooperation project, various activities have been implemented toward to improvement for better maintenance and management of 30 units of secondhand compactor trucks donated from Japan.

Main activities are (1) Preparation and implementation of “Vehicle Book-Log”, (2) Plan and implementation of “Daily and Regular Inspection”, (3) Preparation and implementation of “Preventive Maintenance”, (4) Preparation and implementation of “Parts Stock Management”, (5) Activities of “Occupational Safety and Health”, (6) Preparation and operation of “Database”, (7) “Improvement of maintenance technique” and others.

Achievement of above mentioned activities, evaluation of each activity, total evaluation, subjects and advises for future development are described below as a final report.

C.5.1 Achievement and Evaluation of Each Activity

a Vehicle Book-Log

As due to lack of recording data about collection vehicles belong to DIGAUE, Vehicle Book-Log has been prepared to make it easy to grasp present condition of each vehicle and maintenance schedule. This Book-Log contains specification, history, maintenance record, maintenance schedule, odometer reading and cost for repair of each collection vehicle can be input.

Achievement: After preparation of format of Vehicle Book-Log, necessary data were input and linked to the Database system. And schedule and history of implemented maintenance, repair record with cost and other data were input and implemented Database operation.
Evaluation: As Book-Log plan, preparation and operation has implemented after input necessary data, and linked to Database which operation has implemented already, Book-Log has been achieved as original plan. In the near future, after various data will be accumulated,

more efficient operation of collection vehicle and maintenance can be realized by cost and operational analyze.

b Daily Inspection and Regular Inspection

The first step of preventive maintenance is the inspection of collection vehicles. Therefore, daily and periodic (monthly, quarterly, 3-monthly) inspection are planned to design and implement.

Achievement: Both daily and periodic inspection were implemented after deciding inspection items by reference of Japanese style and setup periodic inspection schedule.
Evaluation: As original plan, inspection work has planned and implemented. Daily inspection is done by mainly drivers with mechanics and periodic inspection is done by mechanics.
The inspection items were decided by copy of Japanese (Osaka) style, therefore, reconsideration of inspection items is desirable to fit to local condition in the future.

The daily inspection should be carried out by drivers to let them recognize that they should be professional drivers of compactor trucks, and be aware of daily driving and collection service work.

c Preventive Maintenance

Before now, vehicle maintenance was depend on mainly “breakdown maintenance”, but preventive maintenance system with inspection has been implemented by planning and preparation of contents of preventive maintenance to prevent breakdown of vehicles.

Achievement: Firstly, the items of preventive maintenance were divided into 3 categories (Preventive Maintenance-1, -2, and -3), and implemented after setup maintenance items and its schedule.
Evaluation: The implementation of preventive maintenance can be well evaluated, because breakdown maintenance was popular before. However, it is difficult to implement complete preventive maintenance as planned, because of lack of materials and parts due to lack of budget.

d Stock Management

The stock management has been introduced, because appropriate management system is necessary to stock enough number of various parts that is necessary for repair and maintenance of compactor trucks.

Achievement: The parts stock list has been prepared by targeting main 41 items like oil, tires and batteries, because it is actually impossible to cover many parts in the first stage, and going to link to database system in the future.
Evaluation: It is well evaluated about their efforts to prepare parts stock list, although only 41 main parts. It is expected to cover various parts of compactor trucks in the near future.

e Occupational Safety and Health

The occupational safety and health activities have been tried to introduce, because many injuries and accidents are happened in workshop and especially during waste collection work.

Achievement: Various activities on safety and health were learned, and “safety and health committee” has been organized, and uniform for workers were delivered.
Evaluation: Introduction and practice how to implement safety and health activities were done, but enough activities are not implemented yet, and more active implementation is expected.

f Database Management

It is necessary to prepare the system to be able to get necessary data and information immediately. It meant it is necessary to prepare and accumulate above mentioned book-log data, record of maintenance of each vehicle, and parts stock information, as database system. As

DIGAUE office has personal computer set with its accessories, database system of compactor trucks is decided to prepare.

Achievement: The database system is prepared by input various information of vehicles, maintenance schedule and its implementation, odometer reading and repair cost, and parts stock information, into personal computer.
Evaluation: It is poor about parts stock information, although another various data of vehicles, maintenance information, operation information are enough to stock. By continuing to accumulate more information and records, more efficient operation and maintenance is very much expected to be realized.

g Grade-up of Technical Capacity for Repair Works

In order to master how to repair and maintain compactor trucks properly, not only basic knowledge of hydraulic and electric system, but also how to find troubled portion and cause, operation mechanism, how to repair damaged portion, should be learnt well. Therefore, study and OJT (On the Job Training) how to repair are very necessary.

Achievement: Series of seminar were conducted to master basic hydraulic and electric system of compactor trucks by targeting mechanics in charge of compactor trucks maintenance. And OJT (On the Job Training) was held to one mechanic by showing how to find cause of damage, and how to repair them, and transfer him the techniques of repair. Moreover, a manual on problems and causes finding and how to repair, was prepared to train all mechanics in the workshop.
Evaluation: It takes certain time to master loading and discharging system of compactor trucks, and as the mechanics have learnt how to analyze and repair damaged vehicle as OJT, they learnt basic already. As the next step, they should learn continuously and share gained knowledge among the team to level them up.

h Preparation of Transfer of the Workshop (Layout Design of the Workshop)

As there was a plan to transfer the existing workshop to another place, necessary preparation and study were carried out.

Achievement: The procedure for transfer of the workshop was planned, and below mentioned items were prepared.
(1) Layout of new workshop, (2) flow plan, (3) transfer preparation, (4) others
Evaluation: Various plans were prepared, but original plan was changed by place and area, so transfer / modification of workshop is not yet realized. As design and preparation work of layout of workshop were well trained, so even if there might have any changes of plan, obtained flexible capacity can work well basically.

C.5.2 Overall Evaluation

Various actions are necessary to manage collection vehicles properly. One of the image-example is listed to Fig. C-20, and its main activities are explained below.

(a) Supple of Vehicles: It is necessary to supply new collection vehicles systematically under “waste management basic plan”. If there is no systematic plan to supply vehicles, complete waste collection service cannot be carried out by frequent breakdown of collection vehicles due to overage.
(b) Appropriate Operation of Vehicles: Minimum breakdown and wearing out of collection vehicles can be realized by safe and appropriate manner driving and collection work. Appropriate operation of collection vehicles includes check before operation and wash of vehicles after operation.

(c) Inspection of Vehicles: Early stage repair and accumulation with analysis of record of check, by periodic inspection of collection vehicles, enable various improvement of management of vehicles.
(d) Appropriate Maintenance of Vehicles: By adopting Preventive Maintenance, breakdown can be avoided and condition of collection vehicles keeps best. To keep maintenance work appropriate, it is important to level-up of technique of maintenance men and well-management of workshop of vehicles.

Overall evaluation of 3 years activities is described below on each item.

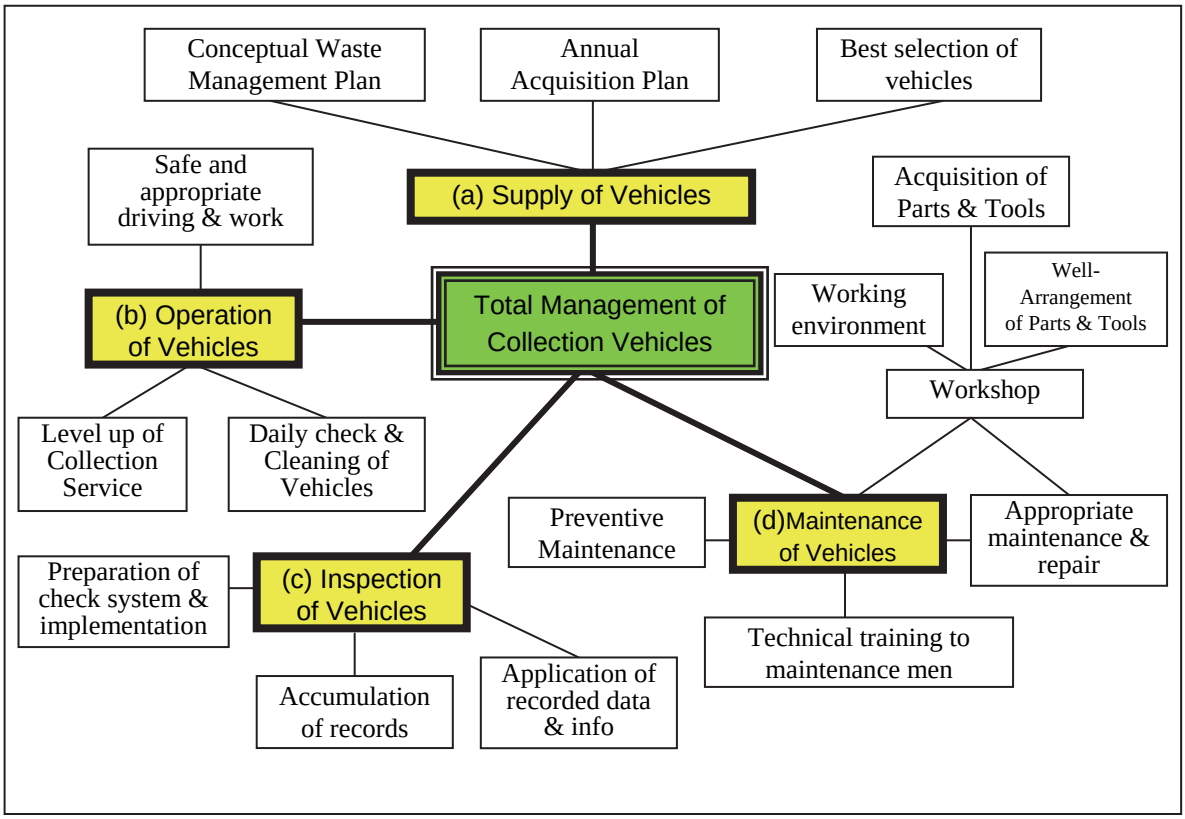


Fig. C-20: Total Maintenance of Collection vehicles

a Supply of vehicles

Concrete activities about supply of collection vehicles have not done well due to out of charge of C/P. But, recently, as purchase of Chinese compactor trucks is realizing, C/Ps are studying practically through their work.

Vehicles Supply Plan should be included in “waste management basic plan”, and all men in charge of maintenance of vehicles should concern upper plan always and understand it well, and they should always prepare how to choose vehicles, how to write specifications, how to prepare requests of necessary manuals and spare parts.

Evaluation: The activity was poor, but C/Ps are studying practically through their work.

b Appropriate Operation of Vehicles

There will be a big different condition of vehicles between (1) treat vehicles carefully by paying attention to safe and appropriate driving and (2) not. Especially in case of drivers of compactor trucks, they should minimize the breakdown by knowing system and condition of the vehicle, and taking good care of their vehicles.

Through our activities, active training and guide of inspection of vehicles prior to the operation have done to drivers, to let them be professional drivers to be careful to treat their vehicles, and the results are satisfactory.

Evaluation: Training to drivers has done and they are tackling eagerly, so this activity is well evaluated and the good results will be expected.

c Periodic Inspection

Inspection of vehicle is the first step of preventive maintenance, and effective activity to avoid breakdown and trouble of vehicle. Especially in case of Japanese compactor trucks, as complicated hydraulic and electric system are installed, periodic inspection is very important.
Inspection items, methods and interval are decided by reference of Japanese style, and inspection work has been implemented. And results of the inspection were recorded, and utilized through database, so good results will be expected in the near future.

Evaluation: As daily inspection and periodic inspection (monthly, quarterly, semestely) have implemented, good result can be expected.

d Appropriate maintenance of collection vehicles

Three types of maintenance (Preventive Maintenance - 1, -2 and -3) have been implemented as Preventive Maintenance.

As far maintenance techniques, how to find causes of trouble and how to repair them were trained through OJT (On the Job Training) under Japanese expert's guide / repair works, as well as learned hydraulic and electric system of loading and discharging mechanism of compactor trucks.

But, improvement of workshop is not proceeded well.

Evaluation: Basic technical matters of loading and discharging system of compactor trucks were understood, however, as maintenance technique of loading and discharging system of Japanese compactor trucks is very deep to master, and it is difficult to understand them completely in short period. Therefore, measure to level-up of technical ability and system to share experiences about learnt and failure among the team members should be established

e Operational rate of vehicles

Recent operational rate (as of 17th July, 2012) is going down to approximately 53%, and non-operational vehicles are listed below table C-6. The number of the trucks which have difficulty to be repaired is 5, and others are under repairing, and it takes time to prepare parts to be changed. In such a condition, the operational rate has room to be improved yet.

Evaluation: The operational rate of the compactor trucks is going down by comparing with the data of half year ago. But, if the budget to buy damaged parts can be obtained, the operational rate can have a possibility to be improved to approximately 80% .

However, as aging of compactor trucks is proceeding, more careful maintenance is necessary and on the other hand, supply plan of new trucks should be prepared.

Table C-6: Condition of non-operational vehicles

No.	Condition of Non-Operational Vehicles	Remarks
1202	Repair of Circuit Board is prepared by out-sourcing	Engine is operational
1203	Trouble of electric sequence	Engine is operational
1208	Unser repair by installing cylinder head of No. 1236	
1215	Overheat and Engine is not good condition	Available parts are removed to use another vehicle.
1216	Under checking and body is corroded and necessary of welding work.	Engine is operational
1220	Sensor of rotating board is damaged	
1223	Hydraulic pump ad sprocket are damaged.	Need outsourcing repair
1225	Un-operational	Available parts are removed to use another vehicle.
1226	Un-operational	Available parts are removed to use another vehicle.
1229	Needs hydraulic cylinder repair (under estimation to purchase)	
1231	Overheat and Engine is not good condition	Available parts are removed to use another vehicle.
1232	Starter motor is damaged.	
1233	Rear Combination Bow is under repair. Welding is finished. Need electric parts for operation.	
1236	Un-operational, Cylinder head was removed to No. 1208	Un-operational

C.5.3 Subjects

a Maintenance Technique

Compare to Japan, there is lack of necessary equipment and measuring tools for vehicle maintenance and the technique is not enough. Especially loading and discharging system of Japanese compactor trucks is unknown to the mechanics, and there were no maintenance manuals, they repaired by following their poor experiences, so they failed to repair, or took long time for repair / could not repaired accurately.

Moreover, the mechanics do not have chance to learn nor system for training, it is very difficult to make capacity development of them.

b Organization of Maintenance Work

It is too finely divided of vehicle maintenance area. Each Mechanic should cover many areas of vehicle by himself, because, more accurate and efficient maintenance can be expected by one mechanic's work. Especially electric and hydraulic system of compactor truck has close relation, so one mechanic should learn both systems to maintain 2 areas simultaneously.

In case of collection vehicle operation, each crew member should be allocated to certain vehicle, because they will be willing to treat their vehicle more carefully than changing their vehicles every day.

c Lack of Budget

Main reason of non-operational vehicles of DIGAUE is to take long time by lack of budget to purchase necessary parts for repair. It may be very hard to get enough budget practically, but priority setting of budget allocation may be possible to change by proper reason.

d Donation of Japanese secondhand collection vehicles

The safety and performance of Japanese compactor trucks is superior as compared to other countries' vehicles. But, it is difficult to find cause when troubled and repair / maintenance due to full automatic mechanism. And it is difficult also to prepare diagram and maintenance manuals that are necessary for maintenance, due to second hand compactor trucks. Moreover, special electric parts are difficult to be obtained.

e Road condition and inappropriate collection work

The road condition for collection vehicle has big difference from Japanese. Especially, access road to waste dump site is very poor and gives damage to collection vehicles. So, not only efforts for maintenance, but also road rehabilitation is important.

Compactor trucks are designed to load household waste / kitchen waste, so, soil, stones and construction debris should be avoided to load because they damage the loading and accumulating system of compactor trucks.

C.5.4 For Further Development

a Improvement of maintenance technique

Although basic vehicle maintenance system has been prepared and implemented already by this project, but it is necessary to grade up the quality of maintenance technique more. In the future, it is not only Japanese vehicles but also other ones to be adopted to DIGAUE, so it will be the first step to obtain operation and maintenance manuals as well as necessary drawings of sequence diagram to make proper operation and maintenance of the vehicles.

To obtain the maintenance technique, we should learn from professionals from vehicle manufacturers and others, and study by themselves among mechanic team by creating system / opportunity to learn together. Although they may be busy by daily work, supervisor should make an effort to prepare study opportunity / environment for them.

And it is important also to prepare maintenance manuals to set maintenance standard to obey and break away from individual intuition / decision.

b Ensure Necessary Budget

Generally, low priority of budget allocation is given to waste management, and it is very hard to purchase collection vehicles regularly. But, it is very necessary to have collection vehicles to make daily collection service, and maintenance of the collection vehicles is inevitable to operate collection vehicles continuously.

We have created database system, and by data analysis through database, we can get various information and data like necessary maintenance and its cost, necessary parts to be obtained and basic data for budget request, so, more effective preparation for budget request can be realized by more accurate data to let financial department understand the necessity.

c Supply and Selection of Vehicles

Even how carefully we operate and maintain our vehicles, we cannot use them forever, because of their limited lives, and must take them out of service some day. In order to conduct waste collection service without interruption, we need to supply new vehicles before out of service of the vehicle, and it is necessary to have planned preparation of vehicle supply.

Generally speaking, collection vehicles are expensive, so vehicle supply plan should be included to waste management plan or another upper plan, and should prepare the budget for purchase.

And it is very necessary to choose bet fitted vehicle by considering not only price but also collection capacity, kinds of target waste and containers, road condition, maintenance ability, service from vehicle manufacturer and so on. It is also necessary to prepare "procurement specification" to identify guarantee and necessary spare parts.

In case of donation of second hand vehicles / grant in aid program, it is necessary to try to get information always and should request necessary items (manuals and parts), even though they are second hand vehicles.

d Continuous operation of Database and Analysis

As one of the results of the project, database system of collection vehicles has prepared and the operation has implemented already. Therefore, this analysis and obtained data and information can contribute various improvement that was impossible before.

For examples, analysis of database can be useful better cost performance of collection service and maintenance, appropriate repair and maintenance and collection operation by knowing frequent damaged portions, appropriate maintenance items and frequency, preventive measure to avoid injuries and accidents by history of accidents, better collection service efficiency and so on.

As the value of database system can contribute above mentioned matters, continuous data input and analysis / evaluation study are very much necessary.

e Japanese donation of secondhand vehicles and technical cooperation

The 30 units of compactor trucks of DIGAUE were donation of secondhand trucks from Japan, as grass roots grant in aid program. Those trucks have been operated by Japanese cities and municipalities as household waste collection service.

From the view point of collection service capacity, it was very effective, but there were various problems about maintenance. First, (1) no sequence diagram of hydraulic and electric circuit, that caused delay of repair and inaccurate maintenance, (2) no maintenance manual let maintenance men mislead proper repair and maintenance, (3) no explanation about maintenance let maintenance men puzzled how to maintain loading and discharging system of compactor trucks, and (4) no information how to get electric parts that delayed the repair works.

Such donation and aid may be continued in the future, below mentioned items should be minded as donor's side.

(1) Attach hydraulic and electric sequence diagram of loading and discharging system.
(2) Attach maintenance manual and explanations
(3) Information how to get electric parts

In case of secondhand vehicles, it is necessary cooperation from vehicle manufactures and users of the vehicles.

Through this project, management and maintenance of collection vehicles and technical abilities are improved a lot. However, maintenance technique of Japanese compactor trucks cannot be mastered for short period, and training and study for several years are very necessary. And if maintenance men can master maintenance of Japanese compactor trucks, then they can maintain accurately all vehicles manufactured in other countries.

It is desirable to take advantage of the dispatch system of JICA expert or senior voluntary, because it is necessary to have long term training from professional about compactor trucks, to learn maintenance technique of Japanese compactor trucks that are very complicated.

And it is necessary also to create opportunity to study among maintenance men in the workshop, and share their experiences and information to obtain better maintenance technique.

D Improvement Plan on USW storage and discharge

D.1 Introduction

D.1.1 Background

Jointly, ADN and JICA conducted "The Study on Integrated Solid Waste Management Plan in Santo Domingo de Guzman, National District, Dominican Republic" from July 2005 to March 2007, producing the Master Plan where main objectives are to establish 100% of waste collection, to perform an adequate discharge of waste, as well as to reduce the amount of waste to a minimum to reduce the load on solid waste management, and to provide an efficient service with the purpose that it is financially sustainable.

The waste collection service in National District is contract with private operators and community foundations according to the area conditions. The providing regular collection service is establishing, namely collection service provided fixed collection day of the week and collection time. Also, monitoring system for collection vehicles by supervisors assigned to each rout and by analysts of operation who use GPS system in the main office is functioning to supervise the contractors and establish supporting system in ADN.

However, the residents received regular collection service still set discharge container such as big size container and/or Garita at the outside of their premises and discharge waste any time. The storage and discharge manner linked with regular waste collection service is not improved by residents.

From above mentioned points of view, the awareness raising of residents to improve storage and discharge manner as well as establishment of regular collection service is important to make sanitary and beautiful district.

D.1.2 Objective

A lot of scattering waste is seen around and inside of the discharge places, especially around and inside of Garita used by many waste dischargers.

Generated waste is usually stored/discharged within the shopping plastic bag. Waste generators in the National District store and same time discharge the plastic bag to sidewalk or roadside directly or to 200 litter plastic and metal container or Garita. Some discharger used Garita who installs the plastic or metal container in it. Those storage/discharge container/place are putting outside their property.

Consequently, waste container or discharge place putting out causes the obstruction of the pedestrian and the vehicle and the obstructions of the spectacle. Moreover, the living waste putting out causes the deterioration of the hygienic condition.

Some waste discharge container and place is inadequate for collection work because of its weight or size. As a result, it takes a long time for collection work and also the obstacle is caused to collection worker's safety.

According to the above mentioned situation, the goal on improvement of USW storage and discharge is established as follows;

- Beautification in the National District
- Improvement of hygiene
- Effective collection work

D.1.3 Policy

The improvement policies of USW storage and discharge of each residential area category and commercial are shown as follows;

- One family residence (OFR), Multi-family residence (MFR) and Commercial (Retail, colmados etc.)
  - ✓ Establish proper USW storage and discharge system
  - ✓ Abolish Garita for USW storage and discharge installed outside of property
- Difficult access are in low-income area
  - ✓ Provide regular waste collection service to difficult access area in low-income area
  - ✓ Establish proper USW storage and discharge system
- Low income urban-fringe congested area
  - ✓ Strengthen regular waste collection service in low-income urban-fringe congested area
  - ✓ Establish proper USW storage and discharge system
- Commercial (Large waste discharger)
  - ✓ Introduce Discharger's Responsibility Principal

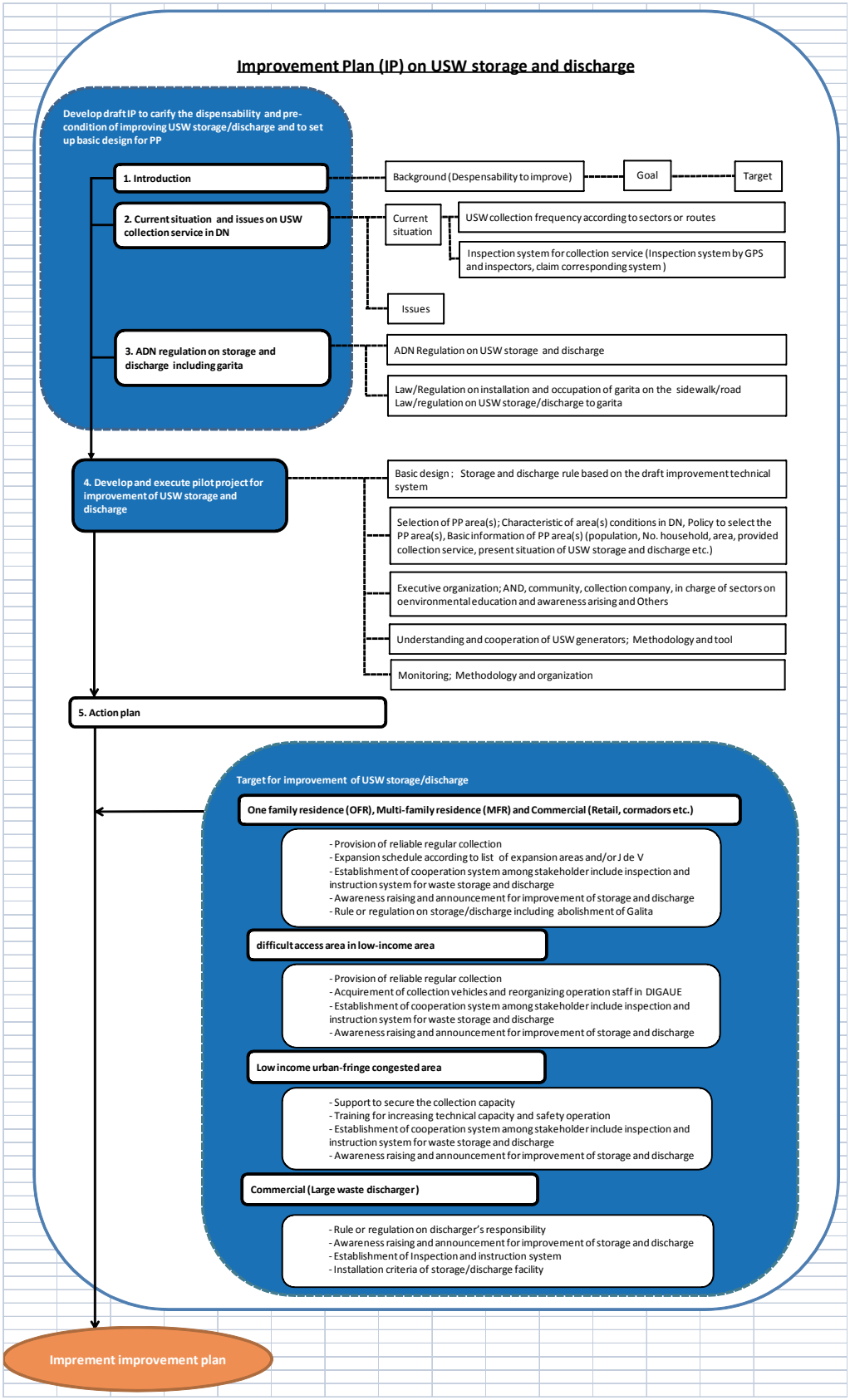


Figure D-1: Flow chart to develop improvement Plan (IP) on USW storage and discharge

D.2 Current situation and issues on USW collection service in the National District

D.2.1 Collection service

As previously described, the waste collection service in National District is contract with private operators and community foundations according to the area conditions. A current contract period is for ten years from 2007 to 2016.

The major private operators are presently only two companies, namely ADN services and DSC. They are providing collection service mainly by 20 yd3 compactor trucks. And ADN also is providing the collection service by using the small compactor trucks for contingency or resident's complaint. On the other hand, low income urban-fringe congested area where have narrow streets and small alleys are provided collection service by community foundations. As of now, ADN contracts with 5 community foundations for waste collection service in those areas.

Big waste generators of waste like universities, hospitals, supermarkets, hotels, commercial malls and public institutions are distributed in the residential and commercial areas and contract with private contractors directly.

The National District is divided into three circumscriptions. The collecting sectors provided collection service to each circumscription are shown Table D-1.

Table D-1: Waste collection sectors provided service

Circumscription	Waste collection sectors	Category of area provided collection service
Circumscription 1	ADN services & ADN	One family residence (OFR) Multi-family residence (MFR) Low income area (difficult access area) Commercial (Retail colmados etc.)
Circumscription 2	DSC &ADN	
Circumscription 3	ADN services & ADN	
	5 Community foundations	Low income urban-fringe congested area include colmados and colmadones
Private company that contracts with waste generators directly		Commercial (Big waste generators)

Generally, the collection service is provided stably, fixed day and time in National District, while the following issues is clarified at the same time.

- The mechanical troubles for collection vehicles belonging to ADN and ADN services frequently occur from inadequate maintenance, which provides the inappropriate collection service such as delay of collection service and partially collection.
- The communication and coordination between ADN and private contractors is not satisfactory.
- There are inaccessible areas by 20yd3 compactor collection truck in collection areas contracted with private operators. The waste generated in those areas taken by residents themselves or collected by private pushcart collectors to main road and it forms accumulations of waste. The collection service in such difficult access areas should be considered to provide regular collection service to whole National District.

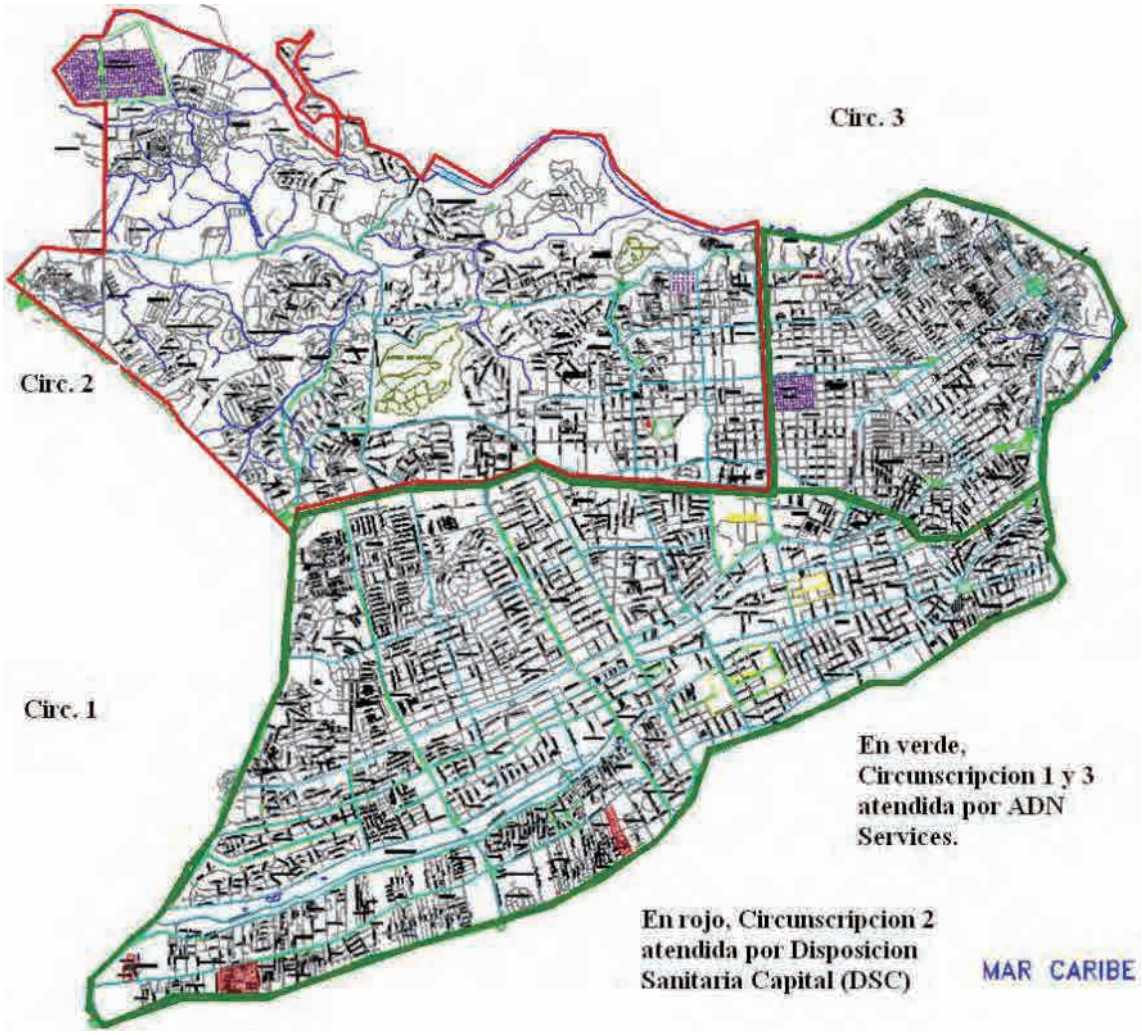


Figure D-2: Collection area assigned by private collection companies and community foundations

D.2.2 Inspection system for waste collection service

Collection service in the National District is conducted through a group of supervisors who have been assigned a micro-route. In Circumscription 1, there are six (6) supervisors, in Circumscription 2 there are four (4), and in Circumscription 3 there are two (2). They are well organized to control and supervise collection units, as well as to identify waste problems and other types of problems which would affect the residents' environment.

The monitoring team is equipped with cameras with the objective to take pictures of any problem which arises in any given sector.

In DIGAUE's main office, there is a group of analysts, eight (8) in total, who supervise with GPS the collection routes with the purpose that they follow the routes and frequencies already established.

	
Analysis by using GPS system by Operation and Monitoring Department	Monitoring by supervisor in the field

Figure D-3: Monitoring by DIGAUE

D.2.3 Waste storage and discharge

In general terms, storage and discharge of solid wastes in the National District are conducted inadequately which makes it difficult to collect them; consequently, health and aesthetic problems are generated in the city.

Storage is generally done in plastic bags, metallic and plastic drums, and other containers of different materials; a small percentage of plastic containers, as it was recommended by the M/P, could be observed. Wastes are always disposed outside the premises on the sidewalk, small roads, and small structures which are built especially for that purpose.

	
Waste container set always sidewalk	Situation of waste discharged to Garita

Figure D-4: Waste Discharge in Pilot Project Area

Even though in many sectors collection service is stable, the service is provided on the days and hours established, the community is not informed about it or does not trust the collection service provided. Consequently, residents are accustomed to take their wastes as they generate them; furthermore, wastes are placed on public areas, even after collection vehicle has passed in their collection area.

Table D-2: Current situations and improvement issues related to waste storage and discharge

Category of household and commercial		Storage container	Discharge container	Waste discharge time and frequency	Waste Discharge place
1. ADN or private companies contracted with ADN					
1-1 One family residence (OFR)	Current situation	In case of concrete yard used for storage container. there are many inappropriate discharges such as waste heaping and scattering surrounding yard	Storage tank and yard are used as a discharge container/place. They are always setting on the sidewalk and road side.	Using storage/discharge tank and yard allow that resident can discharge anytime the waste.	Some tank and yard installed on the sidewalk are obstructing the walking.
	Improvement issues	In the future, abolition of concrete yard is preferable, however in case of continuously using it, should clarify the rules to install it and store waste. In order to enforce the rule, instructing and inspecting system is necessary as well as education and awareness. In the long term, it is desirable to establish the following storage and discharge rule; Waste is stored in the storage container such as plastic tank or drum in the promise. Stored waste is transferred to discharge container and discharged with it or directly discharged with plastic back at the fixed time and fixed day of the week. Improvement of discharge system should be developed and implemented in connecting with improvement of collection system especially collection time.			
1-2 Multi-family residence (MFR)	Current situation	Types of storage container are mainly metal and/or plastic tank set into the concrete yard installed inside or outside near the boundary of premise. These containers are managed by concierge or caretaker.	Storage tank and yard are used as a discharge container/place. They are always setting on the sidewalk and road side.	Residents are able to discharge their waste any time regardless time and frequency. Concierge or caretaker carry out to using storage/discharge tank and yard regardless collection time and frequency.	Some tank and yard installed on the sidewalk are obstructing the walking.
	Improvement issues	From appearance and waste collection efficiency points of view, the abolition of concrete yard for waste storage and discharge outside of premise and establish the installation criteria inside premise and the rule for storage and discharge are necessary.			
1-3 Commercial (Retail etc.)	Current situation	In case of concrete yard used for storage container. there are many inappropriate discharges such as waste heaping and scattering surrounding yard	Storage tank and yard are used as a discharge container/place. They are always setting on the sidewalk and road side.	Daily collection system (except Sunday), so that waste can be discharged any time. Waste should be discharged just before collection vehicle arrival.	Some tank and yard installed on the sidewalk are obstructing the walking.
	Improvement issues	From appearance and waste collection efficiency points of view, the abolition of concrete yard for waste storage and discharge outside of premise and establish the installation criteria inside premise and the rule for storage and discharge are necessary. In the long term, it is desirable to establish the following storage and discharge rule;			

Category of household and commercial		Storage container	Discharge container	Waste discharge time and frequency	Waste Discharge place
		Waste is stored in the storage container such as plastic tank or drum in the promise. Stored waste is transferred to discharge container and discharged with it or directly discharged with plastic back at the fixed time and fixed day of the week. Improvement of discharge system should be developed and implemented in connecting with improvement of collection system especially collection time.			
1-4 Low income area (difficult access area)	Current situation	There is no manner to store the waste.	With plastic bag only or no using any other discharge container	The discharge rule is not kept at all.	Because of lack of provision of collection service, the residents bring their waste to main road. At the corner of main road and alley, the waste taken out from secluded home is heaped up.
	Improvement issues	Provide regular collection service Desirable discharge method Using discharge container with lid i.e. plastic bucket with plastic bag Compliance discharge time and day of the week			
2. Community foundation					
Low income urban-fringe congested area	Current situation	There is no manner to store the waste.	With plastic bag only or no using any other discharge container	The discharge rule is not kept at all.	Basically in front of the house, and residents who live in secluded home take waste to main road accessed by collection truck. At the corner of main road and alley, the waste taken out from secluded home is heaped up.
	Improvement issues	Secure collection capacity and provide continuous regular collection service Desirable discharge method Using discharge container with lid i.e. plastic bucket with plastic bag Compliance discharge time and day of the week			
3. Private company that contracts directly					
Commercial (Large waste discharger)	Current situation	Installation of large metal container is interfering with the collection work.	In case of storage tank and yard are used as a discharge container/place, they are always setting on the sidewalk and road side.	Daily collection system (except Sunday), so that waste is stored and discharged to the container any time.	Some tank and yard installed on the sidewalk are obstructing the walking.
	Improvement issues	From appearance and waste collection efficiency points of view, the abolition of concrete yard for waste storage and discharge outside of premise and establish the installation criteria inside premise and the rule for storage and discharge are necessary.			

D.3 ADN regulation on storage and discharge

In Chapter XI, Article 69-70 of the Urban Cleansing Regulation, it is established that every building to be used for multi-family residence, institutional, commercial, and industrial purposes should have a waste storage area.

Recently, the municipal ordinance draft for Temporary Storage for Non-hazardous waste in multi-family residences was sent to Urban Planning Bureau to be reviewed and submitted for approval.

This ordinance has the objective to regulate temporary non-hazardous solid waste storage areas in multi-family residences; it would be applied to every building to be used for multi-family residence and housing complex which consists of more than 10 houses and are located within the National District´s jurisdiction. It is a general and mandatory regulation for owners, legal representatives, construction companies, managers, janitors, persons responsible or living in the building or family housing complex as mentioned previously.

D.4 Pilot project for improvement of USW storage and discharge

D.4.1 Targets of Pilot Project

The Pilot Project on USW storage and discharge improvement was implemented to verify the reliability, sustainability and expandability of following targets based on the before mentioned current situations and issues.

- Establish USW proper storage/discharge system
- Awareness arising for residents to store in the property and discharge at fixed time and day of the week for collection
- Eliminate garita installed outside of waste dischargers' property for USW storage and discharge

The area condition in National District is classified mainly one family residence area, multi-family residence area and difficult access area. Pilot Project was basically implemented at typical areas selected in each type of areas.

The condition for installation of waste storage and discharge facility in the multi-family residence building is necessary as well as awareness raising for residents to improve waste discharge. So, the Pilot Project in multi-family residence area was excluded from this Pilot Project.

The target sites were selected in the following areas;

- One family residence area including some multi-family residence (building)
- Difficult access area

D.4.2 Procedure of Pilot Project

The implementing procedure of Pilot Project is shown in Figure D-5.

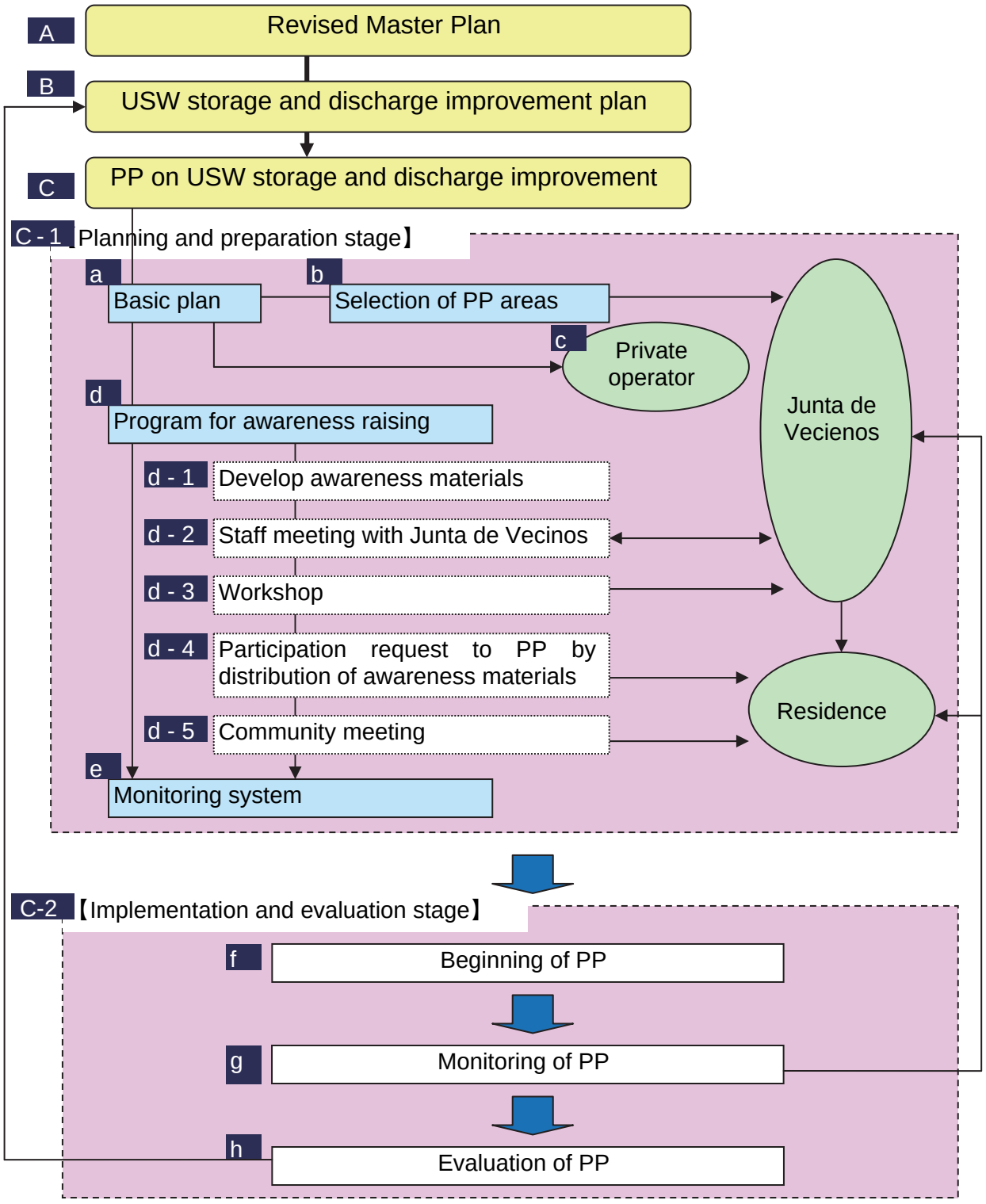


Figure D-5: Procedure of Pilot Project

A: One of the main points to revise of M/P is to strengthen the capacity of collection service provided stably and reliably.

B: Based on the revised M/P, the USW storage and discharge improvement plan targeted adequate storage/discharge manner and awareness rising of residents will be developed.

C: To develop the discharge improvement plan, the Pilot Project was implemented and the

monitoring results were evaluated to verify the validity of storage/discharge system proposed in Pilot Project, the coordination with existing collection service and understanding and cooperation of residents. The evaluation will be reflected to the improvement plan.

PP mainly consists of planning/preparing stage and monitoring/evaluating stage.

C-1: Planning/preparing stage consists of planning storage/discharge system, creating awareness raising program and establishing monitoring system.

a. The basic plan is an improvement system that is related to storage/discharge in consideration of characteristics of the areas, and cooperation with a regular collection system is essential.
b. The Pilot Project areas were selected as typical areas in each type of area to implement the basic plan, as well as the pre-meetings with community were hold. The Pilot Project was progressed in cooperation with Junta de Vecinos.
c. Moreover, the coordination with existing collection system is very important to implement Pilot Project.
d. Awareness raising consists of development of awareness materials, meeting with JV to prepare the Pilot Project, workshop for training of JV and ADN staffs, distribution of awareness materials and community meeting.
    d-1 Awareness materials were developed according to objects, targets and uses.
    d-2 As the Pilot Project is necessary to coordinate with community, several meetings with JV were hold in preparation stage of Pilot Project.
    d-3 The workshop was hold for the JV and ADN staffs to train to distribute awareness materials such as leaflet and magnet, to do an adequate explanation and to request enthusiastically to participate in Pilot Project.
    d-4 The staffs participated in the workshop distributed the awareness materials with door to door visit and requesting to joint Pilot Project.
    d-5 Community meetings were hold to obtain the understanding and cooperation from residents through communication with residents directly.
e. The monitoring system was established to observe the Pilot Project and evaluate its result quantitatively.

C-2: The implementation, monitoring and evaluation stage

f. PP is advanced with discussing and improving the problems.
g. PP was monitored based on the monitoring system and the result was shared with communities through the community meetings.
h. PP was continuously implemented for three (3) month, and the result was evaluated and influenced to the improvement plan.

D.4.3 Contents of Pilot Project

a Storage and discharge system

The basic systems on storage and discharge in Pilot Project are follows;

- The waste generated in the household is stored in their premise.
- The waste is discharged fixed day and time for waste collection.
- The waste discharge container is recommended as follows;
    - ✓ Plastic bag which is not easy to tear and waste water does not go out.
    - ✓ Appropriate size of plastic container for the family, however, after waste collection, it has been taken back in the premise.
- The waste collection service is provided regularly at fixed day of the week and time.
- Make a rule between a private pushcart waste collector and existing waste collection system in difficult access area.

Some multi-family residences which are in the one family residence area and installed “garita” outside of premise which is corresponding “a” in Figure D-6 will be targeted to improve the

storage/discharge system. The activities deployed are same as those in PP in one family residence area

Locations for waste storage/discharge containers are;

a : Outside of the compound and on the side walk
b: Inside of the compound
c: Inside of the compound and facing to the road or side walk

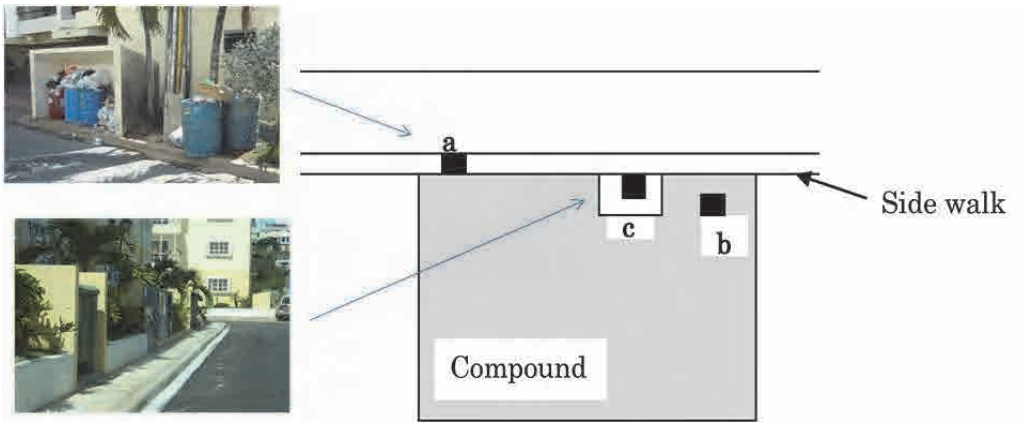


Figure D-6: Type of place installed garita in multi-family residences

b Program on awareness raising for adequate storage/discharge of waste

b.1 Making awareness materials

The awareness materials as showing in Table D-3 were developed and used to raise awareness for residents the Pilot Project. The materials left over will be able to reuse at expansion period.

Table D-3 : Awareness materials for storage/discharge improvement Pilot Project

Awareness material	Use
Leaflet	To be distributed to each one family or multi family residence of the PP areas. The purpose of the leaflets is to inform residents on how to store and discharge waste and to take out on the day and time established.
Magnet	To be distributed to each one family or multi family residence of the PP areas. The magnet can be applied to metallic surfaces like door of refrigerators to remind the resident on the method of storage and discharge, schedule and collection days.
Poster	To be distributed to JV, commercial establishments, sport clubs, educational institutions, and other institutions in PP areas. The poster informs the community on the appropriate methods of SWM.

Leaflet for proper storage/discharge

Poster for proper storage/discharge

←Magnet for proper storage/discharge

Figure D-7: Awareness materials used to storage/discharge improvement Pilot Project

b.2 Holding workshop and distribution of awareness materials

b.2.1 Holding workshop

The workshops were held to train JV staffs, residents and students according to the following items.

- To distribute awareness materials such as leaflet and magnet,
- To do an adequate explanation and
- To request enthusiastically to participate in the Pilot Project

b.2.2 Distribution of awareness materials

The awareness materials were distributed to every families by door to door visit based on the training conducted in workshops.

b.3 Holding community meeting

The community meetings were held to receive understanding and cooperation from residents through the communication.

D.4.4 Monitoring system for Pilot Project

a Objectives of monitoring

The monitoring of Pilot Project is essential to verify the reliability, sustainability and expandability of proposed storage and discharge plan. The main monitoring items are shown bellows;

- Discharge manner of residents on the waste collection day (adequate discharge manner by recommended plastic bag)
- Storage manner of residents on non-collection day (adequate storage manner installed and stored the waste container and/or waste inside of the premise)
- Situation of use of garita installed outside of premise on non-collection day

b Monitoring method

b.1 Monitoring unit

The analyst group in DIGAUE was in charge of the monitoring.

b.2 Monitoring items

The following monitoring items were recorded in the monitoring sheet in the field.

- Required time for monitoring
- Meeting time with collection crew
- Number of discharged points by type of discharge container, i.e. plastic bag including cardboard, big size of container such as 200 litter plastic tank and drum can, small size of container other than big size container and garita installed outside of premise and discharged waste
- Recording a specific observation and taking its picture

b.3 Monitoring method

- Monitoring staffs meet with collection crew at fixed place in the Pilot Project areas and fixed time before beginning collection work.
- Monitoring staffs monitor the number of discharge points by types of discharge containers/plastic bags according to the fixed collection routes ahead on the collection work.
- Monitoring report was made by monitoring staffs based on the monitoring sheet.
- Monitoring report was presented to share the situations and issues at a weekly meeting for DIGAUE staffs.

D.4.5 Result of Pilot Project

a Collection service

The following issues regarding waste collection service were clarified through the PP.

- The failure of regular waste collection has lost the trust of the residents to waste collection service.
- The breakdown of the vehicle that happens one after another disturbed to improve an inadequate storage/discharge as well as irregular collection service.
- It is necessary to establish a relationship as a good partner between ADN and private operators

- It is necessary to establish appropriate collection system in difficult access area such as Invi area. (The possibility to corroborate with collection system in USWM)

b Storage and discharge

The following issues regarding waste storage/discharge were clarified through the PP.

- An inadequate discharge which pushcart collectors and some residents take a waste to main road where large-size compactors (20yd3) pass daily have been observed in difficult access area.
- The below showings basic system for storage/discharge improvement PP was not obeyed in the almost families which mainly use waste container like big tank, small container and Garita.
  - ✓ To store waste in the premises (To install the waste container such as big tank in the premises and store waste in it)
  - ✓ To discharge waste on collection day before collection vehicle coming to collect
  - ✓ To take back a waste container into the premises after finishing waste collection service
- On the other hand, the storage/discharge method using plastic bag will be expected to improve it, because the families who discharge a waste with plastic bag on non-collection day has been considerably decrease.

c Awareness arising of residents

- The materials for awareness raising have been effective enough to make understand the importance of adequate storage/discharge and encourage the residents to participate in the PP.
- The communications with residents through community meetings have been important to win the understanding from them.
- JVs in both PP areas have played a significant role as coordination between municipality and community.
- The regular meeting with JV and/or community to share the monitoring result of PP is important to promote the improvement of storage/discharge and expand the area.

d Monitoring system for storage and discharge manner of residents

The importance of a regular collection service for an adequate waste storage/discharge has been recognized through the PP implemented in Invi and Antillas. The monitoring staffs belongs analysis group in DIGAUE confirmed the arrival time of collection vehicle allocated the PP areas in cooperation with supervisors assigned those areas during monitoring period. Also, the delay or cancel of collection service have been prevented to manage the collection time provided in those PP area based on the GPS data etc.

It is important to make keep collection service regularly in cooperation with between supervisors and analysis group in DIGAUE to expand an adequate waste storage/discharge.

D.4.6 Evaluation of Pilot Project

a Provide regular waste collection service

A regular collection service trusted by resident should be provided to expand an adequate waste storage/discharge. To achieve the aim, the following systems should be strengthened;

- Strengthen the operation management of collection vehicles
- Strengthen the maintenance system for collection vehicles

- Strengthen the relationship between waste collection companies regarding collection service
- Define in difficult accessible areas and establish collection system to them (examine to coordinate between existing collection system and pushcart collectors)

b Improve to an adequate waste storage/discharge

The followings area conditions should be considered to improve waste storage/discharge system.

- In difficult accessible area for collection vehicles, it is necessary to examine to prevent an inadequate waste discharge to main road by pushcart collectors and some residents.
- In area where a big tank mainly used as a waste discharge container, it is necessary to promote to use plastic bag instead of container such as big tank Garita.
- In multi-family residence, the regulation or guideline to install waste storage/discharge facility should be examined

c Raise awareness for citizen

The awareness raising for citizen is essential to extend the improvement of storage/discharge. The following systems should be examined to establish to raise citizen's awareness effectively.

- To establish the system to coordinate among use of materials for awareness raising effectively, having a community meeting and cooperation with JV
- To establish an occasion of conversation with community through regular community meeting

d Strengthen the management system to provide regular collection service

The following management system should be strengthened to provide regular collection service.

- To strengthen the inspection system for collection vehicle by corporation with supervisor and analysis groups.
- To strengthen arrangement system to prevent delay and cancel of collection service by cooperation with maintenance, supervisor and analysis groups
- To strengthen collection service to provide regularly by corporation with DIGAUE and private collection companies

D.5 Action Plan

D.5.1 Target

a One family residence (OFR), Multi-family residence (MFR) and Commercial (Retail, colmados etc.)

- Provide regular waste collection service
- Establish USW storage system in the property
- Establish USW discharge system, namely USW is discharged at fixed time and day of the week
- (Above two system including dissemination and awareness oriented to National District citizens whose main objective is to "Strengthen the compliance of the rules of wastes storage and discharge"
- Abolish garita installed outside of property for USW storage and discharge

(This improvement plan including development of two municipal ordinances regulating the conditions of storage and discharge, one in buildings of multifamily residential use and other buildings in commercial, industrial and institutional use.)

b Difficult access area in low-income area

- Provide regular waste collection service to difficult access area in low-income area
- Establish proper USW storage and discharge system

c Low income urban-fringe congested area

- Strengthen regular waste collection service in low-income urban-fringe congested area
- Establish proper USW storage and discharge system

d Commercial (Large waste discharger)

- Introduce Discharger's Responsibility Principle

Table D-4: Target and action plan for each category

Sectors providing collection service	Category of area provided collection service		Target	Action Plan
1. ADN or private companies contracted with ADN	1-1 One family residence (OFR)		Adequate storage and discharge Abolish Garita	Provision of reliable regular collection Expansion schedule according to list of expansion areas and/or JV Establishment of cooperation system among stakeholder include inspection and instruction system for waste storage and discharge Awareness raising and announcement for improvement of storage and discharge Rule or regulation on storage/discharge including abolishment of Garita
	1-2 Multi-family residence (MFR)	Inside install	Adequate storage and discharge	
		Outside install	Adequate storage and discharge Abolish Garita	
	1-3 Commercial (Retail colmados etc.)		Adequate storage and discharge Abolish Garita	
	1-4 Difficult access are in low-income area		Provision of regular collection service by small compactor trucks Adequate storage and discharge	Provision of reliable regular collection Acquisition of collection vehicles and reorganizing operation staff in DIGAUE Establishment of cooperation system among stakeholder include inspection and instruction system for waste storage and discharge Awareness raising and announcement for improvement of storage and discharge
2. Community foundation	2. Low income urban-fringe congested area		Provision of stable collection service Adequate storage and discharge	Support to secure the collection capacity Training for increasing technical capacity and safety operation Establishment of cooperation system among stakeholder include inspection and instruction system for waste storage and discharge Awareness raising and announcement for improvement of storage and discharge

Sectors providing collection service	Category of area provided collection service	Target	Action Plan
3. Private company that contracts directly	3. Commercial (Big waste generator)	Discharger's Responsibility	Rule or regulation on discharger's responsibility Awareness raising and announcement for improvement of storage and discharge Establishment of Inspection and instruction system Installation criteria of storage/discharge facility

D.5.2 Schedule to achieve the plan

Table D-5: Schedule to achieve the plan

	2010	2011	2012	2013	2014	2015	After 2016
1. Develop improvement plan	←	—	→				
2. One family residence, Multi-family residence (MFR) and Commercial (Retail, colmados etc.)							
2-1 Pilot Project	←	—	→				
2-2 Strengthening of regular collection service		1st Expansion		2nd Expansion			3rd Expansion
2-3 Adequate storage & discharge (Announcement to citizen, awareness raising and inspection)		1st Expansion		2nd Expansion			3rd Expansion
2-4 Rule or regulation			···	···	···	···	→
3. Difficult access are in low-income area							3rd Expansion
3-1 Pilot Project	←	—	→				
3-2 Provide a regular collection service		1st Expansion		2nd Expansion			3rd Expansion
3-3 Preparation(Establish cooperation system, Announcement to citizen)		1st Expansion		2nd Expansion			3rd Expansion
3-4 Adequate storage & discharge (awareness raising and inspection)		1st Expansion		2nd Expansion			3rd Expansion
4. Low income urban-fringe congested area							3rd Expansion
4-1 Support to secure the collection capacity			···	···	···	···	···
4-2 Provide a regular collection service					—	—	—
4-3 Adequate storage & discharge (Announcement to citizen, awareness raising and inspection)					—	—	—
5. Commercial (Big waste generator)							
5-1 Rule or regulation			···	···	···	···	
5-2 Preparation (Announcement to citizen)					—	—	
5-3 Implement (Awareness raising and inspection)							←

D.5.3 Action plan for area provided collection service by ADN or private companies contracted with ADN

a Provision of reliable regular collection

The following aspects should be established to keep the reliable regular collection.

- Proper management of final disposal site,
- Proper maintenance of collection equipment,
- Good relationship with contractors and
- Inspection system by collaboration with GPS system and supervisor

a.1 Proper management of final disposal site

A cutting off the traffic to final disposal site caused by a heavy rain brought hurricane and tropical storm is repeated every year. Securing smooth going into and leaving from the final disposal site for waste collection trucks was an earnest desire for GIGAU which is in charge of waste management.

The policy to improve the management system for Duquesa final disposal site including to secure the smooth access for waste collection vehicle will be clarify in the revised M/P.

a.2 Proper maintenance of collection equipment

In order to provide adequate waste collection service, each responsible sector to prove collection service should maintain their collection equipment and vehicles. As for ADN, capacity of staffs to maintain and repair to small compactor trucks donated by Japanese aid is strengthen through the Japanese capacity development project. According to ensure the appropriate maintenance system, the collection service in an inaccessible areas and quick correspondence to the complaint from the residence can be done.

ADN continuously request private contractors to maintain their collection vehicles adequately.

As community foundations is a tiny companies, ADN will support them to strengthen the capacity of maintenance and repair for collection equipment.

Because the community foundation is a petty organization, ADN supports it for the maintenance management ability strengthening.

To establish an adequate maintenance for collection vehicles is indispensable issue to request residence an adequate storage and discharge manner.

a.3 Good relationship with contractors

It is difficult to provide adequate regular waste collection without cooperation of private collection company contracted with ADN. On the assumption of payment not delayed, DIGAUE closely takes relation with private contractors through regular meeting to provide adequate regular waste collection and to improve inadequate discharge manor.

a.4 Inspection system by collaboration with GPS system and supervisor

The waste collection work is inspected and instructed to provide adequate service by twelve (12) supervisors and eight (8) analysis staffs in Operation and Maintenance (OM) department of DIGAUE. The following inspection system will be established to be reflected quickly the inspection result in the field or by GPS system to improvement of inadequate waste collection service and/or to increase collection efficiency of collection workers.

a.4.1 Case 1:

1. The supervisor observes inadequate situation in collection area.
2. The supervisor informs it to OM Dept. in DIGAUE
3. OM Dept. orders private contractor to correspond it or request Maintenance Dept. (Taller) to send collection vehicle.
4. The supervisor checks the situation improved.
5. The supervisor informs the situation at the weekly meeting to share among DIGAUE.

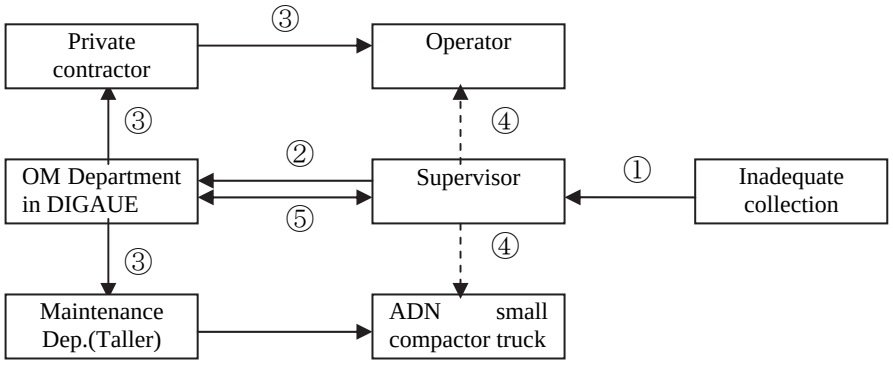


Figure D-8: Inspection system for inadequate collection and storage/discharge (1)

a.4.2 Case 2 :

1. OM Dept. receives directly the claim about inadequate situation in collection area
2. OM Dept. contacts with supervisor covered the area and make him to check the situation.
3. The supervisor informs it to OM Dept. in DIGAUE
4. OM Dept. orders private contractor to correspond it or request Maintenance Dept. (Taller) to send collection vehicle.
5. The supervisor checks the situation improved.
6. The supervisor informs the situation at the weekly meeting to share among DIGAUE.

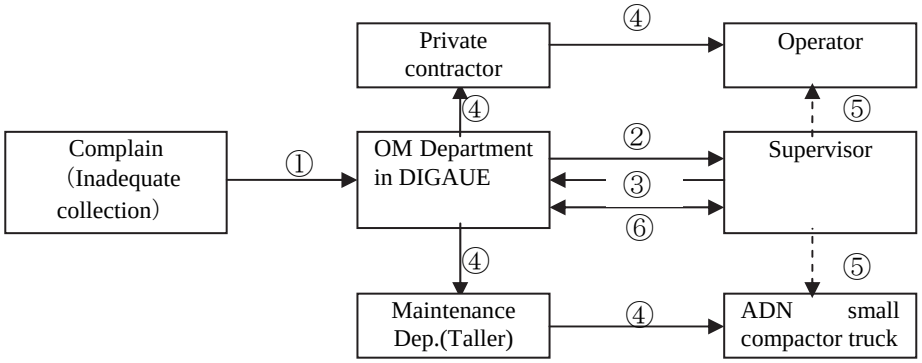


Figure D-9: Inspection system for inadequate collection and storage/discharge (2)

b Expansion schedule

The expansion of areas to improve storage and discharge manner is promoted according to the following a policy, target and schedule.

b.1 Expansion policy

An improvement of storage and discharge manner will be expanded a collaboration of both activities to all collection area in ADN. One is provision of adequate collection service by service provider, another is to keep a storage and discharge rule by service receiver.

b.1.1 A difficult accessible area and difficult to provide collection service by large capacity collection truck;

- The collection service in a difficult accessible area those areas will be expanded gradually by small compactor truck belong to ADN, while considering the collection schedule by existing collection trucks and purchase plan of small compactor trucks in the future.
- Arising awareness for adequate storage and discharge manner is encouraged by distribution of leaflet developed during PP and by holding community meeting.

b.1.2 A collection areas provided collection service;

- Encourage a regular collection service, fixed day of the week and time
- Cooperation with private contractors
- Arising awareness for adequate storage and discharge manner is requested to cooperate by distribution of leaflet developed during PP and/or by holding community meeting, if it is necessary.

In order to achieve improvement of storage and discharge manner, it is necessary the effort to receive understanding and cooperation from residents in each area. However, it is difficult to establish the unit to promote it in DIGAUE. Therefore, the expansion will be promoted with a cooperation of community such as Junta de Vecinos (JV).

b.2 Target and schedule for expansion

b.2.1 Target

- First expansion (2012): Target areas are along Av. Independencia in the Southwest in ND (1% population in ND)
- Second expansion (2013-2015): 1.47% of population in ND
- Third expansion (after 2016): 100%of population in ND

The following table shows the expansion program in three phases.

Table D-6: Target and schedule for expansion

Expansion schedule	Target	2012	2013	2014	2015	After 2016
First expansion	1 percent of total area in ND					
Second expansion	1.47 percent of total area in ND and 3.46% with regards to C1					
Third expansion	Whole area in ND					

b.2.2 First priority expansion (2012)

- The procedure of expansion for first priority expansion is shown as follows;
- The invitation and selection of JV which has willingness to improve
- 16 JVs which are willing to improve will be first priority expansion target.

In all areas southwest in the ND, awareness material will be distributed to disseminate proper message about adequate discharge and community meetings will be held if it is necessary.

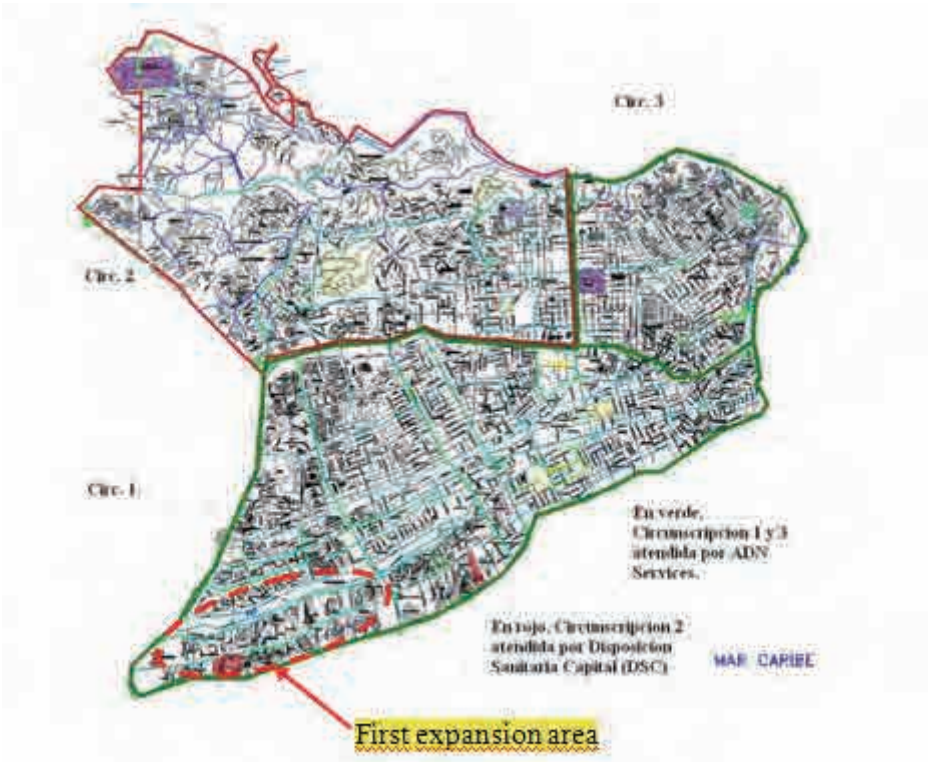
As a continuity of the PP which was developed in Invi and Antillas, some sectors in the "Kilometros" target area have been chosen (Ave. Independencia) to become part of the project, taking into account the main characteristics that each sector should have for implementation. These expansion areas are initially provided with adequate collection service (fixed day and time), with the purpose to evaluate the neighbors' behavior as they get use to the service quality, guarantee, and commitment by ADN and conduct a responsible and adequate solid waste discharge by the neighbors in those sectors.

In this manner, only distribution of educational materials is missing and on-site talks to instruct residents that the project is being conducted with their participation from that moment on; their usual cooperation will be required to confirm one of the mottos of the project: 50% ADN and 50% residents.

In this regard, on Friday 15th of June, 2012, a meeting with Neighbors' Committee was held at Res. Sandra II which has become responsible to discharge their waste in an adequate manner since they realized that ADN was being punctual with waste collection service. A talk was conducted by Mr. Pablo Mejía from the DIGAUE who explained activities conducted previously in pilot project areas, methodology used, experiences, and requirements to the residents by ADN-JICA team.

Similarly, educational flyers and posters were distributed. The number of this material donated by JICA is shown in a reception letter for the project which is shown as an Annex.

Next, a table shows three categories of situations that take place in the project and the respective expansion sectors in the target area (Ave. Independencia) which have been modified and have become part of model sectors, such as INVI and Antillas. These sectors are La Habichuelita and Res. Sandra II which have received for some time an adequate service by ADN and have also received educational material. In this table, other positive changes are shown, for example, sectors which have not received educational material, but already receive adequate service by ADN and are awaiting talks and distribution of educational material. It should be added that two sectors (Los Praditos and El Manguito) were not included in the expansion program because they do not belong to the target area (Ave. Independencia), but they will be included in the third expansion program in 2013. Additionally, Residencial Independencia and El Pedregal, which already have adequate waste collection service by the contractor, will be under evaluation; however, coordination works should be conducted with the contractor to provide conscious awareness citizen education.



LEGEND

Group	Color	Descripción
Group I		Regular collection by ADN and citizen´s conscious awareness provided
Group II		Regular collection by ADN, citizen´s conscious awareness is planned
Group III		Irregular collection by ADN Services, direct operation will have to implemented

b.2.3 Second expansion (2013-2015)

The procedure of expansion for second expansion is shown as below;

- Selection of expansion areas
- Verification of JV in the selected areas
- Briefing and cooperation requirement to representative and/or member of JV

The method to be followed will be to implement the project where collection by the private company, ADN Services, is inefficient due to difficult access in those areas.

The vehicles from that company are unable to collect waste door to door as it is done in other areas of the National District; this situation causes that residents discharge in improvised illegal dumpsites located in the closest main avenue.

One of the main characteristics for a sector to be chosen as part of the project is that they should have an active Neighborhood Committee (Junta de Vecinos) which is concerned with the issues related to waste accumulation at the entrance or exit from their area which have negative impact on the ornament and implies diseases, proliferation of insects, and other nuisances.

Expansion area: 2013-2015 (After finalizing this second phase, all critical areas in Ward No. 1 in the National District will be covered).

c Storage and discharge system

The improvement of storage and discharge is implemented based on the following system.

- One family residence, low-income area and distributed commercial like a retail, colmados etc are introduced in pilot project.
- The storage space and container is necessary to install inside premise of multi-family Building. The waste management staff is managed generated waste in the compound. (refer to photo 1: Waste is well managed in side of compound at Pradera verde)
- In Multi-family residence, the improvement system is depend on owners and management staffs of the housing. On the other hand, for the residents who live in multi-family residence is not improved at all, they are able to discharge their waste at any time same as before.

- In some multi-family residence, the structure of waste discharge points are not suitable to manage the waste. It is caused unfavorable beautification and sanitary condition in those housing areas. It is necessary to improve the structure of discharge points. (refer to photo 2: The structure of storage/discharge place is inadequate at Jose Contrerason)

Photo 1: Waste is well managed in side of compound at Pradera verde

Photo 2: The structure of storage/discharge place is inadequate at Jose Contreras

The improvement of storage and discharge system introduced in expansion area is summarized in Table D-7.

Table D-7: Storage and discharge system

System	One family, Commercial, Low-income	Multi-family	
		Waste management staff	Residents
Announcement	fixing collection day and time and prohibit to discharge other day and time	fixing collection day and time and prohibit to discharge other day and time	As a building, fixing collection day and time and prohibit to discharge other day and time
Waste storage system	Storage in side of premise Prohibit to install outside of premise include install the garita on the side wake	Storage in side of premise Prohibit to install outside of premise include install the garita on the side wake	Residents living in the Building has not custom to store the waste
Waste discharge system	Discharge at fixed day and time Recommend to use plastic bag as a discharge container However, if discharge container like big tank is used, it has to be bring back it to premise	Discharge at fixed day and time Bring back the discharge container to premise	Residents living the Building are able to discharge any time. Recommend to use plastic bag as a discharge container

d Establishment of cooperation system

It is necessary to establish cooperation system among following sectors and stakeholder.
The role of each sectors shown below and relationship among sectors is illustrated in Figure D-10.

d.1 DIGAUE:

- Observation of area condition and arrangement with improvement system such as storage, discharge and collection system proposed in pilot project
- Meeting with community staff on object to improve, improvement method, cooperation request and confirmation of cooperation organization in community etc.
- Preparation of awareness material
- Supporting for community meeting
- Supporting for Inspection and instruction

d.2 Community (Junta de Vecinos):

- Meeting with DIGAUE on cooperation organization in community
- Preparation of holding community meeting include distribution of awareness material and leaflet for holding community meeting by house to house visit.
- Implementation of inspection and instruction of storage and discharge manner

d.3 Residence:

- Participate to community meeting to understanding and cooperation
- Implement adequate waste storage and discharge

d.4 Operation unit:

- Providing adequate regular collection service

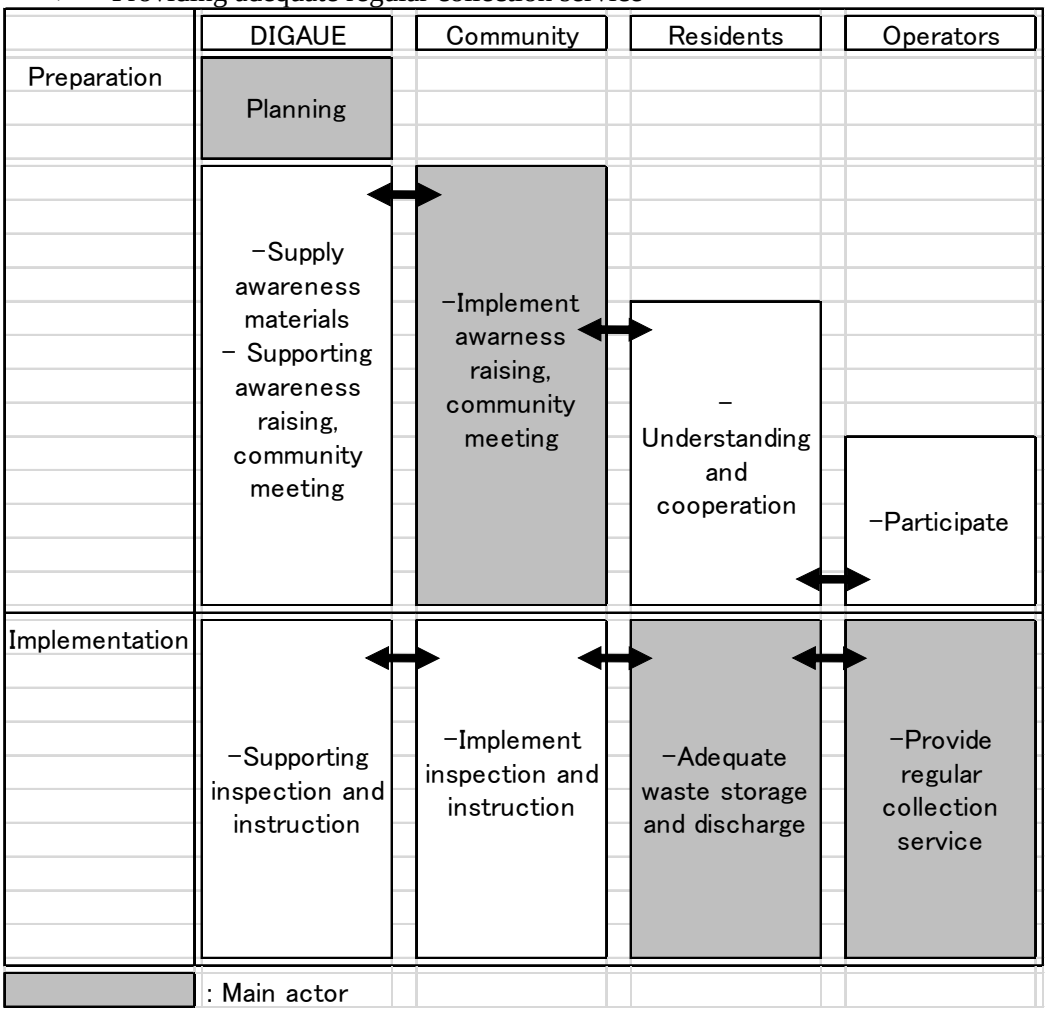


Figure D-10: Cooperation system among stakeholders

e Awareness raising and announcement

The understanding and cooperation of community and resident to execute the storage and discharge improvement is received through following tools and opportunity.

- Awareness raising materials
- Community meeting
- Announcement on improvement of storage and discharge to citizen by media

e.1 Preparation of materials for awareness raising

Materials for awareness rising developed at PP are used to area expansion for improvement.

Table D-8: Material for awareness rising developed at Pilot Project

Awareness material	Use
Leaflet	To be distributed to each one family or multi family residence of the PP areas. The purpose of the leaflets is to inform residents on how to store and discharge waste and to take out on the day and time established.
Poster	To be distributed to JV, commercial establishments, sport clubs, educational institutions, and other institutions in PP areas. The poster informs the community on the appropriate methods of SWM.

e.2 Holding community meeting (if necessary)

The community meetings were held to receive understanding and cooperation from residents through the communication.

- The community meeting is hold as following procedure;
- Pre-meeting with JV staffs on date, place and program of meeting etc.)
- Preparation and distribution of leaflet on holding community meeting and awareness rising materials
  - ✓ Preparation of power point for explanation material by DIGAUE
  - ✓ Method of improvement (Regular collection and adequate storage and discharge）
  - ✓ Role assignment among stakeholders such as DEGAUE, private contractor, community and residents
  - ✓ The contents of cooperation request to community and residents
  - ✓ The incentive given to communities

e.3 Announcement to citizen by media

A public announcement by using effective media such as newspaper, TV, Radio and wave site etc. is necessary to involve citizen.

f Acquirement of vehicles and reorganizing operation staff for difficult access area in low-income area

The following items should be examined to provide collection service in difficult access area in low-income area.

f.1 Target area and population in the area

Target area is difficult access area in low-income area where is not provided waste collection service. The areas and population living in the area are identified.

f.2 Target year

The vehicle is scheduled to be acquired by 2013 at this moment, though it depends on the financial situation for ADN. The collection service to obligate proper storage and discharge of waste to the resident is provided.

f.3 Required number of vehicles

Methodology to estimate the required number of vehicles

A required number of small size of compactor trucks are estimated the following method based on waste amount generated in difficult access area in low-income and the condition shown in table below.

Consequently, it is estimated that six (6) compactor trucks are required to provide collection service in whole difficult access area in low-income.

- Target waste amount (ton): A = (a x b)/1,000,000 = (681×10,000)/1,000,000 = 6.81
- Maximum waste amount be collected: MA = A x (maximum interval between collection day and collection day) = 6.81 x 3 = 20.43
- Capacity of compactor truck(ton): Cw = ｛d×e｝/c=（2×2） x 0.2 = 0.8 ton
- Total number of trips: TTw = 3A/CW = 20.43/0.8 = 25.54
- Acquired number of compactor trucks: CTw = TTw/g = 25.54/4 = 6

Table D-9: Conditions to estimate required number of small size of compactor trucks

Item	Unit	Condition
a. Generation waste amount in low-income household per capita per day	g/per capita/day	681[*1]
b. Population in low-incomes and difficult access area	person	10,000
c. Apparent specific gravity	-	0.2[*2]
d. Capacity of trucks	m3	2
e. Compaction ratio	-	2.0
f. Collection frequency per a week	Times/week	3
g. Average trip number per day (collection area-transfer station)	times/day	4
h. Loading rate		1.0

*1,*2: The figure is used based on the result of WACS conducted MP stage in 2005.
The figure marked yellow color should be investigated and finalized.

f.4 Required number of operation staffs

According to the required number of collection truck, it is estimated the following collection staffs are necessary newly;

Driver: six(6) persons
Collectors: twelve (12) persons

g Rule or regulation on storage/discharge of residential and commercial including abolishment of Garita

Establishment of rule or enactment of regulation to encourage the improvement storage and discharge manner and abolishment of Garita are examined.

The examination to establish discharge rule without penalty or to enact regulation with penalty has to enough discuss with related persons and sectors.

The contents had to examine are enumerated as follows;

g.1 Objective

- To establish USW storage system in the property
- To establish USW discharge system, namely USW discharge at fixed time and day of the week
- To abolish garita installed outside of property for USW storage and discharge

g.2 Target

For all residence and commercial except big waste generator.

g.3 Responsibility of waste generator

Waste generator has to store his waste in the property and discharge it at fixed time and day of the week.
Waste generator has to stop using the Garita installed on the side wake and abolish it.

g.4 Inspection and instruction

ADN establishes the organization to inspect and instruct the waste generator regularly.

g.5 Penalty

The penalty is imposed following procedure;

Inspection => Instruction => Warning => Order => Penalty

D.5.4 Action plan for low income urban-fringe congested area provided collection service by community foundation

a Support to secure the collection capacity

Presently, five (5) community foundations are provided collection service to the low income urban-fringe congested areas and within four (4) foundations lease the collection trucks. In order to provide the reliable regular collection service, it is indispensable to secure the collection capacity.

One of the options to support the foundations, ADN procures collection vehicles and leases them to foundations with obligation of regular maintenance. However, this is depending on the financial situation of AND in the future.

b Training for increasing technical capacity and safety operation

Also, In order to provide the reliable regular collection service, it is necessary to increase the technical capacity of staffs of foundations. A sample of program for training is shown in table below. For the training, a manual for training is prepared and DIGAUE's staffs mainly train foundation's staffs along the manual.

Table D-10: Object and contents of training conducted to community foundation

Object of training	Target	Contents of training	Execution Place	Execution Frequency
To improve collection service	Owner Manager Drivers	Check the existing collection routs and select proper collection routs Proper collection system (collection manner, collection day and time, collection frequency etc.)	DIGAUE office and/or sight	Once a half year

Object of training	Target	Contents of training	Execution Place	Execution Frequency
To improve maintenance capacity to collection vehicles	Manager Mechanic Drivers	Proper maintenance items and method (daily and regular)	Taller	Once a half year
To manage collection work safely	Owner Manager Drivers Workers	Safety work at the time of collection, transportation and unloading etc.	DIGAUE office and/or sight	Once a half year

c Improvement of storage/discharge, cooperation among stakeholders and awareness raising system

The action plan on Improvement of storage/discharge, cooperation among stakeholders and awareness raising system are promoted in the same manner as the pilot project.

D.5.5 Commercial (Big waste discharger)

a Rule or regulation on discharger's responsibility

Establishment of rule or enactment of regulation to dispose waste generated from business sectors in an own responsibility are examined.

The examination to establish discharge rule without penalty or to enact regulation with penalty has to enough discuss with related persons and sectors

The contents had to examine are enumerated as follows;

a.1 Objective

A business sector has to dispose the waste generated from his business activity in an own responsibility.

a.2 Target

For the limited business sectors whose building activity are more than constant scale
The following criteria are used to establish the targeting scale of business;
According to the space for use business activity
According the waste amount generated from business activity

a.3 Responsibility of business sectors

The targeted business sector should appropriately dispose the waste generated from their own business activity in an own responsibility.

a.4 Obligation of business sectors

The targeted business sector should dispose the waste as follows;

1. Contract with collection or disposal companies registered by ADN
2. Transport to final site by himself (The tipping fee has be shown clearly.)
3. Effort to reduce waste generation as much as possible and contract with recycling company (ADN has to register and introduce proper recycling companies).

a.5 Registration of collection and disposal companies

ADN registers the companies to be able to collect, dispose and recycling appropriately based on the certain criteria. The targeted business sectors must not contract to companies other than registered companies.

a.6 Inspection and instruction

ADN inspect and instruct the targeted business sectors regularly.
It is necessary to examine the system to collect the fee for the inspection and instruction from collection and disposal company according to the amount of collection waste or number of contract, or from business sectors according to the space of business activity or generation waste amount.

a.7 Penalty

The penalty is imposed following procedure;

Inspection => Instruction => Warning => Order => Penalty

Currently, a project for ordinance for Big Generators has been publicized in ADN's web page. This ordinance will regulate non-hazardous waste management for institutions, commercial, and industrial generators.

This ordinance refers to solid waste from institutional, commercial, and industrial generators; it excludes healthcare center, special management, hazardous, inflammable wastes, and those not similar to urban wastes which are mentioned here.