8 Recommendations for Disaster Waste

8.1 Immediate Actions

The damage, caused by the last hurricanes in the area of the Caribbean and the Gulf of Mexico, alert the necessity of proceeding to mitigate the fall of trees, especially, exotic species not adapted to the climate. Under appropriate conditions, native and endemic species usually resist the impacts of the natural phenomena. Also, they require less maintenance necessities.

With the purpose of mitigating the damage that could occur in the National District, the following are proposed.

- Species selection: Select native and endemic species that resist hurricane winds consulting with the Botanical Garden.
- Planting methodology: Large trees should be placed in a location that allows the roots to sufficiently anchor and sustain the tree; they are preferable for the isles without pavement and continuous green fringes with a minimum width of 1.20 meters.
- Tree-planting maintenance: With appropriate maintenance, strong and well balanced structures can be achieved. Trees of good quality and formation pruning in the first years are essential for the development of a structure resistant to damage due to hurricane winds.

Spaces to Give Attention

There are spaces that are important in the case of emergencies such as access to healthcare centers.

Table 8-1: Access to Healthcare Centers

LIST OF THE PUBLIC HOSPITAL CENTERS IN THE N.D.		
Health Center	Road of main access	Prevail Species
HOSPITAL CENTRAL DE LAS FFAA	AVE. ORTEGA Y GASSET	YELLOW ACACIA
HOSPITAL GENERAL PLAZA DE LA SALUD	AVE. ORTEGA Y GASSET	YELLOW ACACIA
HOSPITAL SALVADOR B. GAUTIER	C/ PEDRO LIVIO CEDEÑO	YELLOW ACACIA JAVILLA EXTRANJERA
HOSPITAL INFANTIL SANTO SOCORRO	C/ 28 (ENS. LA FE)	YELLOW ACACIA JAVILLA EXTRANJERA
HOSPITAL DEL BILLETERO	C/ 14 (VILLA CONSUELO)	JAVILLA AMERICANA
HOSPITAL LUIS E. AYBAR	C/ FEDERICO VELASQUEZ ESQ. C/ FEDERICO BERMUDEZ	YELLOW ACACIA JAVILLA EXTRANJERA
UNIDAD DE QUEMADOS		
CENTRO DE GASTROENTEROLOGIA	C/FEDERICO BERMUDEZ ESQ. C/OSVALDO BAZIL	
INSTITUTO DOMINICANO DE DERMATOLOGIA	C/ ALBERT THOMAS	YELLOW ACACIA JAVILLA EXTRANJERA
HOSPITAL DR. FRANCISCO MOSCOSO PUELLO (MORGAN)	AVE. NICOLAS DE OVANDO	
MATERNIDAD NUESTRA SRA. DE LA ALTAGRACIA	AVE. PEDRO HENRIQUEZ UREÑA – AVE. MEXICO	YELLOW ACACIA JAVILLA EXTRANJERA PALMS ¿
HOSPITAL PADRE. BILLINI	C/ SANTOME	NO TREE-PLANTING
HOSPITAL DE LA MUJER	AVE. BOLIVAR	

LIST OF THE PUBLIC HOSPITAL CENTERS IN THE N.D.		
HOSPITAL INFANTIL DR. ROBERT REID CABRAL	AVE. ABRAHAM LINCOLN	JAVILLA EXTRANJERA
INSTITUTO DE LA DIABETES (INDEN)	C/ PASEO DEL YAQUE (LOS RIOS)	SEVERAL BUSHES
INSTITUTO DOMINICANO DE CARDIOLOGIA	C/ MAGUEY (LOS RIOS)	SEVERAL BUSHES
INSTITUTO ONCOLOGICO DR. HERIBERTO PIETER	C/ CORREA Y CIDRON (ZONA UNIVERSITARIA)	SEVERAL BUSHES

Other centers of strategic attendance for the city include: the Municipal Palace of the Center of the Heroes, the General Barracks of Firemen and the Firemen Stations, the Transfer Station of Villas Agrícolas, the facilities of the Emergencies National Commission and the Cruz Roja Dominicana.

9 Action Programs

9.1 Action Programs Recommended

This Chapter presents the Action Programs for ADN to carry out the implementation of the Master Plan, especially during the preparatory stage (2006) and Phase 1 (2007-2008). In addition, for the case of a new final disposal site being needed, recommendations are given as technical guidance for the selection of the new final disposal site, and the administrative procedures required for its construction. Furthermore, in the event that the new final disposal site is to be located farther away, as assumed in MP2, recommendations are given for the construction of the proposed transfer station.

The following are Action Programs proposed. In addition, the table below shows relations between the Strategies, the Description of the Master Plan, the Action Programs and Major Expected Results to be achieved. Details are described in the Main Report.

Establishment of Legal Infrastructure
- Program 101: Establishment of a Basic Rule

Strengthening of the Management Organization
- Program 201: Strengthening of Coordination among ADN Directorates
- Program 202: Reform of the Urban Cleansing Department of EMUCD
- Program 203: Establishment of Municipal Company

Towards Achievement of the Collection Goal
- Program 301: Categorization and Definition of Collection Services
- Program 302: Design of Collection Routes
- Program 303: Establishment of Collection Service Structure
- Program 304: Establishment of Contract Auditing System
- Program 305: Expansion of Collection Data Management
- Program 306: Reform of ADN Direct Operation
- Program 307: Communication with Citizens

Towards Achievement of the Final Disposal Goal
- Program 401: Improvement of the Current Disposal Operation
- Program 402: Landfill Site Selection
- Program 403: Construction and Operation of a New Transfer Station

Towards Achievement of the Waste Minimization Goal
- Program 501: Generation Control
- Program 502: Discharge Control
- Program 503: Resource Recovery (Composting)

Towards Achievement of the Financial Goal
- Program 601: Increase of Income
- Program 602: Reduction of Expenditures
- Program 603: Subsidy to the Poor

Table 9-1: Action Programs

Strategies	M/P description	A/P	Expected Results	2006-08	2009-11	2012-15
1. To establish legal infrastructure	7.3.1 a. Municipal Regulation for Cleansing	101: Establishment of Basic Rule	• Municipal regulation for cleansing is enacted.	◆		
2. To strengthen the management organization	7.3.2 a.1 Directorate Level	201: Strengthening of Coordination among Directorates of ADN	• Functions of Directorates of ADN are clarified	◆		
	7.3.2 a.2 EMUCD	202: Reform of the Urban Cleansing Department of EMUCD	• Necessary number of qualified personnel are assigned to the Urban Cleansing Department	◆		
	7.3.2 b. Establishment of Municipal Company	203: Establishment of Municipal Company	• A Municipal Company is established		◆	
3. To establish order in the collection service market	7.3.3 Public-private Partnership 7.3.5 Communication regarding Collection Service 7.4.2 a. Collection	301: Categorization and Definition of Collection Services	• Deferent services are well categorized and defined	◆		
		302: Design of Collection Routes	• Collection routes are designed	◆		
		303: Establishment of Collection Service Structure	• Contracts with the private sector are revised or newly made	◆		
		304: Establishment of Contract Auditing System	• New collection services are implemented	◆		
		305: Expansion of Collection Data Management				
		306: Reform of ADN Direct Operation				
		307 Communication with Citizens				
4. To build a consensus among the municipalities in the Metropolitan Area	7.4.2 b. Transfer Station 7.4.7 Final Disposal	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		◆	
		403 Construction and Operation of a New Transfer Station	• A transfer station is constructed and operated if necessary		◆	

Strategies	M/P description	A/P	Expected Results	2006-08	2009-11	2012-15
5. To begin 3Rs and to apply the principle of Extended Producer Responsibility	7.3.5 b. Communication regarding Waste Minimization 7.4.4 Waste Minimization	501: Generation Control	• Environmental education is conducted by the Information Center	◆		
		502: Discharge Control	• Recycling activities are conducted at supermarkets, colmados and/or schools		◆	
		503: Resource Recovery	• Composting is carried out targeting the market waste		◆	
6. To apply the Polluter Pay Principle, but to consider the poor	7.3.4 Financial Management	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 • Total amount of subsidy is reduced	◆		

10 Conclusion and Recommendations

10.1 Conclusion

10.1.1 The Current Situation of the MSWM and Challenges

a. Collection, Transport and Sweeping

a.1 Establishment of collection route and frequency was required

Regrettably, the city is not necessarily kept clean. Accumulated and scattered waste can often be found on roads and vacant spaces. The direct cause of this problem is the irregular collection service that causes waste to remain for a long period outside households. Adequate planning of collection routes and frequency and conduction of these routes are required to solve the problem.

a.2 Strengthening ADN's capability to manage contracts was required

Most of the collection service in the city is operated by the private sector. According to the contract, the contractors have to make a service operation plan including routes and frequency and submit it to ADN. However, such plans have never been prepared by them. Also, ADN does not have the capability to instruct them to do so. ADN should strengthen its capability of contract management in order to encourage adequate participation of the private sector in the collection service.

a.3 Communication with the citizens was necessary

Collaboration with the citizens is indispensable for improving the collection service. The citizens have not been informed about the collection day and time, as those were not established. ADN has to establish a collection service plan and establish a system to distribute the information to the citizens.

a.4 Improvement of sweeping was necessary

In September 2005, about 1,500 people were working on sweeping. This figure later became 3,000 people. The reasons why such a large number of sweepers were required is that the inadequate collection service increased the amount of waste scattered on the roads and required sweeping, and there was no efficient sweeping plan in place. The cost of sweeping was estimated as 30% of the total MSWM cost in 2005. This was a considerable financial burden for ADN. It is necessary to attack the improvement of sweeping along with the improvement of the collection service.

b. Final Disposal

b.1 Consensus building regarding Duquesa was necessary

At the initial stage of this Study, there was a concern of whether Duquesa would be closed due to the opening of the airport constructed nearby. At this time, the Secretariat of State for Public Works and Communications took the initiative in building consensus among the municipalities, which disposed their waste in Duquesa, and other institutions concerned for improving the operation. Thus, the airport and Duquesa coexist at present.

At the final stage of this Study, late September 2006, the Municipality of Santo Domingo Norte declared that it would tear up the contract with Duquesa Consortium who operates the landfill. Although the reason has not been clarified, there is a concern that the cancellation of this contract may adversely affect the MSWM of the concerned municipalities, e.g., temporal suspension of collection service.

Stable operation of Duquesa is indispensable for the municipalities that dispose of waste there. It is necessary to build consensus and work together for stable operation.

b.2 Consensus building for construction of a new landfill was necessary

It was roughly estimated that Duquesa could continue the operation for about 10 years more. However, the duration may change as no detailed operation plan has been prepared. Furthermore, closure of the operation may result if a fire occurs and it adversely impacts the operation of the airport.

It is recommendable to build consensus among organizations concerned for construction of a new landfill, as it requires a long period of time and there are uncertainties on the operation of Duquesa as mentioned above.

c. Minimization

c.1 Start environmental education

The waste generation amount per capita was estimated as 1.5 kg/day. This value is comparable to that of industrialized countries and is large enough to require minimization. However, the MSWM in the National District should give priority to the improvement of the collection service taking into account the current situation. While doing so, it is recommendable to focus on environmental education that disseminates importance of minimization.

d. Finance

d.1 Improvement of the accounting system was required

Proper financial management is indispensable for stably and continuously providing the SW service to the citizens. In order to properly carry out financial management, it is necessary to accurately know how much is spent on what kind of activities. However, the current accounting system cannot give such information. Therefore, it is recommendable for ADN to clarify the cost structure of the MSWM and to establish an accounting system that makes it possible to give accurate and detailed financial information. Such information should be fed back to the MSWM for continuously improving its efficiency.

d.2 Increase of fare receipts was required

The fee collection rate at amount base was 7% in June 2004. It had been considerably improved to 43% in June 2005. However, it reached only to about 50% in June 2006. The improvement has slowed down. Four thirds of the MSWM cost is covered by the general budget, i.e., subsidies from the central government. It was recommendable to increase the fare receipt for the collection service in order to make the financial base stable. To reduce the dependence on subsidies also increases financial resources for other municipal services.

e. Institution and Organization

e.1 Establishment of legal infrastructure was required

The Secretariat of the State for Environment and Natural Resources had well developed legislations for solid waste management at the national level. However, the municipalities did not have legislations to meet with the requirements established by the national legislations. Therefore, a legislation was required that responds to the national legislations and to give guidance to the National District.

e.2 Strengthening of organizational ability was required

Up till now, change of organization and personnel has been conducted in each alteration of governments. This made it difficult to accumulate experiences and knowledge in public organizations. The MSWM is not an exception. The MSWM must solve various problems that arise every day, as well as coordinate the activities of several actors as citizens and service providers of private sectors. The complexity of problems that they confront daily requires an MSWM of high technical and organizational ability.

10.1.2 Pilot Projects

a. Integrated Collection Improvement

A series of pilot projects were conducted in order to improve the collection service. First, a project conducted by the direct operation of ADN with the principal purpose of letting ADN and the citizens understanding what is a good quality collection service. The target area was sector 6 according to the categorization of Triple A that extends to the south of Mirador Sur Park and has a population of 70,000.

Following that, a project was carried out with a private firm with the purpose of strengthening the contract management ability of ADN. The target area was Sector 5 which extends to the north of Mirador Sur Park and has a population of 80,000.

The projects were composed mainly of two aspects. One was to approach to service senders; design of the collection route and frequency, and implement and monitor it. The other was to address the service takers; distribute information regarding the collection day and time to the residents in order to encourage proper waste discharge.

As a result of the implementation of the projects, 97% of the residents expressed their satisfaction of the new collection service in the former case, and 93% confirmed improvement of the quality of collection service in the later case. Therefore, it can be said that the new service introduced by the projects were adequate for the project area.

As for communication with the residents, various tools were employed. In particular, the distribution of leaflets, which give information about the collection day, time and a way of discharging waste, to the residents by hand with explanation, was effective. Also, holding meetings with communities, Juta de Vecinos, and explaining directly to the residents were effective ways.

Furthermore, the projects established a data management system to quantitatively monitor the collection service. With this system, it became possible to timely obtain detailed information of the collection service in the target area.

It is recommendable for ADN to expand the pilot projects to other areas, then to cover the whole city. In order to do so, a strong organization is required that is capable of designing a collection service plan, communicating with residents, monitoring the collection service and feeding back lessons for continuous improvement.

b. Environmental Education

A project for environmental education focusing on waste minimization was carried out. The targets were the counterparts from ADN, the Secretariat of the State for Education and the Secretariat of the State for Environment and Natural Resources. Firstly, workshops were held targeting the counterparts. Secondly the trained counterparts carried out workshops inviting teachers from seven schools. Finally, those teachers practiced trial environmental education classes in their schools inviting the counterparts and other teachers to observe.

The counterparts and the teachers fully understood the contents of the workshops. The trial lessons acquired a favorable reputation from the parents. It can be said that the project may be acceptable for the society of the National District.

The issue is sustainability, because it is disputable that ADN gives resources for such activities. SEE may have to take in charge of these kinds of activities.

However, ADN has the Environmental Information Center. In the pilot project, staffs of the center played important roles and the workshops were held in the center. The Center can play a role, such as holding workshops, within the jurisdiction of ADN.

10.1.3 The Master Plan

The Master Plan was prepared on the basis of understanding of the current challenges and the lessons learned from the pilot projects.

a. Two Scenarios, MP1 and MP2

The Master Plan has two scenarios, MP1 and MP2, as it is uncertain that Duquesa operates until the target year, 2015. MP1 considers that Duquesa operates until 2015. Meanwhile, MP2 assumes that a new landfill, which is located 40km away from the city center, operates after 2012. Setting these two scenarios, the Master Plan increases its flexibility.

b. Basic Concept, Objectives and Goals of the Master Plan

The ADN's vision in the field of MSWM is a "Clean City", where the citizens enjoy a sound environment. The M/P contributes to realize this vision.

The basic approach of the M/P is "collaboration among the municipal government, the citizens and the private sector", taking into account the importance of their appropriate participation in the MSWM. In this collaboration, ADN is expected to assure provision of proper SW service, the citizens are to contribute by respecting discharge manners, and the private sector is to operate the SW service efficiently according to contracts.

The M/P aims at the "establishment of a Sustainable Solid Waste Service." Its goals are 1) 100% collection rate, 2) sanitary landfilling at Duquesa or a new site, 3) 15% waste minimization rate, and 4) less than 50% dependence on subsidies.

c. Institutional System

- The Municipal Regulation for Urban Cleansing was prepared as the legal basis of the Master Plan. This was given by its quick approval by the City Council and its enactment by the Mayor's Office in September 2006.

- The Master Plan proposes coordinated action among Municipal Directorates related to solid waste management, strengthening of the executing office EMUCD, and the establishment of a municipal company which would be open to citizens but would prevent uncalled for political interference in its management.

- Within ADN, one aspect of the capacity of the organization that should be developed refers to the public private partnership. The Master Plan presents the definitions of the collection service and the expected image of each service, indicating the design of all the collection activities. Also, the Master Plan presents guidelines for bidding, like the order of bidding tasks, contents of the bidding, and contract auditing, as a set of activities for contract management.

- In order to provide a high quality solid waste service in a continued and stable way, it

is necessary to secure the required income and use it effectively. At present, ADN is in the process of undertaking improvements in the budget control system, which are expected to result in more precise calculation of the solid waste management cost. Furthermore, the Master Plan recommends the addition of an accounting system specific to solid waste management, if such a need is recognized.

- Proposed measures to increase the income from solid waste management include improving the accuracy of the number of billed customers, charging a license fee and stricter control of the private companies providing the service to large generators. On the other hand, measures recommended to reduce costs include the already mentioned improvement of cost estimation, the continued monitoring of cost items, and the re-negotiation of commercial fees for billing and bill collection services.

- The use of subsidies is recommended for the residents of the city in the poverty group, while for those with the capacity to pay, the application of the Polluter Pays Principle is recommended as payment for the incurred cost.

- Communication topics and methods have proposed to residents regarding the collection service and waste minimization issues.

d. Technical System

- Appropriate manners of storage and discharge were recommended for each type of discharger.

In the pursuit of a collection service market with order, the Master Plan divided the collection service into six categories, taking into account the road conditions, quantity of waste discharged, and type of solid waste. It further indicates the types and quantities of equipment needed.

Assuming that in the future the final disposal site would be constructed farther away, a study was conducted for transfer and transport. Joint decision with the counterpart personnel assumed that the new disposal site would be located 40km away, in which case the conclusion was that transfer and transport would be more economical. Therefore, the Master Plan includes a plan for transfer and transport. The capacity of the new transfer station is 1,300 ton/day.

The Master Plan includes such indicators as the lineal meters to be swept by a sweeper in one day, the necessary number of brooms and plastic bags. Furthermore, the necessary number of sweepers and equipment are estimated.

In waste minimization, the differences and priorities are given for generation control, discharge control, resource recovery, followed by recommendations on environmental education, volumetric tariff, recycling based on the Extended Producer Principle, and composting with the use of market waste and pruning waste.

The final disposal site is located in Santo Domingo Norte Municipality, out of the scope of this Study, whereby no plan has been formulated. However, measures are presented as an action plan for the improvement of Duquesa, the existing final disposal site. Also, guidelines are presented for the event that a new final disposal site is needed, indicating in the corresponding action plan the measures needed for the selection of an appropriate site.

e. Evaluation

The Master Plan was evaluated from the viewpoints of institutions, techniques, the environment, social, economic and finance perspectives. Then, the validity of the implementation of the M/P was confirmed.

In both the financial and economic evaluation, the "With M/P" was favorable compared to the "Without M/P". In the financial evaluation, calculation of the Net Present Value at a 10% discount rate resulted in the "w/ M/P" exceeding the "w/o M/P" by 9.73 million US$ in the case of MP1 and by 17.89 million US$ in the case of MP2. Likewise, in the economic evaluation, the "w/ M/P" exceeded the "w/o MP" by 34.44 million US$ in the case of MP1 and by 42.63 million US$ in the case of MP2.

Financial Justification for the Implementation of the Master Plan

Cases	Master Plan 1 (Million US$)	Master Plan 2 (Million US$)
With Master Plan	228.47	245.00
Without Master Plan	255.70	290.57
NPV (10%)	9.73	17.89

Economic Justification for the Implementation of the Master Plan

Cases	Master Plan 1 (Million US$)	Master Plan 2 (Million US$)
With Master Plan	174.88	189.61
Without Master Plan	238.55	271.59
NPV (10%)	34.44	42.63

10.1.4 Action Programs

Programs to be implemented during preparation, 2006, and phase I, 2007 – 2008, of the M/P were presented. In addition, procedures for site selection and construction of a new landfill and recommendations for the construction of a new transfer station as technical guidance are presented for the case of necessary.

10.2 Recommendations

The following recommendations are made for achieving the M/P goals and for realizing the ADN's vison, "Clean City."

a. Towards achievement of the Master Plan Goals

It is recommendable to begin with the Action Programs under the Strategies towards achievement of the M/P Goals. What is described in the M/P will become reality by implementing the Action Programs.

b. Keep in mind the Objectives of the MSWM

The main objectives of the MSWM are 1) to eliminate waste from living environment so citizens can enjoy their healthy lives, 2) to dispose of waste so the collected waste does not cause an adverse impact on the environment, and 3) to encourage waste minimization to reduce the burden on the MSWM and to preserve natural resources. In addition, the MSWM should contribute to social well-being as a public service.

The Master Plan set its goals according to the objectives. Therefore, the most important is the objectives and the goals are the second important.

The M/P Goals are considerably challenging. ADN is expected to give efforts to attain the goals. However, the objectives should always be kept in mind. Those should not be underestimated. For example, if waste is illegally dumped to reduce transportation time, to collect more waste in the city. It will cause serious environmental contamination and undermine the citizens' confidence in the MSWM.

Therefore, ADN is also required to continuously review the goals taking into account results of measures and the external environment.

c. Carrying out of "Check – Plan – Do – See"

Various actors play in the MSWM and act according to their characteristics. Such behavioral traits change in correspondence to the socioeconomic system. For example; consumption increases along with an economic upward trend, then the amount of waste also increases; technical innovation shifts use of glass for containers to plastic, then, it results in waste. The MSWM is a mirror of the socioeconomic system, it changes along with time, and there is no absolute unique answer for the MSWM.

In order to cope with such changeable MSW issues, the management body has to set goals according to the objectives, to plan activities for attaining the goals, to establish indicators to measures results of the activities, to continuously monitor and analyze the indicators and to feedback to the activities. In short, the management body is required to carry out the "Check – Plan – Do – See," in their day to day operations. While doing so, if it is clear that the goals do not meet with the objectives, new goals will have to be set up again.

ADN is also expected to accumulate experiences and knowledge by carrying out the "Check – Plan – Do – See," and continuously strengthen its ability. First, in the contract management of the collection service, it is expected to employ qualified persons, to design collection routes, to review the contracts or to invite bid, and to establish a contract auditing system according to the Action Plan.

ADN has just begun to proceed towards establishment of the proper MSWM. It could make a big step, if it gets a certain technical support to follow this Study at the initial stage in the Master Plan.

In conclusion, the Study Team would like to express its appreciation to all organizations and individuals on both the Dominican side and the Japanese side, who participated and cooperated with the Study. We expect that what we have done together with the counterpart will lead to the establishment of sustainable MSWM in Santo Domingo de Guzman , National District, Dominican Republic.

Japan International Cooperation Agency (JICA)

Ayuntamiento del Distrito Nacional (ADN)

The Study on Integrated Solid Waste Management Plan in Santo Domingo de Guzman, National District Dominican Republic

Final Report
Volume I

SUMMARY
(Healthcare Waste)

March 2007

KOKUSAI KOGYO CO., LTD.

Outline of the Study and the Action Plan

1 Outline of the study

1.1 Objectives

- To formulate an Action Plan for healthcare waste management with the target year 2015.
- To transfer technology and knowledge of the management of healthcare waste to personnel and institutions involved through the process of implementation of the Pilot Project and creating the Action Plan.

1.2 Target area

Target hospitals: 230 healthcare centers in the Santo Domingo National District.

1.3 Target waste

The waste generated from the healthcare centers excluding radioactive and special waste.

1.4 Current Situation of the Healthcare Waste Management

- Although there are laws and regulations for the healthcare waste management, almost all of them are not followed.
- Obligation to create the committee for hygiene and hospital waste is not followed by the hospitals
- Waste separation at the hospital is not practiced.
- Intra-hospital management of hazardous waste is done without following the safety and hygiene rules or procedures.
- Even when hospitals separate the waste at the source, all the waste is mixed when collected.
- Collection of mixed healthcare waste causes an occupation hazard to the municipality's worker.
- There is no special cell or space which meets the regulation of SEMARN at the landfill site to dispose infectious waste, in the National District, not even in Duquesa landfill.

1.5 Pilot Project

Improvement of the healthcare waste management was conducted in the Ciudad Sanitaria "Dr. Luis E. Aybar" during the Study, in order to verify the applicability of measures recommended in the Action Plan, by taking into consideration the problems of the current situation.

2 Outline of the Action Plan for Healthcare Waste Management

The Goal of this Action Plan is: "All healthcare institutions, from Level I to Level III, in the National District will properly manage their healthcare waste by 2015."

Each stage has a target towards the achievement of the final goal.

Stage	Targets
Phase I (2007 – 2008)	All (31) healthcare institutions of Level III (Large and mayor hospitals) manage healthcare waste properly.
Phase II (2009 – 2011)	All (31) healthcare institutions of Level II (Medium and small hospitals) manage healthcare waste properly.
Phase III (2012 – 2015)	All (168) healthcare institutions of Level I (Small hospitals and clinics) manage healthcare waste properly.

When the Action Plan is implemented, waste flow will be changed as follows.

Table 1: Waste flow of Current Situation (2006)

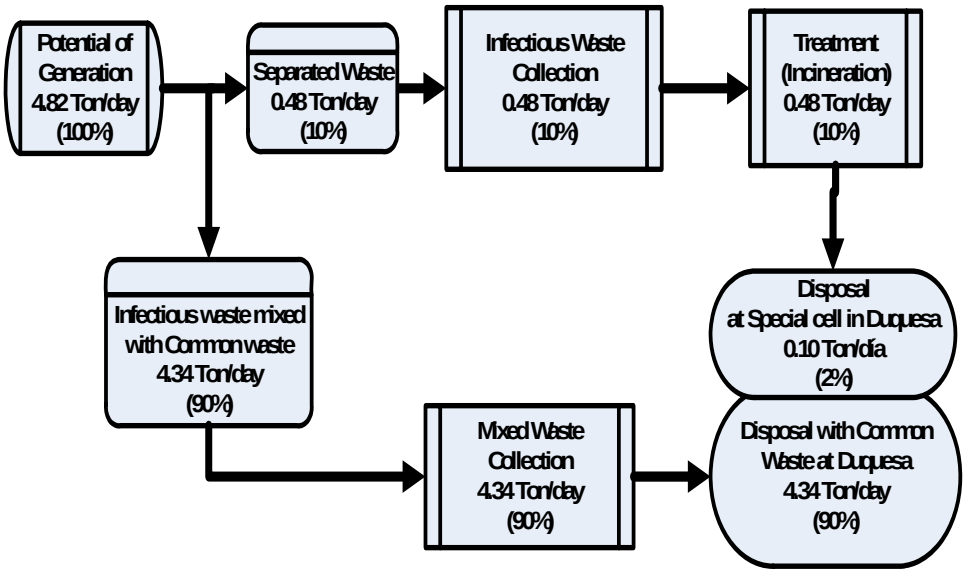
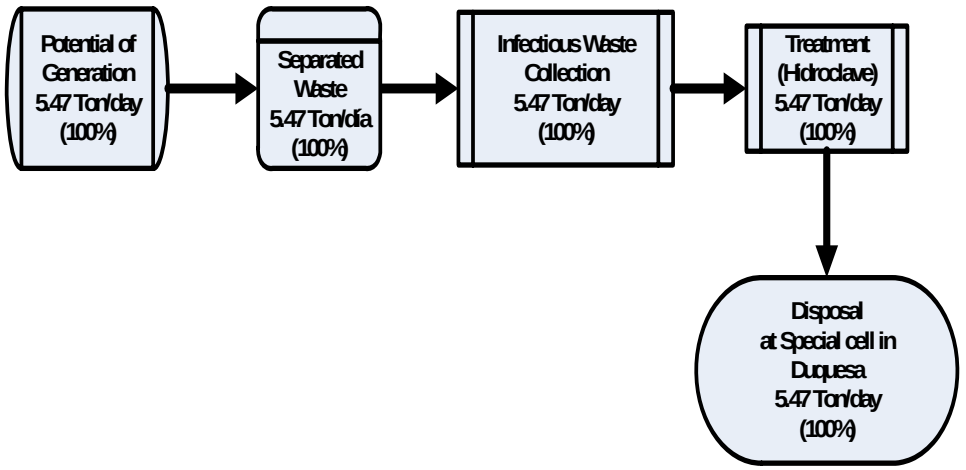


Table 2: Expected waste flow of target year (2015)



3 Recommendation for implementation of Action Plan

The following are recommended for implementation of the Action Plan.

a. Institutional system

SESPAS and SEMARN will take the initiative to expand the project, especially SESPAS could play the role of supporting the target hospitals to set up the committee for hygiene and hospital waste management.

b. Separation and intra-collection and transport

Setting up the committee is the key to managing the waste in the hospitals with support and assistance from SESPAS, including the allocation of necessary resources.

c. Transport and Treatment

Development by SEMARN and SESPAS of the market for private healthcare waste service will be essential. In particular, SEMARN is required to supervise and control those entities.

d. Final Disposal

SEMARN shall monitor the disposal of infectious waste operation at the landfill.

According to the law, the hospital as a discharger has responsibility of the waste, from discharging the waste until final disposal of it.

SITUATION **BEFORE** THE PILOT PROJECT AT THE TARGET HOSPITAL

Syringe with needle mixed with other waste

Blood leaked from the bags and spreaded on the floor

Transferring the waste into another, many syringes scattered on the patio.

All mixed waste was transported though the route of busy street outside the hospital.

Temporal storage of the hospital.

Collection worker without any protection

PILOT PROJECT OF IMPROVEMENT OF HEALTHCARE WASTE MANAGEMENT

Workshop to instruct waste separation

Demonstration of separation by nurses

Installed container with red bags, and “base de galón”

Installed of posters

Internal transportation of infectious waste.

Temporal storage for common waste

Temporal storage for infectious waste

Transportation of infectious waste

PRESS TOUR (13, SEPT, 2006)

8 La República

Diario Libre
SECCIÓN A AÑO CVI Nº 37213
Viernes 22 de septiembre del 2006

PREVENIR INFECCIONES

Establecen plan manejo desechos hospitales

DORIS PANTALEÓN

SANTO DOMINGO.- Un programa de recolección y manejo de desechos hospitalarios, dirigido a prevenir infecciones entre el personal de salud y a nivel ambiental, se lleva a cabo en la Ciudad Sanitaria Luis Eduardo Aybar con el apoyo de la Agencia de Cooperación Internacional del Japón (JICA).

Para poner en marcha el programa fue entrenado el personal de salud de las centros que confirman la Ciudad Sanitaria, y en cada uno de sus servicios se colocaron bolsas rojas, para depositar los desechos infecciosos, y negras para los comunes. Los detalles fueron ofrecidos por el director del Centro de Educación Médica de Amistad Dominico Japonés (CEMADOJA), doctor Sergio Castillo; el director de la Ciudad Sanitaria Luis Eduardo Aybar, doctor Julio Rodríguez Grullón; la jefa de Epidemiología, Mercedes Castro, e Ikuo Mori, de la JICA.

El programa se desarrolla actualmente en CEMADOJA, en el hospital Luis Eduardo Aybar y en unidades de Quemados 7 de Gastroenterología. Los cuales manejan un promedio diario de 300 kilogramos de desechos infecciosos y 1,400 de desechos comunes. Estos centros tienen 217 camas y 1,291 empleados. El programa se extenderá a otros hospitales.

Los doctores Julio Rodríguez Grullón, Sergio Castillo, Mercedes Castro, y el señor Ikuo Mori ofrecen detalles sobre el programa de manejo de desechos hospitalarios.

8 Viernes 22 de septiembre de 2006 HOY

EL PAÍS

Cuatro hospitales ya separan basura infectada

POR UBALDO GUZMAN MOLINA
Redactor de Hoy

Cuatro centros de salud públicos iniciaron un programa de recolección y disposición de residuos hospitalarios con la separación de los desechos infecciosos y comunes según las normas para el manejo de los desperdicios biomédicos.

Se trata de los centros CEMADOJA (Centro de Educación Médica y Amistad Dominico-Japonesa), el hospital Luis Eduardo Aybar y las Unidades de Quemados y de Gastroenterología, ubicados en la Ciudad Sanitaria, los cuales generan un promedio diario de 300 kilogramos de desechos infecciosos y 1,400 kilogramos de desperdicios comunes.

Las informaciones fueron ofrecidas ayer por los doctores Julio Rodríguez Grullón, director de la Ciudad Sanitaria; Sergio Castillo, director de CEMADOJA; Mercedes Castro, jefa de Epidemiología de la Ciudad Sanitaria y directora del proyecto piloto de mejoramiento de los desechos sólidos. Por JICA estuvieron presentes Ikuo Mori y Mario Valle.

El proyecto, que resolverá el problema que durante años ha significado los desechos hospitalarios, cuenta con el apoyo de la Agencia Internacional del Japón (JICA).

Previo al proceso de manejo de los desechos hospitalarios, los médicos, enfermeras, bioanalistas y conserjes fueron capacitados. Se crearon comités de higiene y manejo de los desperdicios hospitalarios.

Los objetos cortopunzantes (agujas, bisturís, cuchillas y ampolletas) son depositados en galones, mientras los desechos infecciosos (gasas, algodones, guantes, mascarillas, toallas, sondas, tubos, colectores de orina, cultivos y probetas) se colocan en fundas rojas. Los desechos comunes, como envases, utensilios para comida, servilletas y cartones, se depositan en fundas negras.

Tan pronto se llenan los cavasos, el personal de mantenimiento retira los recipientes en carritos adecuados, donados por la JICA. Los desperdicios infecciosos se depositan en tanques en un cuarto especial, desde donde son retirados por la compañía Alianza Innovadora De Servicios Ambientales (AIDSA), que incinera los desechos y luego los deposita en celdas especiales en el vertedero de Duquesa.

Los tanques son reemplazados por la compañía y tanto los carritos como el almacén de los desechos son lavados debidamente, mientras los desechos comunes son llevados a otro almacenamiento donde son retirados por el Ayuntamiento del Distrito Nacional.

Explicaron que anteriormente no existía la recolección separada de desechos comunes de los infecciosos, los cuales se mezclaban indiscriminadamente y eran depositados en recipientes inadecuados al frente del hospital.

Señalaron que no existía una ruta interna de recolección de los desechos infecciosos que protegiera a los visitantes y cuidara áreas sensibles como la cocina y lavandería.

El doctor Castillo señaló que el programa se extenderá a todo el país y que el personal del hospital Francisco Moscoso Puello recibirá el entrenamiento en la Ciudad Sanitaria sobre el manejo de la basura hospitalaria.

Posteriormente se agregarán los hospitales Darío Contreras y Padre Billini.

Los médicos recorrieron con los periodistas las áreas de Pediatría, Medicina Interna y los depósitos de desechos hospitalarios y comunes, para que observaran los cambios en la recolección de basura biomédica.

El doctor Sergio Castillo, director de CEMADOJA, ofrece declaraciones sobre el programa de mejoramiento de depósitos hospitalarios. A su lado el doctor Julio Rodríguez Grullón, director de la Ciudad Sanitaria; la doctora Mercedes Castro, jefa de Epidemiología de la Ciudad Sanitaria, y el japonés Ikuo Mori, de JICA. Hoy/José Reyes

News paper articles about the pilot project

Declaration of healthcare waste management by Minister of health and Minister of Environment

under the witness by Mayor of Santo Domingo, to expand the experience of the pilot project to other hospitals for proper healthcare waste management (25, Oct, 2006)

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1 Outline of the Study

1.1 Background

The Santo Domingo National District of the Dominican Republic had a population of around 950,000 in 2002, and there are 230 hospitals. At present, the main issues in healthcare waste management in Santo Domingo National District are:

Infectious hospital waste is not separated before collection and transport, and is disposed of together with general municipal waste in the final disposal site. Consequently, there are increased risks of infection to the solid waste management crew, as well as adverse effects on the surrounding environment.

The hospitals, Ministry of Public Health and Social Assistance (Secretaría de Estado de Salud Pública y Asistencia Social, here after referred as SESPAS) and international donor agencies have been making efforts to improve the existing situation. However, the problems have not yet been solved.

While, in November 2003, the Government of the Dominican Republic requested Japan to implement a development study. In response to this request, JICA dispatched a Preparatory Study Mission in March 2005, and the Scope of Works was signed on April 26, 2005. Finally, for the implementation of this Study on Integrated Solid Waste Management Plan in Santo Domingo de Guzman, National District, JICA selected Kokusai Kogyo Co. Ltd. The study for healthcare waste management was conducted as part of this study.

1.2 Objectives

- To formulate an Action Plan for healthcare waste management with the target year 2015.
- To transfer technology and knowledge of the management of healthcare waste to personnel and institutions involved through the process of implementation of the Pilot Project and making the Action Plan.

1.3 Targets

Target hospitals: 230 healthcare centers in the Santo Domingo National District.

1.4 The Solid Waste to be covered in the Study

The waste generated from the healthcare centers excluding radioactive and special waste.

1.5 Organization of the Study

The organization of the study was composed of three teams, Technical Team, Working Team and the committee for hygiene and hospital waste management of the target hospital for the Pilot Project. The study team worked with them.

The Technical Team was playing the role of necessary decision making, especially for preparation of the Action Plan, the members of the Technical Team are from SESPAS and Ministry of Environment and Natural Resources (Secretaría de Estado de Medio Ambiente y los Recursos Naturales, hereafter referred as SEMARN).

The Working Team and the committee played the role of implementing the Pilot Project for the improvement of healthcare waste management.

The members of Working Team are composed of personnel from SESPAS and the target hospital of the Pilot Project, Ciudad Sanitaria. This hospital is a complex of four healthcare

centers as are shown in the list of members. The committee is defined by the legislation to be set up at each hospital in the country.

1.5.1 Technical Team

Table 1-1: List of personnel of the Technical Team

Name	Position	Organization
Lic. Luis Felix Roa	Director of Health Environment	SESPAS
Dr. Bruno Calderón	Occupational Health	SESPAS
Ing. Román Brache	Occupational Health	SESPAS
Ing. Alba Heredia	Basic Sanitation	SESPAS
Ing. Hildebrando Rivera	Solid Waste Unit	SESPAS
Lic. Elsa Ferreras	Environmental Quality	SEMARN

1.5.2 Working Team

Table 1-2: List of personnel of the Working Team

Name	Position	Organization
Dr. Julio Manuel Rodríguez Grullón	President	
Dr. Nelson Gómez	Región IV	SESPAS
Lic. Raúl Rosario	Dep. Riesgos Ambientales	SESPAS
Ing. Luis Alonzo	Dept. Ocupacional Health	SESPAS
Dra. Mercedez Castro Bello	Director of Committee of hygiene and hospital waste management of Ciudad Sanitaria	Ciudad Sanitaria Luís E. Aybar

1.5.3 Committee of Hygiene and Hospital Waste Management

Table 1-3: List of the members of the committee for hygiene and hospital waste management of Ciudad Sanitaria

Name	Position
HOSPITAL LUIS E AYBER	
Dra. Luisa Lafontaine	Director
Dra. Sonia Valdez	Epidemiologist (President of the committee)
Lic. Fátima Espinosa	Administrator
Sr. Juan Gómez	Chief of cleansing dept.
Yolanda Nicolás	Chief of Laboratory
Lic. Santa Rita Pimentel	Chief of Nurse
CEMADOJA	
Dr. Sergio Castillo	Director
Dra. Ana Julia Cesin	Epidemiologist (President of the committee)
Lic. Delfis Taveras	Lab. Researcher
Rudys Morales	Technician of X Ray
Santiago Reinoso	Chief of cleansing dep.
Lic. Elba Felix	Nurse of X Ray
Lic. Nurys Tamayo	Administrator
UNIDAD DE QUEMADOS	
Dr. Carlos de los Santos	Director
Lic. Arcadio de los Santos	Administrador
Dra. Rosario Alt. Valdez Duval	Infectology service
Lic. Rosa Margarita Beltré Pérez	Nurse
Lic. Dulce Milagros López Gónzalez	Surgery operation

Lic. Ana Isabel Herrera Plaza	Pharmacy
María Elena Peña Quezada	Hygiene and desinfection service
CENTRO DE GASTROENTEROLOGIA	
Dr. Miguel Castro	Director
Sr. Sócrates Canario	Epidemiologist (President of the committee)
Lic. Leocadia Altagracia D'Oleo	Administrator
Lic. Alba Gómez	Chief of Laboratory
Lic. Brunilda Zayas	Chief of Nurse
Sr. Luís Jiménez	Chief of cleansing dept.
Ivelisse Rodríguez	Pharmacy

1.6 Technology transfer

Understanding and experiences of the healthcare waste management was shared during the process of Pilot Project implementation. Especially, as the decision at the workshops and discussions were reflected in the Pilot Project, the teams were encouraged to conduct the project.

The major activities related to technology transfer are shown in the table below.

Table 1-4: Workshops and meetings and their agenda and activities of the Teams

3-May	Setting up Technical/Working group, and deciding target hospitals	
12-May	Working Team	Setting up the committee for hygiene and hospital waste
18-May	Working Team + committee	Discussing necessary materials and methodology for the pilot project to solve the problems.
19-May	Working Team + committee	Definition of target area and responsibilities of members of the committee.
24-May	Working Team + committee	Investigation, problem analysis
30-May	Working Team + committee	Investigation and planning the implementation of the Pilot Project
31-May	Working Team + committee	Preparation of the workshop to initiate the Pilot Project
7-9/June	Working Team + committee	Workshop for initiating the Pilot Project
12-Jun	Working Team + committee	Commencing the Pilot Project (2 months)
7-Jul	Working Team	Intermediate evaluation of the Pilot Project
27-Jul	Working Team + Technical Team	Workshop for expansion of the Pilot Project
8-Aug	Technical Team	Planning the Action Plan

2 Current Situation

2.1 Definition of "Healthcare Waste"

In general, the healthcare waste indicates the waste generated from healthcare facilities, and it contains both infectious and non-infectious waste.

The Norm for Environmental Management and Solid Waste (Norma para la Gestión Ambiental de Residuos Sólidos) also shows that waste from the hospitals or other health care centers is composed of infectious, special and general waste.

2.2 Legal framework

There is sufficient legislation for proper management of healthcare waste in the country. This legislation is the following:

- The General Law for Health (La Ley General de Salud),
- The General Law for Environment and Natural Resources (Ley General del Ambiente y Recursos Naturales),
- The General Regulation for Hospitals (Reglamento General de Hospitales),
- The Norm for Environmental Management and Solid Waste (Norma para la Gestión Ambiental de Residuos Sólidos)
- The Environmental Norm for Integral Infectious Waste Management (Norma Ambiental para la Gestión Integral de Desechos Infecciosos).

In addition to the existing legal instruments, SESPAS is preparing the Regulations for Hospital Waste (Reglamento de Residuos Hospitalarios). Meanwhile SEMARN has initiated a process of putting into effect the Environmental Norm for Integral Infectious Waste Management (Norma Ambiental para la Gestión Integral de Desechos Infecciosos).

The existing legal instruments basically describe what should be conducted and by whom for proper healthcare waste management.

2.3 Institutional framework

The main institutions that relate to healthcare waste management are hospitals, SESPAS, SEMARN and ADN.

a. SESPAS

The responsibility for healthcare waste management is split into two departments,

- Department of Basic Sanitation
- Department of Occupational Health under the Directorate of Environmental Health.

These two departments have various tasks not only ones regarding healthcare waste management. It is difficult for them to concentrate solely on the issue.

b. SEMARN

The main role of SEMARN in healthcare waste management is to supervise any center/entity, which deals with infectious, and/or hazardous waste from healthcare centers (Art.84 of the "*Norma Ambiental Para la Gestión Integral de Desechos Infecciosos*, Santo Domingo Julio, 2004", Secretaría de Estado de Medio Ambiente y Recursos Naturales (*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004,* Hereinafter referred to as the Norm)) and to give technical support to SESPAS as required

According to legislations, all healthcare centers are required to inform SEMARN of their location and operation as they have the potential to generate those kinds of waste (Ley general de salud (Ley No. 42-01) Art48.). Also, any entities that deals, transports, treats and disposes infectious/hazardous waste must obtain permission or a license from SEMARN for their operations (The Norm Art.78, 79).

Subsecretario de Gentión Ambiental of SEMARN is in charge of it. However, there is not sufficient personnel to be in charge.

c. ADN

Although ADN does not have legal responsibility for hazardous waste, it has to provide a service to collect and dispose of common waste generated in healthcare centers. Since large scale healthcare centers generate considerable amounts of common waste, it has to be collected every day so as not to degrade the sanitary conditions of healthcare centers where people come to improve their health.

In ADN, there is a section for biomedical waste in its organization of the environmental management and urban cleansing direction.[1] The section for biomedical waste is in charge of effective collection of solid waste from clinics and hospitals in the National District.

2.4 Current situation

a. Committee of hygiene and hospital waste management

- Obligation to create the committee for hygiene and hospital waste is not followed by the hospitals.
- Necessary statistics regarding healthcare waste, such as amounts of generation, characteristics of the waste, occupational accidents and cost are not kept.
- No routine training program exists at hospitals for waste management.

b. Separation

- Waste separation is not practiced at the hospital.
- Containers differ in characteristics and size; they regularly have no lids; and they are not washed or disinfected. Plastic bags do not meet the thickness specifications and are inadequate for the kinds of material they contain. Sharp materials are placed in plastic containers which endanger the staff.

c. Internal-collection and Temporal Storage

- Intra-hospital transportation of hazardous waste is done without following safety and hygiene rules or procedures.
- Temporal storage places do not satisfy the minimal sanitation and safety protection conditions.
- Collection and internal movements' staff do not have elementary protection gear (uniform, rubber aprons, shoes, gloves, breathing filters, etc).
- Some hospitals have incinerators, however they do not meet the standards and regulations of SEMARN to incinerate infectious waste, and are not maintained well.

d. Collection and Treatment

- Even when hospitals separate waste at the source, all the waste becomes mixed when collected.
- External transportation is done in vehicles not meeting the set conditions for transporting hazardous waste.

[1] Direccion de: Gestion Ambiental y Aseo Urbano, *Manual de organizacion y funciones, Direccion de Gention de Calidad, Santo Domingo de Guzman, Distrito Nacional,* Agosto de 2005, p15

- There is a private company that is able to transport and treat infectious waste and has permission from SEMARN; however, this company was not contracted by any hospital at the time of investigation.
- ADN or the private collection companies collect the waste from hospitals as common waste. However, waste collection by ADN is irregular and deficient, which causes accumulation of waste. Thus, it produces hygienic and esthetic problems in the premises of the hospitals.

e. Final disposal

- There is no special cell or space which meets the regulations of SEMARN at the landfill site to dispose infectious waste, in the National District, not even in the Duquesa landfill.

3 Pilot Project

3.1 Objective and methodology

The objective of the pilot project is to properly manage healthcare waste by complying with existing laws and regulations by creating a system for proper management for separation, collection and final disposal of healthcare waste which is generated from the medical centre. The system created will be a model which will be applied to other hospitals and medical centers.

3.1.1 Project design

Table 3-1: Project Design Matrix for pilot project: Improvement of healthcare waste management

Name of the Project: Improvement of healthcare waste management	Period May 2006 – August 2006
Target Areas: Ciudad Sanitaria “Dr. Luis E. Aybar”	Target Group: Personnel of Hospital, ADN, SESPAS and SEMARN

Summary of the Project
Overall Goal In the National District, the waste generated from hospitals is managed properly like the management method conducted in Pilot Project as a model.
Purpose of the Project The waste from the target hospitals is separated correctly. Of them, infectious waste is collected, transported exclusively and finally disposed at a special cell in the landfill site.
Results 1. The staff of SESPAS obtains the experience and knowledge about management of healthcare waste, and become able to train people in other hospitals. 2. Personnel of the target hospitals obtain the experience and knowledge of the management of healthcare waste and implement it. 3. Infectious waste is appropriately collected and transported from the hospitals, treated and finally disposed at the special cell in the landfill. *The Target hospital possesses and operates an incinerator. It will be analyzed and its use will be determined. The manner of collection, transport and final disposal will be confirmed depending on the results of the analysis.
Activities 1. Investigation of the actual situation of healthcare waste management, together with personnel of SESPAS, the hospital and the study team. 2. Planning the system of healthcare waste management based on the investigation. 3. Implement the plan together with the counterparts and personnel of the hospital. 3.1 Promote separation of waste, prepare posters, containers, and hold workshops to instruct personnel of the hospital. 3.2 Promote exclusive collection and transport of infectious waste in the hospital, prepare the pushing carts, uniforms, protective gear and hold workshop to instruct the cleansing personnel on how to handle infectious waste. 3.3 Prepare temporal storage facility for infectious waste in the hospital and instruct the usage of it. ４. Contract with a private company which has the permission of SEMARN for transport and treatment of infectious waste. 5. Implement the disposal of treated infectious waste at the special cell in the landfill site. 6. Implement the monitoring of healthcare waste management. 7. Compile all the activities from 1-6, hold a workshop to expand the project by applying the same management in other hospitals.

3.1.2 Profile of Target hospitals

The target of the pilot project is Ciudad Sanitaria "Dr. Luis E. Aybar" (hereafter, referred as Ciudad Sanitaria). Ciudad Sanitaria is a complex of healthcare institutions, composed of four healthcare centres, which are Hospital Luis E. Aybar, Gastroenterología, Unidad de Quemados Pearl F. Ort and Centro de Educacion Medica de Amistad Dominico- Japonesa (CEMADOJA). The number of patients including internal and external is approximately 2,201 per day, 803,376 per year

Table 3-2: Number of personnel and beds in Ciudad Sanitaria

Name of establishment	Medical Doctor	Nurse	Bio-analyst	Cleansing personnel	Total	No. of Beds
Luis E. Aybar	209	531	191	60	991	278
Gastroenterología	33	52	53	34	172	29
Unidad de Quemados	15	47	9	14	85	10
CEMADOJA	8	4	3	28	43	0
TOTAL	265	634	256	136	1291	317

3.1.3 Characteristics and volume of waste

The characteristics of waste from each centre are shown in the table below.

Table 3-3: Characteristics of waste from each center

Hospital	Type of Treatment	Type of waste
Hospital Luis E Aybar	General hospital (including, obstetrics, gynecology, ophthalmology, pediatrics, surgery, internal medicine, analysis, training and education)	Almost all types of infectious waste (syringes, needles, sheets, infectious bandage and gauze, tubes, common wastes (office paper and large volumes of food waste)
CEMADOJA	Diagnostic images, training and education	Infectious waste, chemical waste (mostly liquid, such as developing fluid from X ray images), common waste (office paper, lunch boxes etc.)
Unidad de Quemados	Specialized in treatment for burn injury patients	Large volumes of blood/body fluid adherent bandages and gauze, other disposal cloths (not heavy), needles, sheets, injections, common waste (office paper, a little food waste)
Center of Gastroenterology	Specialized in gastrointestinal treatment	Liquid contained waste(heavy), needles, injections, leafs, bandages and gaze, tubes, waste from laboratories (cultures, test tube and slide glass etc.), common waste (office paper, food waste)

Table 3-4: : Quantity of Waste Generated Based on the Study of SEMARN (2004) and the Study Team (Kg/day)

Healthcare center	Common	Infectious	Total
Hosp. Luis E. Aybar	681	145	826 (701.1)
Centro de Gastroenterología	332	97	429
Unidad de Quemados	69	43	112
CEMADOJA	27		27
Grand Total	1,109	285	1,394

Note: The survey on the management and disposal of biomedical waste in healthcare centers in Santo Domingo and San Cristóbal, SEMARN (2004) and the numbers in parentheses are the results from the survey by the Study Team.

3.1.4 Survey results

- There was no structure which coordinates all the different actors who are involved in healthcare waste management: director, doctors, nurses, cleansing staff, administration, epidemiology, and maintenance.
- Most of the waste was mixed at the place of generation. A better effort was made to separate sharp objects which were disposed in rigid containers (gallon) which were discarded by the cleansing department and contained previously in detergent or soap.
- Cleansing personnel collected mixed waste following an irregular route and schedule. In addition, they did not use any protective gear to handle infectious waste.
- There was a temporary storage site which was used by four (4) healthcare centers of Ciudad Sanitaria. As the waste was already mixed, even if there was some separation, they were discharged mixed at this site.
- All the mixed waste was collected by the Municipality with no adequate vehicle to transport the infectious waste. Also, the collection workers do not use protective gear to handle infectious waste.
- In Ciudad Sanitaria, there is an incinerator which does not have an environmental permit. The operation of the incinerator was not appropriate and there is opposition from nearby communities.

3.2 Planning for Healthcare Waste Management

3.2.1 The Committee for Hygiene and Hospital Waste Management

The Reglamento General de Hospital (Reglamento General de Hospital (Decreto No. 351-99) determined that a hygiene and hospital waste management committee has to be established in each hospital which should properly manage the waste generated in hospitals. However no such committee had been established in Ciudad Sanitaria prior to the pilot project; consequently, four (4) committees were activated in Ciudad Sanitaria as part of the pilot project, one for each healthcare center.

The roles of the members of the committee are as follows.

Table 3-5: Roles of Committee members

Position	Roles and responsibilities
Director , President	Coordinate the committee, allocate the budget for materials (bags, containers, transportation, etc.), and assemble members for the meetings.
Epidemiologist	Record statistic data for diseases and accidents, and coordinate the plan for education and monitoring
Chief of Nurse Chief of Laboratory Chief of Surgery center	Education, Monitoring
Chief of cleansing and maintenance personnel	Educate and supervise the cleansing personnel, calculate the use of materials and apply them to the administrator, give advice for planning education and monitoring
Chief of administrator	Review the application of materials from cleansing dept. process and apply to the director. Distribute the materials purchased (bags, containers, etc.)

Since Ciudad Sanitaria is composed of four hospitals; in addition to the committee at each hospital, one committee is specially created to coordinate the common issues among the hospitals.

3.2.2 The Scheme of the Pilot Project for Healthcare Waste Management

The committee defined the practical manners of separation, storage sites, operation of private service providers and so on. Figure 3-1 shows a scheme of waste flow.

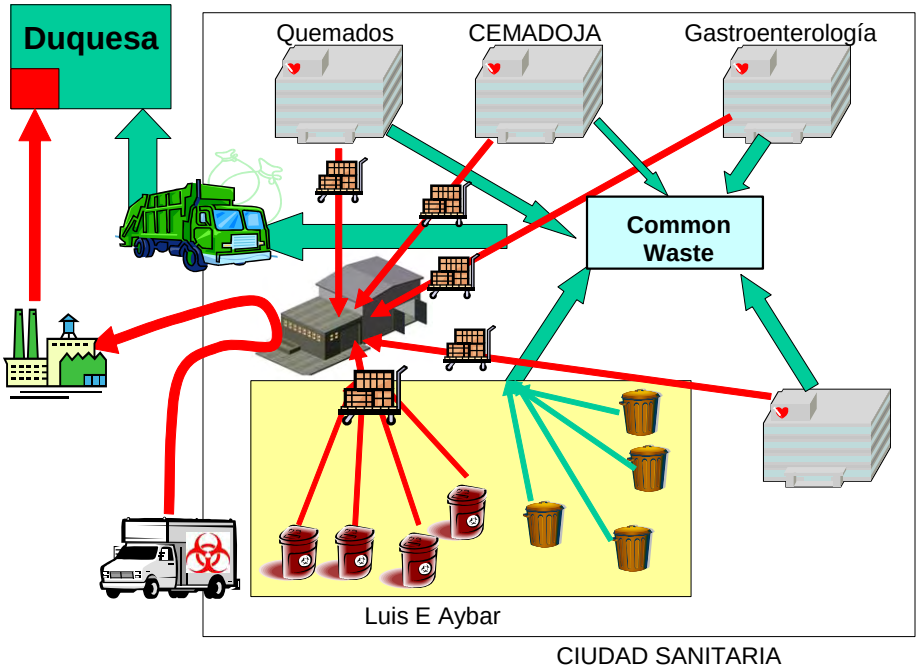

Figure 3-1: The Scheme of Waste Flow

3.3 Implementation of the Pilot Project

3.3.1 Separation

Separation requires two important components: trained human resources and adequate materials to conduct effective separation.

a. Training and instruction

Workshops were conducted for doctors, nurses, and cleansing personnel. Two days (June 7 and 9, 2006) were assigned for the doctors and nurses; meanwhile, on the June 8, the cleansing personnel were trained. In addition to the workshops, daily monitoring and instruction also helped the understanding of separation among the personnel.

b. Procurement of Materials

In order to achieve effective separation, materials which meet the Norm were procured. Whenever the Norm was not specific enough, the experiences of other countries were consulted and the materials were decided though the discussion of the teams.

The procured materials were as follows.

- Poster (3 types)
- Bags for infectious waste and their containers
- “Base de galón”

3.3.2 Internal Collection and Transport

In addition to the workshop, the cleansing personnel in charge of waste collection were trained daily to follow the most adequate collection routes and work schedule.

Five (5) pushing carts were provided for internal collection; one for each center (2 for Luis E. Aybar) which meet the specifications of the Norm. The cleansing personnel received protective gear: a uniform, apron, boots, gloves and a mask.

3.3.3 Temporary Storage

Two temporary storage sites were constructed: one for common and another for infectious waste which satisfy the Norm. The meeting was held to inform them about the use of storage, the manual for the cleansing personnel and the notice on the door of the storage site which show the instructions for use.

3.3.4 External Transport, Treatment, and Final Disposal

The Study Team contracted the only company authorized by SESPAS for transportation and treatment:

The disposal site at Duquesa has conditioned a cell for infectious waste disposal. This area is isolated from the sector where municipal waste is disposed; however, this special cell does not meet all the requirements of SEMARN yet.

3.3.5 Monitoring

Monitoring was conducted by members of the committee with emphasis on separation. Each member of the committee has been assigned specific areas of responsibility to monitor and encourage separation[2]. These monitoring activities showed the strong and weak points; and in general, continuous progress on separation was observed.

3.3.6 Cost

The unit cost obtained in the Pilot Project is shown in the following table.

Table 3-6: Unit Cost obtained in Pilot Project

	Unit	Unit Price (RD$)	Cost (RD$)
I Separation			
Containers with logo	100	243.98	24,398.28
Red bag	13500	11.22	151,463.52
Base de Galón	100	284.20	28,420.00
Poster	200	100.00	20,000.00
II Internal Transport			
Pushing cart	5	24,000.00	120,000.00
Uniform	7	1,657	11,559
III Temporal Storage facility			
1 Storage facility for infectious waste	1	246,065.04	246,065.04
1 Storage facility for common waste	1	542,266.31	542,266.31

[2] See ANEX, Chapter 3, The Manual for cleansing personnel

3.3.7 Workshop for expansion of the Project

The Workshop for expansion of the Project was held on 27th July by SESPAS. All the directors of the major hospitals in the National District were invited by SESPAS. At the workshop, the pilot project was introduced by Ciudad Sanitaria and they discussed the problems and the hospitals concerns. SESPAS's role for supporting proper management of healthcare waste was confirmed.

4 Action Plan of Healthcare Waste Management

4.1 Outline

a. Basic Concept

The country has adequate legal instruments which define what and by whom proper healthcare waste management should be conducted. Therefore, the Action Plan proposes a basic concept: “To comply with the existing legislations.”

b. Objective

The objective of the Action Plan is: “To promote proper management of healthcare waste in order to reduce health hazards to healthcare workers, patients, waste management workers and citizens in general in the National District and to protect their environment.”

c. Targets

c.1 Target Waste

The waste generated from the healthcare waste institutions, including both infectious and noninfectious except radio active waste.

c.2 Target Healthcare Institutions

The scope of the Action Plan includes the health establishments of both public and private organizations that are from Level I to Level III in the National District.

The levels are defined in correspondence to the Proposal of Healthcare Waste Regulation prepared by SESPAS.

Level I: Hospitals of external consultation and smaller veterinaries. Clinical laboratories that carry out from 1 to 20 analyses per day. Odontological centers dealing with 1 to 20 patients per day.

Level II: Health Centers that have from 1 to 20 beds. Clinical laboratories that carry out from 21 to 100 analyses per day. Odontological centers with more than 21 to 100 patient per day. Veterinary centers that manage from 1 to 20 animals per day.

Note: There is a breach without defining establishments of among 20 and 50 beds that are categorized as Level II for the purposes of the Action Plan.

Level III: Health Centers with more than 50 beds. Clinical laboratories that carry out more than 100 analyses per day, laboratories for biological production, teaching and investigation centers, anthracic centers and veterinary centers that assist more than 50 cases.

Consequently, there are 31 Level III Healthcare centers in the National District and their total number of beds reaches 3,865. Two of the centers that have less than 50 beds, Unidad de Quemados and Gastroenterology that already began their operation as part of the Ciudad Sanitaria are included as Level III.

d. Target stages and Goals

The Goal of this Action Plan is that: “All healthcare institutions, from Level I to Level III, in the National District will properly manage healthcare waste by 2015.”

Each stage has a set target towards the achievement of the final goal.

Stage	Targets
Phase I (2007 – 2008)	All (31) healthcare institutions of Level III manage healthcare waste properly.
Phase II (2009 – 2011)	All (31) healthcare institutions of Level II manage healthcare waste properly.
Phase III (2012 – 2015)	All (168) healthcare institutions of Level I manage healthcare waste properly.

4.2 Institutional System

The main actors are the healthcare centers, SESPAS, SEMARN, ADN, and the private entities as suppliers of the hazardous waste management service.

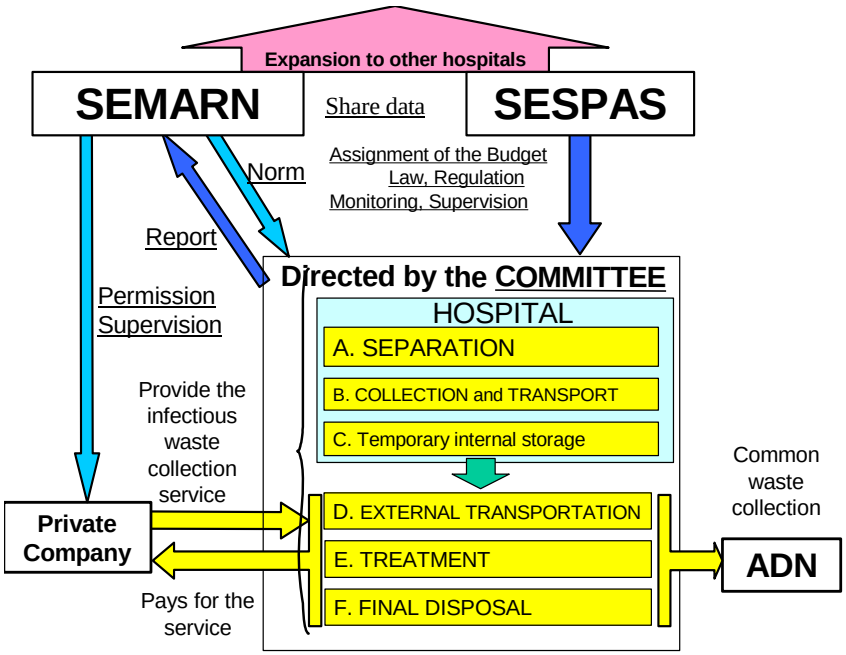

Figure 4-1: Relation of the Organizations related with the Healthcare Waste Management

a. Healthcare Centers

The healthcare centers have full responsibility for the waste generated, even if the waste is transported, treated, and disposed by others such as the private sector. To manage healthcare waste, a committee should be established for hygiene and healthcare waste management.

b. SESPAS

b.1 Establishment of a Task Force

It is recommended that SESPAS structures an administrative unit to conduct the training and monitoring of hazardous waste management in healthcare centers and that SEMARN regulates and controls the collection, transport, treatment and final disposition activities of the hazardous waste outside of the Health centers.

b.2 Utilization of the Existing Structure

SESPAS has an organization structure over the country, i.e., National Level, Regional Level, Provincial Level, Municipal Level and Local Level. This structure should be fully utilized to conduct the activities of the Action Plan. It is recommended to assign tasks to each level as follows.

c. SEMARN

The main function of SEMARN in hospital waste management is to supervise every aspect related to infectious waste and any hazardous waste in general; additionally, SEMARN should provide technical support to SESPAS to the extend that it is required.

d. Waste Service Providers

Participation of the private sector in the healthcare waste management is key for establishing a system outside hospitals, i.e., transport, treatment and final disposal. In order to promote the participation of the private sector, a secure market has to be developed that has a certain scale and is well organized.

e. ADN

It is recommended that ADN assigns enough personnel to collect common waste generated from healthcare institutions of Level III. The personnel should ensure collection as well as check if the waste is mixed with hazardous waste. If the waste includes hazardous waste, the personnel should inform the healthcare center, SESPAS and SEMARN; and they should refuse to collect such waste.

4.3 Technical System

a. Separation, internal movement and temporary storage

- The implementation of the pilot project showed that the following practices are effective.
- It is recommended to use a 1 gallon bottle for sharp objects.
- It is recommended that the thickness of the red bags should be the same or thicker than 250 to prevent any filtration of contained fluids.
- The containers to place the red bags in should be sufficiently strong, of simple form, and clear colour in order to carry out frequent cleaning and so that dirt can be easily identified.
- In most of the areas, the waste containers should have lids, although in some surgery rooms, the lids can be inconvenient during periods of great activity such as during operations.
- Using exclusive pushing carts, works must be protected by gear (uniform, boots, gloves and mask) for internal movement and temporal storage.

b. Transport and treatment

Transporters and treatment operators must have the permission of SEMARN.

b.1 Collection and transport network

Taking into account that the quantity of waste generated by healthcare center is small, one truck can cover several health establishments. Therefore, the cluster of these health centers, taking into account their vicinity, is an efficient way to collect and transport waste.

b.2 Recommended treatment system

Taking into account the discussions above, this Action Plan recommends the following treatment systems in each stage.

Phase I Stage (2006 - 2008): This is a transition period from the individual system to the centralized one. Hospitals with incinerators should decide if they will continuously use those or not, taking into account its convenience, nuisance, expenditure and remaining service life. Once the use of the incinerator has been decided, a permit has to be obtained from SEMARN.

Phase II (2009 – 2011): A centralized treatment system is to be established. Autoclaving (Hydroclaving) is recommendable however, incineration is also acceptable if it complies with legislations and is economically reasonable.

Phase III (2012 – 2015): The centralized treatment system is to be continuously operated.

c. Final disposal

According to the Norm, there are minimum requirements for infectious waste disposal. In addition to these requirements, we recommend for Phase1of the A-P (2007-2008) that the special cell should be surrounded by a trench and a fence should be prepared in the exclusive place for infectious waste.

4.4 Estimated Waste Amount

Generation amount, discharge amount and targeted discharge amount in each year are shown in the table below.

Table 4-1: Waste Amount of the target year (ton/day)

	Amount Potentially Generate				Target Amount to be Separated			
Year	LevelI	LevelII	LevelIII	Total	LevelI	LevelII	LevelIII	Total
2006	0.17	0.64	4.01	4.82				
2007	0.17	0.65	4.07	4.89			2.44	2.44
2008	0.17	0.66	4.12	4.95			4.12	4.12
2009	0.18	0.67	4.18	5.03		0.2	4.18	4.38
2010	0.18	0.68	4.24	5.1		0.41	4.24	4.65
2011	0.18	0.69	4.3	5.17		0.69	4.3	4.99
2012	0.18	0.7	4.36	5.24	0.05	0.7	4.36	5.11
2013	0.19	0.71	4.43	5.33	0.11	0.71	4.43	5.25
2014	0.19	0.72	4.49	5.4	0.17	0.72	4.49	5.38
2015	0.19	0.73	4.55	5.47	0.19	0.73	4.55	5.47

4.5 Estimated Waste Flow

When the Action Plan is implemented, the waste flow will be altered as follows.

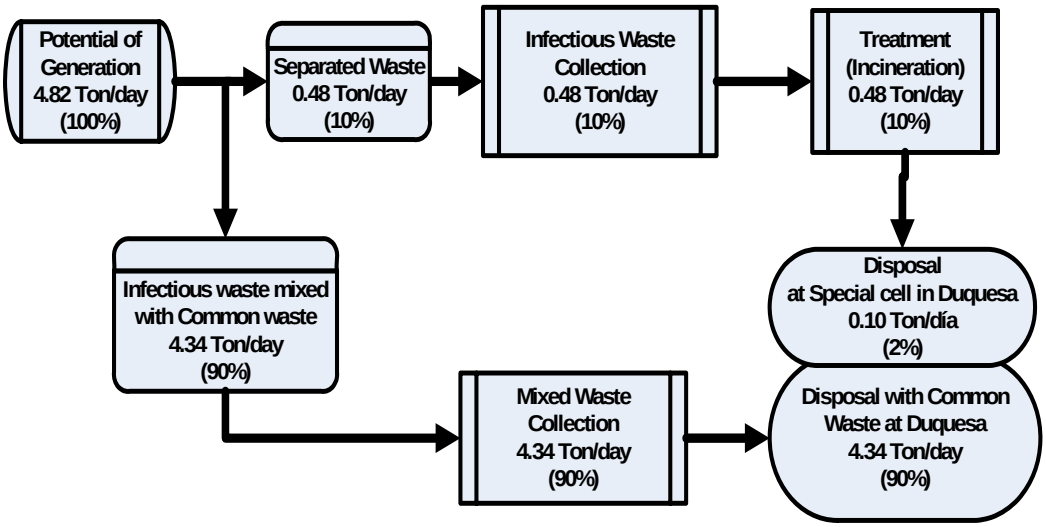

Figure 4-2: Waste flow of Current Situation (2006)

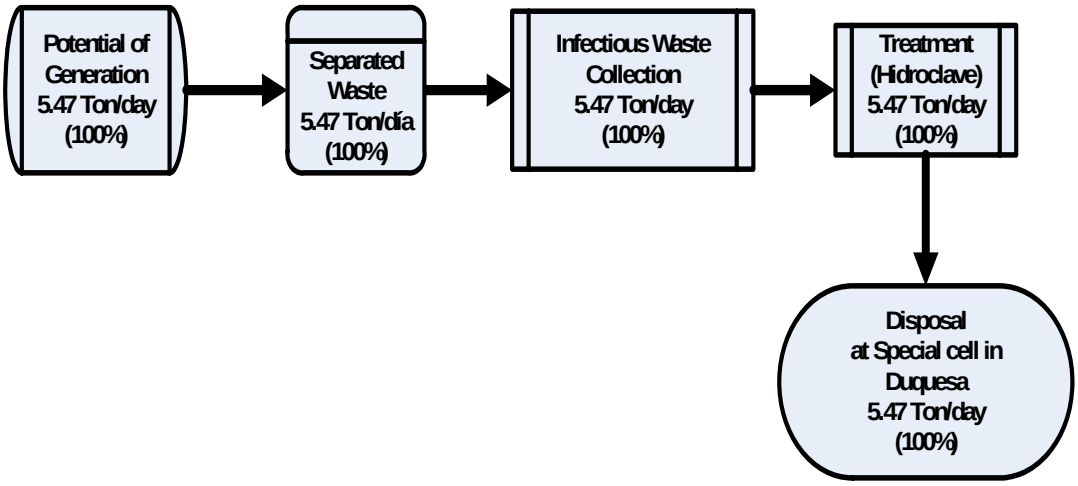

Figure 4-3: Expected Waste flow of Target year (2015)

4.6 Preliminary Cost Estimate

Table 4-2: Action Plan by Phases

AP 1											
Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	US$/ton
Intra-hospital separation	263	445	473	502	538	552	566	580	590	4,509	
Transport & Treatment	335	567	603	639	686	704	721	739	753	5,747	
Disposal	2	3	17	18	19	20	20	21	21	141	
Administration 10%	60	102	109	116	124	128	131	134	136	1,040	
Total	660	1,117	1,202	1,275	1,367	1,404	1,438	1,474	1,500	11,437	750
AP 2											
Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	
Intra-hospital separation	263	445	473	502	538	552	566	580	590	4,509	
Transport & Treatment	335	567	603	639	686	704	721	739	753	5,747	
Disposal	2	3	17	18	19	40	41	42	42	224	
Administration 10%	60	102	109	116	124	130	133	136	139	1,049	
Total	660	1,117	1,202	1,275	1,367	1,426	1,461	1,497	1,524	11,529	756

Note: AP 1 establishes the cost only for the use of Duquesa for the different phases. AP 2 establishes the cost only for the use of Duquesa until 2011 and then for the use of the new landfill.

5 Conclusion and Recommendation

5.1 Conclusions

To carry out appropriate healthcare waste management, all actors or institutions involved shall follow the existing legislations. The study was conducted to clarify the obstacles that prevent those actors from playing their roles and responsibilities.

Instruction about the necessity and practical manners of healthcare waste management is required for personnel in the hospitals. Together with that, necessary materials have to be procured to manage the waste.

In SESPAS and SEMARN, human resources are limited to enforce the legislation and to supervise the hospitals and the private service providers' performance. Therefore, there was little experience of actual enforcement of the legislations.

Through the pilot project, it was clear that the materials were locally available and instructions to the personnel definitely increased the understanding of healthcare waste management and promoted proper waste handling in the hospital. As for transportation and treatment, there is a private company which has SEMARN's permission for handling infectious waste. The service of that company is acceptable in quality and financially for the pilot project hospital. And at the final disposal site, a special space was prepared for infectious waste and it is expected that the site will be developed to meet the standards of SEMARN.

The results of the Pilot Project gave hints to make the Action Plan, that is to say expansion of the Pilot Project to other hospitals for SESPAS and SEMARN.

5.2 Recommendations

For implementation of the Action Plan, the following are recommendable.

a. Institutional system

SESPAS and SEMARN take the initiative of expanding the project. In particular, SESPAS could play the role of supporting the target hospitals to set up the committee for hygiene and hospital waste management.

b. Separation and intra-collection and transport

Setting up the committee is the key to managing waste in the hospitals with support and assistance by SESPAS, including the allocation of necessary resources.

c. Transport and treatment

Development of the market for the private healthcare waste service will be essential by SEMARN with SESPAS. In particular, SEMARN is required to supervise and control those entities.

d. Final disposal

SEMARN shall monitor the disposal of infectious waste operation at the landfill.

According to the law, the hospital as a discharger has the responsibility for the waste from discharging the waste until final disposal.