CHAPTER 9

PROPER HWM AT SOURCES

AND

PROMOTION OF 3 R

(REDUCE, REUSE, AND RECYCLE)

9. PROPER HWM AT SOURCES AND PROMOTION OF 3 R (REDUCE, REUSE, AND RECYCLE)

The basic principle of HWM in the Philippines is that HW generator holds the primary responsibility for proper management of HW. HW generator has the obligation to properly store or treat HW on-site or off-site in compliance with the laws and regulations concerned.

To accomplish his duties, HW generator has to well understand the legal and regulatory system of HWM in the Philippines and completely follow it by his internal HWM system to be established.

The regulating authority is required to encourage and guide HW generator in his effort of proper HWM. Mentioned below are the policies and measures to promote these efforts of HW generators.

9.1 Targets of Proper HWM at Sources and Promotion of 3 R

The master plan set the following targets for proper HWM at sources and promotion of 3 R in the Philippines:

Targets
- **To increase the number of registered HW Generators**
- **To establish proper HWM at sources by 2004**
- **To establish in-house HWM system by HW generators**

To achieve these targets, the master plan further set the following actions to be taken by relevant stakeholders.

Required Actions
- **Compliance with registration and reporting obligations by HW generators**
- **HW minimization and recycling at sources**
- **Construction and operation of on-site TSD facilities**
- **Compliance with Waste Tracking System in case of off-site treatment of HW**
- **Establishment of in-house HWM system by HW generators**

The details of required actions are given below respectively.

9.2 Compliance with Registration and Reporting Obligations

9.2.1 Increasing HW Generators' Registration

The master plan set up the following sub-targets of increasing the number of HW registered generators.

Sub-Targets:
- **To increase the number of registered HW generators from the current 1,079 to 6,500 by the average annual additional registration of 400 generators.**
- **To register every new enterprise generating HW.**

Registration of HW generators will be carried out in accordance with the priority industries to be determined by the regulating authority. Table 9.2.1 below shows the ratio of registered HW generators to the total number of potential HW generators by scale of employee numbers. Registration priority should be given to large-scale industries and enterprises.

Table 9.2.1 Targeted Number of Registered HW Generators by Scale of Industries

Scale of industries (No. of employees)	Under 10 employees	Under 50 employees	Under 200 employees	Under 1000 employees	Over 1000 employees
Coverage of Generators	0.1%	1.1%	6.1%	15.6%	43.0%
% of Potential Generators (# of Generators)	1% (1,315)	10% (1,584)	60% (2,064)	100% (1,262)	100% (158)

(1) Promoting Registration of the New Enterprises

Taking the opportunities of issuing the ECC, registration should be promoted to the potential HW generators of the newly established enterprises. ECC procedure is also a good chance to explain in detail on HWM mechanism by the regulating authority.

(2) Promoting Registration of Non-Listed HW Generators

It is presumed that the existing unregistered HW generators may not know the system or neglect their registration because of no application of penalties. It is necessary for the regulating authority to well inform unregistered HW generators of the system and their violation of the law.

Unregistered HW generators can be identified from the existing registration data. The list of ECC-issued enterprises will also be useful cross-examine with the registered generators. As to some specific industrial sub-sectors such as hospitals,

chemical, electronic, and metal products manufacturing industries, the promotion can be effectively carried out through industrial or business associations.

The regulating authority, taking into account the characteristics of their business activities, will also inspect some of the generators who claim not to generate any HW.

It will also necessary for the regulating authority to clarify the detailed requirement for HW registration such as lower limit of HW generation above which the amount has to be registered, and so forth.

9.2.2 Compliance with Reporting Obligation

The obligation of quarterly reporting on HW generation is only followed by around 20 % of the registered HW generators. It should be increased to nearly 100% at the earliest possible.

9.3 Promotion of 3 R

9.3.1 Policy Targets

(1) HW Minimization (Reduction)

The keys of HW minimization at sources exist in conversion of raw materials to non-hazardous or less hazardous materials and improvement of production process to low HW generation. These measures should be mainly promoted.

(2) Reuse and Recycling

The Study Team suggests promoting recycling of the following key HWs at sources.

- Waste oil
- Waste solvents
- Acid and alkali wastes
- Heavy metal sludge, soot and dust

9.3.2 Policy Measures

(1) HW Minimization (Reduction)

In cooperation with the international organizations such as UNIDO, the regulating authority should promote cleaner production technologies (CP) to the HW generators by providing information and also raising their awareness. It will be useful to organize CP working group by types of industries. Representatives from the generators, regulating authority, CP experts, and so forth will organize the working group. It will be the nucleus of promoting CP technologies.

The regulating authority will also examine possible measures to support HW generators in their efforts of research and development and investment in HW minimization.

Table 9.3.1 Policies Measures to Promote HW Minimization

2001-2002	2003-2004
・Accumulate relevant information about CP, identify policy issues to promote CP, and formulate the natioal CP promotion plan. ・Awareness raising of CP	・Implementation of the plan through the involvement of the relevant industries generating HWs.

(2) Reuse and Recycling

While the HWs of liquid state, such as waste oil, solvents, acid, and alkali, are prohibited to be treated at landfills, some of them can be recycled and reused if there is no or very few impurities in these HWs. Recycling of no or less polluted liquid HWs has to be strongly promoted.

As to heavy metal sludge, soot and dust, recycling in metal refining industries will be promoted if they contain useful metals. Storage of these HWs will also have to be considered if it cannot be used in metal refineries.

In addition, the Waste Exchange Program, which is currently under way by PRIME, has to be further expanded to other HW generators, especially those who have ISO 14001 certifications.

The government will take the following measures to promote HW recycling.

Table 9.3.2 Policy Measures to Promote HW Reuse and Recycling

2001-2002	2003-2004
・Identify issues to be solved for promoting HW recycling by types of waste. ・Prepare the guidelines for promoting HW recycling ・Establish economic incentives. ・Deregulation	・Promote and expand on-site recycling. ・Expand recycling business by private sector. ・Study the possibility of storing the HWs to be reused or recycled in the future.

9.4 Promotion of Proper HWM at Sources

To promote proper HWM at sources, the regulating authority will encourage HW generators to take the following actions:

- Development of on-site TSD facilities,
- Proper contract with TSD operators,
- Implementation of the Waste Tracking System

9.4.1 Development of On-Site TSD Facilities

The regulating authority will take the following policy measures to promote development of on-site TSD facilities by HW generators.

(1) Development of on-site HW treatment facilities

It is virtually impossible for HW generators to build high cost facilities such as thermal treatment plants and landfills, on-site treatment will be focused on comparatively low cost facilities including physicochemical treatment of acid and alkali wastes, recycling of waste oil and solvents, and so forth. The regulating authority will promote development of these low cost HW treatment facilities.

(2) Development of on-site HW storage facilities

Some of the HWs have to be temporarily stored until the proper TD (treatment and disposal) facilities start their operation. The regulating authority will first encourage HW generators to prepare on-site storage facilities. To ensure proper storage of HWs on-site, the regulating authority will also request each HW generator to submit a HW storage plan. If it is difficult to prepare on-site storage facilities by HW generators, the regulating authority has to consider about the development of off-site storage facilities probably at local levels.

(3) Notification and permits of on-site TSD facilities

On-site TSD facilities should also be subject to notification and permission by the regulating authority like off-site ones. Therefore, details of these notification and permission procedures need to be established in the form of Department Administration Orders (DAOs) or other governmental orders.

(4) Reporting obligations of on-site HW storage

The regulating authority needs to clarify the total amount of HWs currently stored including on-site ones. Therefore, the HW generators storing their HWs on-site will be required to report their stock of HWs probably on annual basis.

9.4.2 Proper Contract with TSD Operators

If the generators cannot properly handle the HWs on-site, they have to contract with the officially authorized treaters for proper off-site treatment and disposal. In making a treatment contract with the treaters, HW generators have to confirm the treaters' capability of proper HW treatment. The contract must specify the types of HWs to be treated, treatment technologies applied, compliance with the Waste Tracking System, and treatment fees.

Meanwhile, the regulating authority has to clarify the waste acceptance conditions of each authorized HW treater at the time of issuing facility operation permits. Such information will also be provided to HW generators in order that they can easily find the right treaters.

9.4.3 Implementation of the Waste Tracking System (WTS)

The master plan set up the target of full-fledged implementation of the Waste Tracking System (WTS) to start by 2003.

The first step of implementing WTS is to establish the supply and distribution system of manifest sheets. Manifest sheet is the most important material in WTS, without which nothing can start. It should be given the first priority. In principle, the local offices of the regulating authority (hereinafter called as local authority) will sell manifest sheets. One original and one copy of manifest sheets will be submitted to local authority at every movement of HWs. It will be necessary to establish a centralized information management facility. This facility will manage the waste tracking information and also supervise proper flow of HWs. If the system is

electronized, related paper works will be drastically reduced.

If the number of registered HW generators reaches 6,500, it will be very difficult to manually manage manifest sheets and WTS itself. Therefore, the electronic waste tracking system needs to be established by 2010 with the exclusively assigned staff from the regulating authority. The input information to the WTS has to be limited to a few couples of data, including ID numbers of HW generators, haulers and treaters, HW codes and their amount, and the date of manifest issuance. No other information is needed for WTS.

Necessary equipment for operating electronic WTS may only include a certain sets of computers having enough memories and communication lines. WTS is a low-cost but strong tool to control HWs. HW generators, haulers, and treaters will collectively cover the operation and maintenance cost of WTS through buying the manifest sheets or other forms of charges for the use of WTS.

9.5 Establishment of In-House HWM System by HW Generators

The regulating authority will take the following policies and measures to promote establishment of in-house HWM system by HW generators.

9.5.1 Institutionalization of the Appointment of In-House HW Managers

The regulating authority will promote the appointment of in-house HW managers to each HW generators. It will become a legal obligation of HW generators. The regulating authority will also establish the official licensing system and training programs to increase qualified in-house HW managers. Legalization of HW managers should be carried out as soon as possible probably within the 1st Phase so as to accelerate establishment of in-house HWM by HW generators.

9.5.2 Promoting the Certification of ISO 14001 and Establishment of In-House HW Management System

Promotion of ISO 14001 will accelerate the establishment of proper in-house HWM system by HW generators since it requires the establishment of EMS (Environmental Management System), into which the in-house HWM system will be integrated. The regulating authority, therefore, will promote acquisition of ISO 14001 to the registered HW generators.

Moreover, As a part of EMS under ISO14001, the regulating authority will promote establishment of the in-house HWM system at every generators so as to confirm proper HWM at sources. To help HW generators learn accurate knowledge of HWM, current orientation manual for DAO92-29 will also be renewed and disseminated by holding workshops and seminars, and so forth.

9.6 Awareness Raising

9.6.1 Disseminating Information on HWM

To increase awareness and understanding of HWM, the regulating authority has to properly provide information to HWM stakeholders and also the public. The information to be provided with by each stakeholder is given in Table 9.6.1 below.

Table 9.6.1 Information to Be Provided to Each Stakeholder

	Information
Generators	・Details of the laws and regulations, including RA6969 and DAO92-29. ・Waste prevention and CP technology ・Economic incentives for environmental investments. ・Activities of HW treaters. ・In-house HW management system, and acquisition of ISO 14001 certification.
HW Treaters	・Details of the laws and regulations, including RA6969 and DAO92-29. ・Economic incentives for environmental investments. ・In-house HW management system, and acquisition of ISO 14001 certificate.
Public	・Needs of proper HWM and outline of legal and regulatory system ・Current status of HW management in the rest of the world.

The above information will be disseminated through seminars, workshops, and other public relation tools such as pamphlets, official bulletins, websites, and so forth.

9.6.2 Training Seminars and Workshops

To disseminate correct knowledge of HWM to HW generators, the regulating authority should organize seminars and workshops in cooperation with industry groups and NGOs. A special training program should also be prepared for in-house HW managers to be appointed by each HW generator.

9.6.3 Information and Opinion Exchange Between Regulating Authority and Regulated Communities

To exchange information and opinions on HWM, the Study Team recommends organizing regular meetings on HWM at national and regional levels. The meeting will be organized by the representatives from the regulating authorities (government) and regulated communities (generators, treaters, NGOs, citizen, etc.).

CHAPTER 10

STRENGTHENING OF LAW ENFORCEMENT AND ADMINISTRATION ON HWM

10. STRENGTHENING OF LAW ENFORCEMENT AND ADMINISTRATION ON HWM

This chapter deals with the following topics relating to the strengthening of law enforcement and administration on HWM.

- Preparation of laws, regulations, and rules.
- Development of information management system.
- Monitoring and inspection on HWM according to the plans.
- Capacity building and human resource development.
- Strengthening financial capability.

10.1 Measures to Strengthen Law Enforcement on HWM

10.1.1 Basic Strategy

The principal keys of proper HWM in the Philippines are enactment of sufficient laws and their supporting rules and regulations, as well as the establishment of strengthened institution and human resource to enforce them.

In particular, laws and their supporting rules and regulations have to be further elaborated to at the earliest possible. The Study Team recommends that it needs to be completed within the coming few years. In parallel, capacity of the regulating authority to enforce the laws and to implement relevant policies has also to be strengthened.

The first step of strengthening the above capacity is to accumulate visible achievement in a step-by-step manner. Quantifiable targets may be necessary to be easily understood by each staff member of the regulating authority.

Taking all the above into account, the Study Team set up the phased targets as given in Table 10.1.1.

Table 10.1.1 Phased Targets of Strengthened HWM Capacity

2001-2002	2003-2004
・Develop necessary regulation, standards, and manuals. ・Capacity building	・Enforcement of the established regulation, standards, and manuals.

10.1.2 Review and Reinforcement of Laws and Regulations

RA6969 was enacted in 1990 as the basic law for HWM and DAO92-29 was issued in 1992 as the implementing rules and regulations of RA6969. Although, it has already been 10 years since the issuance of DAO92-29, there are still a lot of legal and regulatory issues to be addressed for proper enforcement these laws and regulations.

Among others, the issues of great importance to be addressed are preparation of the standards and criteria relating to HWM, which include the following:

- HW treatment and disposal standards (waste acceptance criteria).
- Technological requirement for TSD facilities and their operations,
- Stricter criteria for permitting HW haulage,
- Reporting requirement regarding the operation records of TSD facilities,
- Stricter criteria for permitting HW treatment.

(1) HW Treatment and Disposal Standards

An important issue in enforcing DAO92-29 is that there is no rule and regulation concerning the criteria for identifying HW and standards for proper HW treatment and disposal. It has to be given the first priority to prepare and issue these criteria and standards. The master plan proposes that this issue will be solved by the end of 2002.

(2) Technological Requirement for TSD Facilities and Their Operations

Preparation of technological requirement for TSD facilities and their operations is of great importance in carrying out proper HWM in accordance with DAO92-29. Both existing and proposed TSD facilities will be assessed on the basis of this requirement.

(3) Criteria for Permitting HW Haulage

Currently, it is possible to obtain HW transport permission without any vehicles ownership in the Philippines. There is no limitation regarding consignment to other haulers. Furthermore, mixed loading of hazardous and non-hazardous waste cannot be controlled because there are no specified rules and regulations.

Meanwhile, HW haulers are obliged to take transport permits every time they transport HW, which creates enormous routine works to EMB officers as well as HW haulers.

Taking these all into account, the following actions are required to improve present situation of HW

haulage.

- Reinforcing the criteria for issuing HW transport permits,
- Implementation of Waste Tracking System (WTS),
- Reinforcing HW transport standard,
- Establishment of the penalties for non-compliance with the above rules (e.g. revocation of permits, etc.)

If WTS is completely operated, it is no longer necessary to issue permits in every occasion of transport. Criteria for licensing HW haulers may include the following requirements:

- HW haulers must have one or more qualified HW manager,
- HW haulers must clearly identify what types of HW they transport and how they transport them in compliance with the relevant laws,
- HW haulers must specify the containers to be used for transporting HW by types,
- HW haulers must have their own vehicle(s) designed to transport HW with proper leakage prevention measures,
- Every HW transport vehicle must so indicate in a visually clear manner,
- HW haulers must have no commitment to crime or violation relevant to waste management at least in the past 2 years

Meanwhile, HW transport standard will specify types of HWs allowed transporting, obligation on separate transport of different HWs, designation of transport vehicles, record keeping, etc.
It is also necessary to include the provision regarding revocation of license in the case of violation of relevant laws and regulations including illegal dumping.

(4) Reporting Requirement regarding the Operation Record Keeping of TSD Facilities

There is no reporting duty regarding operation records of TSD facilities in the Philippines. It has to be provided by law to report TSD operation records to the regulating authority at least once per year. In this case, the extent of reporting obligation also needs to be clearly defined by law.

(5) Criteria for Permitting HW Treatment

Technical and financial capability of HW treaters has to be duly examined before issuing permissions. HW treaters should also be encouraged to enter an insurance contract on possible risks of HW haulage.

10.1.3 Other Complementary Rules and Regulations

(1) TSD Facilities and HW Transport Permits

The existing rules and regulations regarding TSD facilities and HW transport permits need to be reviewed to properly control HW haulers and treaters. Especially, the permission of new TSD facilities has to be controlled in accordance with the region level TSD facilities plans to be formulated by the local authority.

The master plan targeted to complete all these activities by 2003.

(2) Introduction of In-House HW Managers at Sources (Generators)

The regulating authority should provide by laws or regulations the obligation of HW generators to appoint in-house HW managers.

(3) An Official Notice of Temporary Storage of HW

An official notice needs to be issued by the regulating authority so as to regulate proper storage of HW until proper HW treatment facilities start their operations. It also needs to specify the methods of proper HW storage by types.

(4) Preparation of Guidelines and Manuals

To guarantee impartial enforcement of laws and regulations, manuals for HWM administration works should be prepared for regulators. Administrative works on HWM will be carried out in accordance with the manuals. It will also be useful to prepare such manuals for generators and treaters of HW.

The manuals may include:
- Detailed explanation of HW category and categorization methods,
- Procedure for registration of HW generators and treaters,
- Procedure for issuing TSD facility permits.

Categorization of HW often causes troubles and confusions for regulators as well as generators. Detailed explanation including Q & A explanation will be needed. As to registration of HW generators, some sort of guidelines may be necessary for generators to correctly fill in the registration sheets. The guidelines can be utilized to check the items and omissions by regulators. Procedure for issuing TSD facility permits will be explained by a flow chart, in which all the necessary surveys and examinations are indicated.

10.2 Information and Data Management System

Target:
To establish the electronic data management system by 2001-2002 and build a network with regional regulating authorities

The information and data to be managed in HWM include registration of HW generators and treaters, their reports and notifications, and relevant permits. All of them should be controlled through an electronic database at the earliest possible. One important issue here is update of these data and information. Capacity building should also be made in these aspects.

Table 10.2.1 below shows the results of assessing available data and information on HWM in the regulating authorities.

Table 10.2.1 Present Information and Data Availability and Assessment of the Future Needs

	Policy Items	Information Management	Current Level
EMB Central Office	• Planning measures on Treatment/ recycling	• National information on sources of waste generation.	B
		• TSD facility management	C
	• Source control	• National information on sources of waste generation	B
	• Treaters	• National information on treaters	C
	• Status of monitoring	• Local monitoring plans and their reports.	D
	• Inappropriate treatment practice	• Instances of inappropriate treatment at local level.	D
	• Informative assistance	• Generating source, HW, and technical information	D
	• TSD facility permit	• Relevant information	D
EMB Regional Office	• Source control	• Manage information on HW registration	B
		• Quarterly reports	C
		• Manifest information	D
	• Treater management	• HW registration information	D
		• Quarterly reports	D
		• Manifest information	D
	• Monitoring implementation	• On-the-spot inspection at source.	D
		• On-the-spot inspection of the treaters.	D
		• Illegal dump sites	D
	• IEC activities	• Seminar participants	D
	• TSD facility permit	• Relevant information	D
	• Improvement order, notice of violation	• Information of the targeted businesses	D

Remark: A: Excellent B: Good C: Moderate D: To be Improved

All the information and data given above have to be properly managed by the regulating authority at the earliest possible. Particularly, registration data, quarterly reports, and information on TSD facilities and treaters are of great importance.

To do this, the Study Team set the target that EMB central and regional offices should establish the electronic information and data management system by 2004 and start full-fledged electronic data and information management in 2005.

10.3 Monitoring and Inspection

10.3.1 Development of HWM Monitoring and Inspection System

(1) Target and Strategy for Target Compliance

Target:
- **Strengthen the present institution and capacity of available human resource up until 2003.**
- **Start full-fledged HWM monitoring and inspection in 2004**

The objective of monitoring and inspection is to confirm and guide proper HWM to HW generators and treaters.

Monitoring and inspection of HW is totally different from air and water quality monitoring. It is difficult to identify the objects to monitor and inspect from the dispersed sources. It also needs a lot of relevant experiences. The regulating authority should prepare a manual for HW monitoring and inspection and training programs to raise HW monitoring and inspection experts.

(2) Strategy for Target Compliance

The regulating authority will formulate the national HW monitoring and inspection plan. The plan will include regional target number of facilities to be monitored and inspected. It will also provide criteria for selecting priority HWs and sources subject to monitoring and inspection. Based on this plan, regional regulating authority will formulate its own monitoring and inspection plan. Region-by-region achievement of HW monitoring and inspection will be annually evaluated by the central regulating authority.

Monitoring and inspection has to be carried out also on unregistered HW generators, illegal damping sites and the existing landfills (inc. municipal waste landfills). Analysis of the sampled

HW will also be conducted if needs arise.

(3) Monitoring/Inspection Subjects

Monitoring and inspection subjects may include:

- Compliance with the registration duty,
- Compliance with the reporting duty,
- Safekeeping of manifest sheets,
- Proper storage of non-recyclable/non-treatable HW on site,
- Separate management of HW by categories,
- Proper consignment to the HW haulers and treaters,
- Establishment of in-house HWM system
- Conditions of in- house rules, manuals, and training on HWM,
- Proper categorization of HW,
- Exact and true record-keeping and reporting to the regulation authority,
- Proper treatment and disposal of HW

(4) Expansion of Registered HW Generators

The master plan set up the target to increase the number of registered HW generators to 6,500 by 2010. As the first step, the regulating authority has to identify priority industries on the basis of available HW generators' information. Subsequently, non-registered enterprises of corresponding industries are inspected to confirm their generation or no generation of HW. The identified non-registered HW generators will enter the procedure for registration one after another.

The regulating authority will take the following steps to achieve the established targets.

A. Capacity Building of the Existing Human Resources (2001-2002)

Capacity building of the existing human resources in the regional offices will be the starting activity. The central regulating authority (EMB) will conduct the training of regional officers on HWM starting from the basic knowledge of HW generation.

B. Implementation of Preliminary (Pilot) Surveys on Potential HW Generators (2002-2003)

Based on the established targets of industries, regional offices will start the surveys on potential HW generators by the existing but trained staff. The surveys in this period will focus on accumulating experiences and know-how, as well as identifying the potential number of HW generators.

C. Full-Scale Implementation of the Surveys (2003-2010)

Based on the possible increase of human resources and their training probably in 2003, regional offices will start full-scale surveys in 2004. Average number of potential HW generators surveyed will be set at 200 to 300 per annum.

(5) Monitoring and Inspection according to the Prepared Implementation Plan

A. Selection of Priority HWs

Monitoring and inspection priority should be given to the HWs having large and serious impacts on human health and environment. Especially, the danger to human health is of great importance. In this respect, priority HWs may include some of hazardous inorganic chemical substances and organic wastes of high toxicity, such as chlorine solvents, PCBs, infectious waste, asbestos, and so forth.

B. Selection of Priority Industries

Priority industries will be determined by screening the generators of priority HWs with some criteria, for example, those who generate more than 10 tons of priority HWs per year.

Priority industries may include ferrous and non-ferrous metal processing, electronic equipment production, transport equipment production, leather and tannery, and chemical production, and so forth. The premises having inorganic wastewater treatment facility will also be given priority.

In addition, large HW generators should be subject to monitoring and inspection. The HW generators of more than 100 tons per year will be identified as large HW generators.

As to other industries, monitoring and inspection will be carried out by examining the submitted document and materials. The generators of low HWM performance will be identified to assess necessity of on-site inspection.

All of the TSD facilities (including on-site ones) will also be subject to on-site inspection.

C. Monitoring and Inspection Details

Monitoring and inspection will be carried out on the subjects given above (see (3) of Section 10.3.1). The regulating authority may require generators to analyze tests on some HWs to assess their toxicity. Maybe some of the sample will be taken for analysis in the labs of the regulating authority.

As to TSD facilities, the following items needs to be thoroughly inspected.

- Landfill operations,
- Handling of treatment residue,
- Treatment and landfill operation records.

D. Frequency of Monitoring and Inspection

It is not necessary to conduct monitoring and inspection on all registered generators. On-site inspection will be conducted once per 1 or 2 years on the priority generators. As to TSD facilities, the regulating authority will conduct on-site inspection once or twice a year. The necessity of inspection on other generator will be determined on the basis of examining the submitted document and materials.

E. Phased Development of Monitoring and Inspection

Monitoring and inspection on HW generators and TSD facilities will be developed by taking the following steps:

a. Selection of Priority Generators and Facilities (2001-2003)

Based on the currently registered 1,079 generators, EMB will select priority generators. Regional Offices will conduct preliminary survey on the selected generators to determine the necessity of monitoring and inspection. Priority generators will be annually reviewed by adding the new registered generators and TSD facilities.

b. Formulation of the National Monitoring and Inspection Plan (2001-2003)

EMB will formulate the national monitoring and inspection plan on HW generators and TSD facilities. Regional offices will start trial of monitoring and inspection according to this plan.

c. Full-Scale Implementation of Monitoring and Inspection (2004-2006)

Regional Offices will start full-scale monitoring and inspection according to the regional monitoring and inspection plans to be formulated.

(6) Inspection on Illegal Damping Sites and Municipal Waste Landfills

The regulating authority will conduct patrolling of illegal dumping sites and municipal waste landfills to control improper HWM. The regulating authority will set up a window to receive

reports from the peoples. If illegal dumping of HW is identified, the regulating authority, in cooperation with the police department as far as it is possible, will conduct detail investigation. Illegal dumping of HW at municipal waste landfill will be regularly inspected at the gate of landfills.

(7) Analysis and Screening of HW

First priority will be given to the establishment of the criteria for determining toxicity of HWs and standardization of analyzing methods. All of them have to be completed at the earliest possible in 2001. HW analysis guidance to the generators will also be carried out to promote self-analysis.

10.3.2 Establishment of Waste Tracking System (WTS)

Figure 10.3.1 below shows the flow chart of the manifest system.

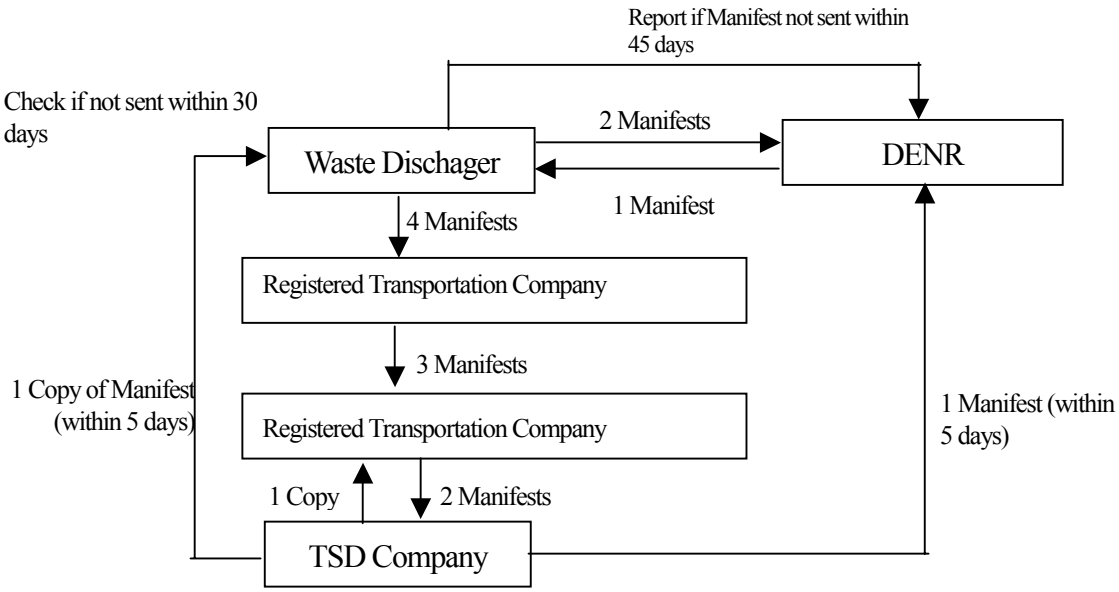

Figure 10.3.1 Flow Chart of HW Manifest System

The master plan establishes the target to realize WTS in the Philippines. The actions to be taken to achieve this target are as follows.

- Establishment of the manifest sheet distribution system,
- Dissemination of WTS to HW generators, haulers, and treaters,
- Inspection on the compliance with WTS participation.

Cross-examination of the submitted manifest sheets between those submitted from the generators

and TSD operators will be a complicated and difficult process if it is manually conducted by exchanging manifest sheets. Therefore, the master plan recommends establishing an electronic waste tracking system. To check the proper flow of HWs and its quantity, the data to be filed in the system includes:

- ID number of HW generator,
- HW code and its quantity,
- Date of consignment (haulage and treatment)
- Date of manifest submission from the generator,
- ID number of consigned haulers and treater,
- Date of manifest submission from the treater,

A centralized data management and networking with the Regional Offices will be needed to properly operate this system. The regulating authority needs to establish in the future a section exclusively managing WTS.

However, operating works will be mitigated if TSD facilities are properly controlled to limited number. In this case, it will be also possible to take over operating works to TSD operators because most of the manifests finally go to TSD operators

10.4 Institution and Capacity Building of HWM Administration

To implement the plans and measures provided in this chapter, the Philippines HWM administration has to be strengthened in all its aspects, including organizational, human resource, and financial capacities. The financial capacity is always the key to strengthening all other capacities of HWM administration. Taking into account the current tight budget constraint and conflicting policy priorities, however, capacity building of existing human resource and other available resources should be focused at this moment. Further strengthening of the capacity will be carried out with the expansion of administrative roles of the regulating authority of HWM.

(1) Roles of the Regulating Authority in HWM

Comparing with the required roles in HWM, capacity of the regulating authority is definitely unlimited in all respects (human resource, equipment, and budget). Increased allocation of budget is of particular importance in proper HWM administration.

The roles of regulating authority in HWM include:

- Supervising HWM of generators (generation, storage, treatment, disposal),

- Supervising HW haulers and TSD facilities operations,
- Managing information of registered generators, haulers, and treaters,
- Management operation of the Waste Tracking System,
- Issuance of permissions (TSD facilities, HW transport, etc.) and ECCs,
- Administrative guidance to HW generators, haulers, and treaters,
- Awareness raising of HW generators, haulers, and treaters,
- Strict law enforcement on HWM, especially against violators,
- Preparation of supporting manuals and guidelines for HWM,
- Providing relevant information to HWM stakeholders

To carry out these roles, the following actions need to be taken by the regulating authority.

- Reorganization and strengthening of national and regional regulating authorities on HWM,
- Capacity building of existing human resource,
- Increase in human resources,
- Development of information management system,

Each of the above actions are given in further detail below.

(2) Reorganization and strengthening of national and regional regulating authorities on HWM,

A. Reallocation of Tasks Between National and Regional Regulating Authorities

The roles and required expertise of national and regional regulating authority are given in Table 10.4.1.

Table 10.4.1

Required Roles and Expertise of National and Regional Regulating Authorities

	Duties	Sections	Personnel
National Office	-Development of legislation, regulation, and manuals.	-Laws and regulations	-Lawyer (1)
	-Policy making & Planning -Evaluating treatment status	-Policy, planning, and management section	-Engineer (1) -Lawyer (1)
	-Technical manuals -Technical assistance -Permit approvals -Import-export control	-Technical control section	-Chemical engineers (2) -Engineer (1)
	-Information management -Manifest management -Information offering	-Information management section	-System Engineer (1) -Engineers (2)
	-Waste analysis (tentative)	-Waste analysis section	-Chemist (1)
Regional Office	-HW registration, reports -Receiving manifests	-Management section	-Engineer
	-Monitoring, patrolling, and sampling -Permits	-Monitoring section	-Chemical engineer -Engineer

Currently, the national regulating authority holds most of the roles of HWM in one Section, namely HWM Section of the Environment Management Bureau (EMB). Due to this, most of the members are spending a lot of times for routine works and have no time for policy-making works, which have to be its principal role. Accordingly, the EMB should establish an independent section in charge of formulating HWM policies and plans. The routine works, which are presently carried out by HWM Section of EMB such as registration of HW generators, various permissions, etc., should be taken over to regional offices of EMB.

As to the analysis of HWs, the capacity of national level laboratory should be first strengthened and expanded to regional laboratories in a step-by-step manner.

The regional offices of EMB are the law enforcement and policy implementation units of HWM. Registration of HW generators, reception of manifests, and monitoring and inspection of HWM stakeholders and so forth should all be given to the responsibilities of regional EMBs. Required human resource and other resources may be different among regions, depending on the magnitude of HW generating and treatment activities. In the regions where those activities are small in their scale, it may be inevitable for regional officers to conduct HWM tasks concurrently with other environmental works. It means that a wide range of environmental skills and knowledge are needed in regional officers. To further strengthen capacity of regional EMBs, the central EMB

needs to develop training programs and promote transfer of technologies, skills, knowledge, and know-how of HWM that have been cultivated so far.

B. Cooperation with the Affiliated Organizations

It may be difficult for national and regional EMBs to handle all the works defined in this chapter. The use of the existing affiliated organizations has to be maximized to ease their tasks. Establishment of public-service corporations will be an option to take over some tasks, such as management of the Waste Tracking System, analysis of HWs, and so forth.

C. Institution Building

Figure 10.4.1 below shows the recommended organizational scheme for HWM in the Philippines.

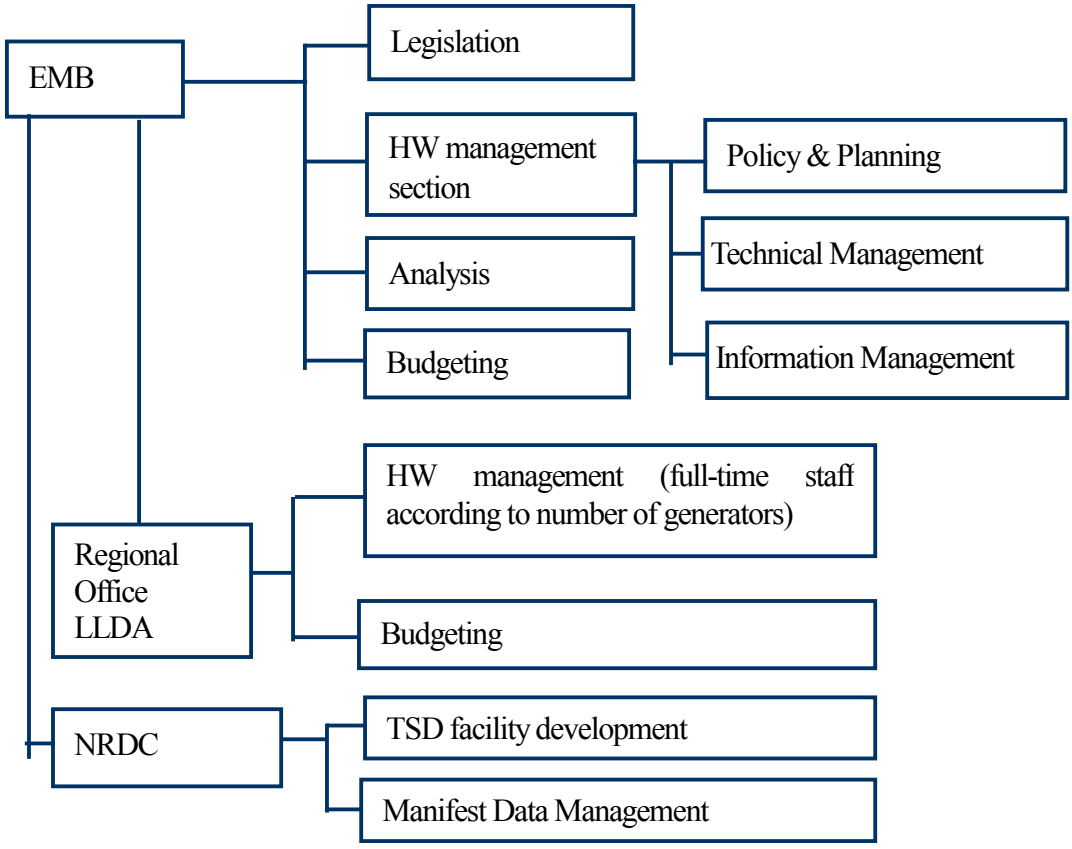

Figure 10.4.1 Recommended Organizational Scheme of HWM

Meanwhile, Table 10.4.2 specifies the tasks of each section.

Table 10.4.2 Allocation of Tasks by Each HWM Section

Branch/ Section			Responsibilities
Inter-Agency Technical Advisory Council			- Council on National Plan on HW Management and Development Plan - Prepare policy and regulation
EMB Central Office	Legislation		- Revise RARA6969 and DAO92-29 - Prepare legislation and regulation - Prepare Official Notice on the regulation
	HW management Section		
		Policy & Planning	- Develop a National Plan on HW Management - Propose policy on HW - Evaluate status of HW management - Prepare a report to the Secretary - Conduct relevant study
		Technical Management	- Develop technical guidelines - Technical audit on TSD facilities - Give technical advise - Manage export and import - Train person concerned
		Information Management	- HW registration information, management on quarterly report - Information on waste treaters - P.R. & promotion
	Analysis		- Standardize analytical methods on waste - Perform waste analysis
	Budgeting		- Fees on HW registration and the manifest - Budgeting on waste tax
Regional Office	HW Management		- HW registration, Manifest - Monitoring
	Budgeting		- Fee collection on HW registration and manifest
NRDC	Facility Development		- Prepare a plan on facility development - Participate in private sector project - Training for the generators and treaters
	Manifest Information		- Sell manifest - Manage data from the manifest

(3) Capacity Building of Existing Human Resource

Targets:
To increase the capacity of existing human resources in the national and regional EMBs as the core members of HWM in the Philippines

Human resources are the most important keys to realization of proper HWM in the Philippines. Not only the human resources in regulating authorities, but also those in the regulated communities has to increase their capacity of HWM. Superior human resources in the regulated communities

will mitigate the burdens of the regulating authorities in HWM.

Capacity building of the central EMB will be given the first priority because proper HWM should start from this bureau. Subsequently, the capacity of regional offices will be raised, followed by human resources in the regulated communities.

Two types of training programs will be necessary. One is for regulating authority, and the other is for regulated communities. The Study Team sets the targets of establishing and implementing the training programs of regulating authority at 2002, and at 2003 for regulated communities.

As mentioned earlier, capacity building of the central regulating authority (DENR/EMB) will be first carried out. Subsequently, DENR/EMB will conduct technical transfer to regional offices. The following training programs will be build for capacity building of the above regulators.

A. Senior Administrator Course

(Themes)

- HWM laws and regulations and their enforcement,
- HWM policy making and planning

B. Junior Administrator Course

(Themes)

- HWM laws and regulations and their enforcement,
- HW Category,
- Assessment of registered information and data,
- Monitoring and inspection,
- HW analysis,
- HW treatment technology,
- Technological requirement for TSD facilities.

The training program will be regularly reviewed and renewed in accordance with the changes in policies, laws, regulations, etc. On-the-job training may be needed in some of the above themes, such as monitoring and inspection. Some of the above program is also useful for HW generators and treaters. The regulating authority should conduct the above training also to generators and treaters.

(4) Increase in Human Resources

A. Monitoring and Inspection Staff

The government will not accept request of additional staff members unless its reasons are

theoretically understood on the basis of actual administrative achievement of the regulating authority. Therefore, the first action to be taken is to increase the administrative performance of the existing human resources in the visually identifiable way. In the case of monitoring and inspection, number of inspected generators can be used as a performance indicator. Based on the accumulation of this kind of data, needs of additional staff members can be reasonably understood by the government.

Additional staff members for the HWM Section are needed to implement RA6969.

B. HW Laboratory Staff

Due to limited budget and human resources, it is not possible to conduct HW analysis sufficiently in the Philippines at this moment. However, the regulating authority should at least set the target, for example, of 10 % increase by 2010. It also needs to improve technical capability of the laboratory staff.

(5) Development of information management system

To conduct efficient HWM administration, information equipment needs to be further increased, especially in regional offices. Supply of vehicles for conducting on-site monitoring and inspection may also be needed. Waste analyzing equipment is necessary in both central and regional regulating authorities.

10.5 Strengthening of Financial Capacity

Targets: **To increase both development and operational budgets for HWM**

Financial capacity of the regulating authority has to be strengthened in terms of development as well as operational budgets. Development budgets, in this case may include new facilities and equipment for HWM, such as HW waste analyzing labs and their equipment, data management and waste tracking systems, and so forth, while operational budget may cover manpower and other regular operation costs of HWM by the regulating authority. In principle, both budgets are necessary to be allocated by the Government of the Philippines. However, some of the above costs can be charged to the regulated communities of HWM. The central EMB currently collects fees for registration of HW generators, issuance of various permits, ECCs, and so forth. The operation cost of Waste Tracking System is an example to be covered by the fees charged to the users of manifests. The cost of HW analysis should also be covered by the fees charged to the generators. It is also another option to introduce HW taxation system, which is widely applied in

European countries. The regulating authority has to duly examine the possibility of all these measures in terms of legal and policy aspects so as to increase its financial capacity. It is also necessary to build a proper and transparent budget allocation and control and accounting system to properly manage the fund for HWM.

The principal constraint in strengthening the capacity of HWM administration in the Philippines is the financial limitation. Any of new HWM administration work creates some costs to be covered. The regulating authority may have to consider the possible sources of fund in addition to government budget allocation. The operation cost of registration and WTS may be covered by charging the fees to the user of the system. The other option is the introduction of taxation on HW, which is widely applied in European countries. The collected taxes are usually used for HWM purposes in these countries.

CHAPTER 11

DEVELOPMENT PLAN

OF

THE MODEL HW TREATMENT FASCILITY

11. DEVELOPMENT PLAN OF THE MODEL HW TREATMENT FACILITY

This chapter discusses the development plan of the model HW treatment facility in the Philippines.

11.1 Basic Concept of the Model HW Treatment Facility

As to the recyclable wastes that are presently handled by the existing private recyclers, the master plan takes a position to support their further development based on the market mechanism. Therefore, the model treatment facility discussed here will mainly deal with the HWs that are difficult or impossible to recycle with the presently available technology.

Necessary HW treatments in the model facility include neutralization of waste acid and alkali, detoxification of toxic substances, thermal treatment of organic HWs, and landfill of the heavy metals containing, treated, and inorganic HWs. The technologies to be applied are physicochemical (including neutralization, oxidization, and deoxidization), thermal, and solidification treatments and landfill. These treatment and landfill operations will be all integrated in the model facility.

11.2 Physicochemical Treatment

(1) Purposes

The purpose of physicochemical treatment is to remove toxic substances from the HWs of acid or alkaline state through physical, neutralization, and chemical decomposition processes.

(2) HWs to be Treated

The HWs to be mainly treated through the physicochemical treatment process include:

- Liquid wastes containing low cyanide content;
- Waste acid (pH ≤ 4), including sulfuric, hydrochloric, phosphoric, fluoric, and bichromate acids.
- Waste alkali (pH ≥ 12.5), including caustic soda, caustic potash, and ammonium.

The model facility can also accept waste acids of the pH4~7 and waste alkalis of the

pH7~12.5 especially if they are contaminated with heavy metals. However, organic acid wastes, such as acetic acid wastes, distillated liquid wastes, and organic alkali wastes that contain amine compounds will be excluded from these physicochemical processes because both BOD and COD of the wastewater discharging after the treatment of these wastes are too high to comply with the existing effluent standard.

The HWs that are subject to detoxification process in physicochemical treatment are cyanide contaminated liquid wastes, fluoride compounds, nitrites, and chromate.

In the case of the Philippines, some HW generators have their own on-site physicochemical treatment facilities such as neutralization, oxidation, or reduction processes. The master plan also supports on-site treatment of HW as far as it is properly carried out. However, since not all of the generators can develop their own treatment facilities on site, they still need proper treatment facility off-site. The model facility will accept HWs from such generators.

(3) Treatment Technologies and Process

The physicochemical treatment includes various processes such as neutralization, reduction, oxidation, precipitation, and so forth. Additionally, physicochemical treatment technologies of acid wastes include thermal cracking for sulfuric acid, ion exchange separation, dialysis, and solvent extraction while recovery of caustic soda and ammonia and contact wet oxidation method are available for alkaline wastes.

However, many of the above treatment processes are designed to deal with specific types of acid or alkali wastes and not applicable to other types. In the case of the model facility, miscellaneous acid and alkali wastes will be subject to physicochemical treatment. Therefore, the model facility has to select the technology that can properly handle any types of acid and alkali wastes as much as possible. In this regard, neutralization is the most appropriate process that can be widely applied for various acid and alkali wastes. Moreover, the reaction tanks used in neutralization process can be used for other physicochemical processes such reduction and oxidation. Accordingly, the master plan selected neutralization process as the core of physicochemical treatment in the model facility.

Besides neutralization, the following treatment technologies will be applied for detoxification of cyanide contaminated liquid wastes, fluoride compounds, chromium contaminated liquid wastes and so forth.

- Oxidization for cyanide contaminated liquid wastes

- Precipitation and Separation for fluoride compounds wastes
- Reduction Treatment for chromium contaminated liquid wastes
- Oxidization for ionized ferric irons
- Precipitation and Separation for metals

(4) Establishment of Treatment Capacity

The treatment capacity is generally designed to be able to satisfy with an estimated market demand. But the market demand may be reduced due to some competing treatment facilities, especially dissemination of on-site treatment facilities by generators. Therefore, the treatment demand has to be carefully estimated to establish proper treatment capacity of the model facility.

Another key factor to be considered is a relation between the treatment cost and market demand. To compete with the on-site HW treatment facilities by generators, the treatment cost in the model facility has to be at least the same or lower than them.

Based our survey on on-site HW treatment facilities in the Philippines as well as our experience in other countries, the Study Team estimated that the level of HW treatment cost allowable to generators would be more or less 200 dollars US per ton.

The designed treatment capacity is determined by estimating the scale of facility that can be operated in an economically and financially feasible manner with the above treatment cost of 200 dollars per ton.

The MIF should be able to secure an appropriate cost upon studying a conjunction of a treatment capacity and cost. According to the proposal, a desirable treatment capacity will be capable to handle over 3,000 ton per year of the HWs, however the design capacity will be estimated with 50% of it.

(5) Facilities and Equipment

Physicochemical treatment plant is consisted with the following equipment and facilities.

- Measuring and weighing equipment
- Waste analysis laboratory
- Waste storage facility
- Tank yard
- Chemicals storage facility

- Reaction tanks
- Flue gas treatment facility
- Flocculent reaction tanks
- Thickener
- Sludge dehydration facility
- Wastewater filtration facility
- Wastewater monitoring facility
- Instrumentation facility (Central control room)

Basic flow diagram of physicochemical process is shown on Figure 11.2.1 on the next page.

A. Waste Storage Facility

Liquid wastes are basically transported by small containers, or drums (200 litters), or pallet tanks (800 litters), however pallet tanks will not be used many in servicing.

A total storage capacity should be satisfied with 30 days operation, which is desirable period for maintenance or improvement of the facility. A capacity by containers should be 15 days, which is 50% of the total.

A facility should be indoor type warehouse construction and its storage capacity is satisfied with 15 days operation, which will be 50% of 1,500 ton per year (310 days operation) and its space will be possible to store 360 drums.

A height of the storage room should be minimum 5 meter and at least 1 meter extra room between the ceiling that is possible to store 3 stacks drums by 4 drums per pallet configuration on racks.

The following HWs shall be segregated to store until its treatment.

- Cyanide contaminated alkali wastes
- Alkali wastes, non contaminated with cyanide
- Acid wastes, non contaminated with chromium, mercury, and ammonium compounds
- Chromium contaminated liquid wastes,
- Others

B. Tank Yard

The tank yard will be outdoor facility and its capacity should be satisfied with 15 days operation. Minimum 5 tanks will be necessary to individually store the above-categorized wastes. Each tank capacity will be designed depending upon acceptance volumes.

However, intermediate storage tanks should be built between reaction tanks.

C. Chemical Storage Tanks

The following chemicals will be stored in tanks.

- Quicklime (CaO)
- Sodium hypochlorite (NaClO)
- Sulfuric Acid (H_2SO_4)
- Sodium sulfide (Na_2S)
- Ferric chlorite ($FeCl_2$)
- Ferrous sulfide ($FeSO_4$)
- Sodium hydroxide (NaOH)
- Polymer coagulant

Total 9 tanks will be needed, including one each tank for quicklime silo and slurry, in addition to the above tanks.

D. Reaction Tank

2 units

E. Fans and Ventilators

2 units per each tank

F. Flocculent reaction tank

1 unit

G. Thickener

1 unit

H. Sludge Dehydration Facility

Filter Press – 1 unit

I. **Others**

Agitators, pumps, piping, container compactors, cooling water, scrubber, electric utilities, fork lifts, instrumentation, control room, analysis laboratory. And washing facility for empty containers, wastewater treatment system

J. Other Technical requirement

Prevention system for the wastewater penetration into the ground

(6) Operation

The following operating conditions are assumed.

- Operation : 8 hours per day

However, an extra space for additional storage tanks should be planned to be able to operate 16 hours per day

- Operation of reaction tanks : Batch operation

The facility is not required with high technology, however an operational know-how will be required. The know-how is that the process will be satisfied with the effluent standards as quickly as possible through effective blending of each HWs, economical dosing of chemicals as well as safety treatment process. In order to satisfied with the above chemical processes, an analysis faction shall be essential and a responsible person for the facility shall be chemistry.

Safety operation is the first priority in the facility. Therefore each reactive chemical should be segregated in storing and in addition, more careful attentions will be taken to toxic gases, which will be generated through chemical reacting in the process. Toxic gases, such as ammonia, hydrogen sulfide, nitrogen dioxide, sulfurous acid, hydrogen cyanide, chroline and etc. will be generated. Also a style for warning display signboard will be extremely important to avoid human errors, if any.

A thickener will be required with an extra capacity, because of that the sedimentation velocity of suspended solids may not be theoretically constant due to a variety of HWs quality.

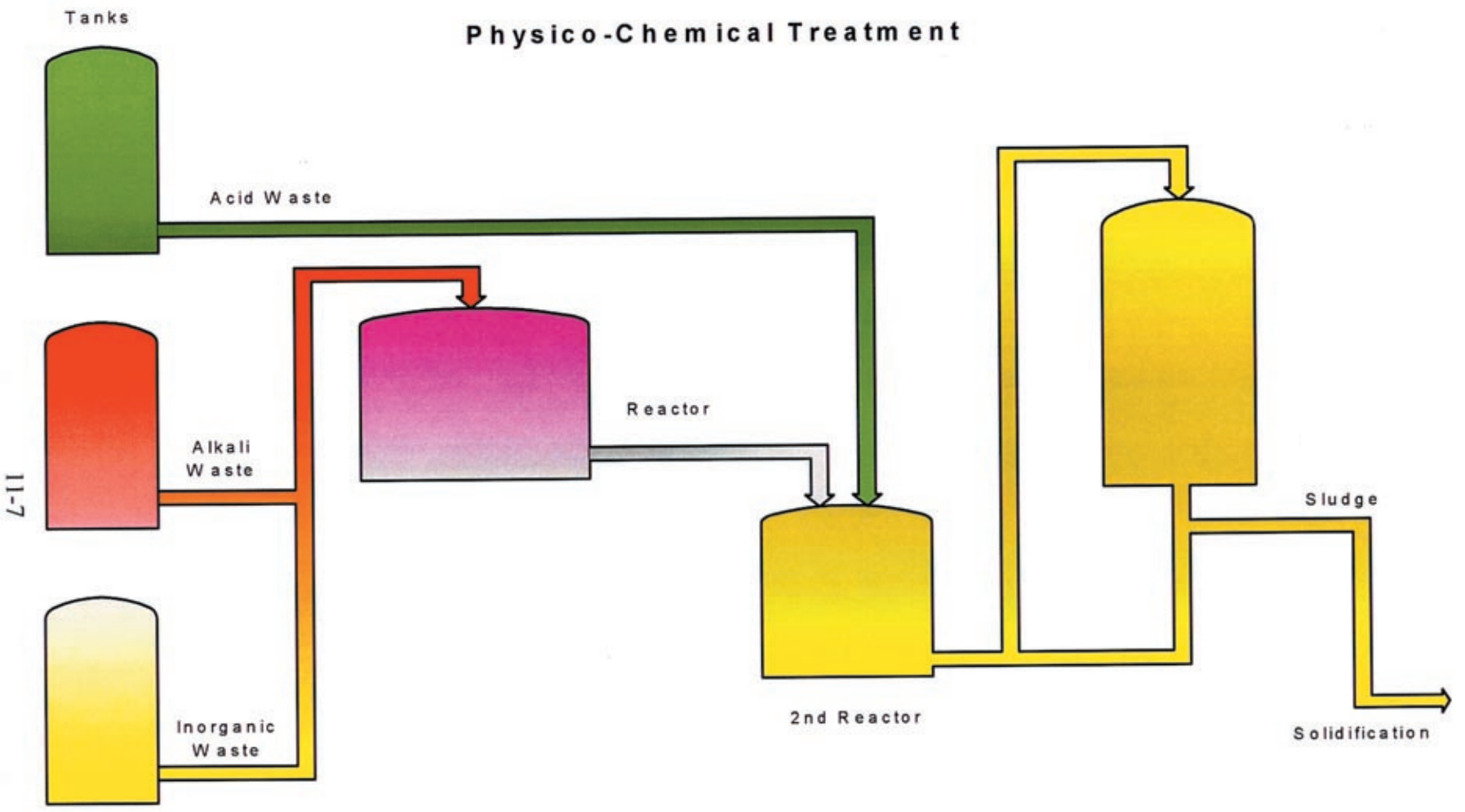

Figure 11.2.1 Process Flow of Physicochemical Treatment

A wastewater pond is required with monitoring of safety effluent condition as well as biological monitoring.

Solid wastes, such as sludge and waste filtrate are produced. These are metallic oxide compounds, which are necessary to be treated by landfill. The solidification will be necessary to comply with the landfill standard.

11.3 Solidification Treatment

(1) Purposes

An object of the Solidification Treatment is to prevent the earth from leaching toxic materials from solid HWs in order to be complied with the waste acceptance criteria for landfill. And also it is to control the HWs from the elution, which will be unable to treat through a wastewater treatment system at landfill site.

(2) HWs to be treated

The following HWs will be subject to be treated by solidification process.

- Heavy metals containing hydroxide sludge (HW code: D401-407, C306)
- Residual sludge generated through the phosphoric acid oxidizing treatment (sludge generating from B204 treatment)
- Sludge generating from the treatment of wastewater contaminated with the fluorine (sludge generated from removal process of D205)
- Hydroxide and sulfate (D499)
- Dust and ash generated from the second fusion processes
- Waste catalysts

And the residues and sludge from the physicochemical treatment and fly ash from the thermal treatment, and sludge generated by the wet type flue gas treatment in MIF will also be subject to this solidification process.

(3) Design Concept of Treatment Capacity

The HWs being a subject to be treated by the solidification process will be that these are noncompliance with the waste acceptance criteria for landfill. In a case, the standard will control toxic metals, the HWs will be required to be treated by the solidification process to prevent the elution from the HWs. These are mostly plating sludge, ashes,

dusts and other HWs. However, these will be estimated fewer volumes to be noncompliance with the landfill standard. And sludge generated from the phosphoric acid oxidizing treatment, sludge contaminated with fluoride generated from wastewater treatment process, the hydroxide and the sulfate, which will be also very limited quantities that will be produced mainly through the physicochemical processes at the MIF

Most volume of the HWs are fly ashes, which will be generated through the thermal treatment process. It is estimated to be around 20 thousand tons per annum. Around 1,000 tons of the fly ashes will be subject to solidification.

(4) Treatment Technologies and Process to be applied

A process of the stabilization / solidification shown on Figure 11.3.1 will be applied for the above described HWs. In addition to the cement solidification process, chemical treatments, acid extraction processes and melting process are able to applied to prevent metals elution from the fly ashes. However, the cement solidification process will be a basic treatment to be able to apply for both the fly ashes and the hydroxide. Thus the solidification by cement process is having more experiences as well as an effective process due to an economical and flexibility for various type of HWs.

The heavy metals, which will be subject to process, include cadmium, arsenic, mercury, and lead. However, the lead shall be required with a special process because of the dipolar metal. The cyanide and hexavalent chromium are required to treat through the detoxification prior to the solidification, because it is difficult to be solidified.

(5) Facilities and Equipment

The process will be composed of the following equipment and facilities.

- Storage facility,
- Waste feeding facility,
- Measurement and weighing facility
- Chemicals dosing tanks
- Water tanks
- Mixing equipment
- Granulating machine
- Conveyor system
- Pit for waste treatment

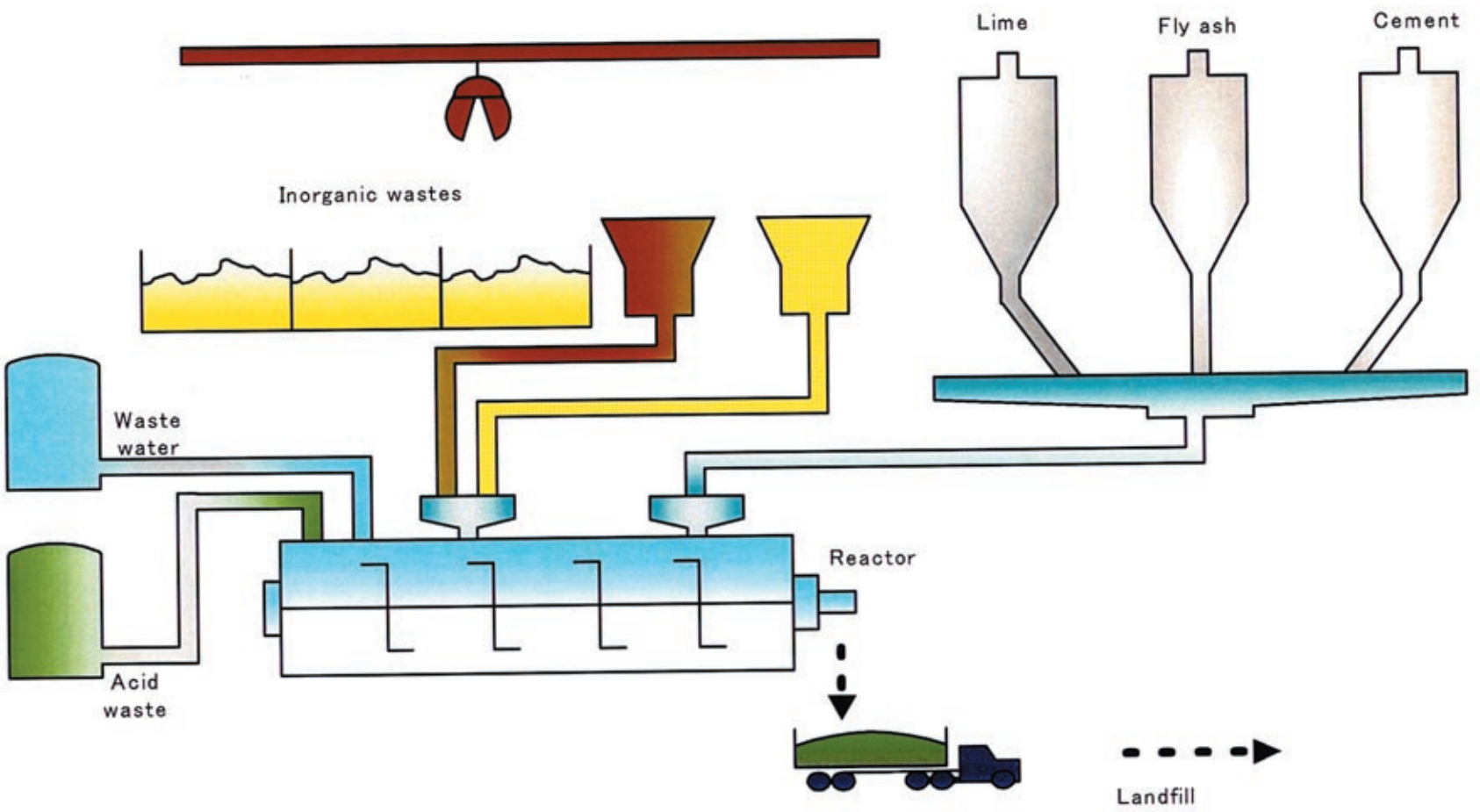

Figure 11.3.1 Process Flow of Solidification Treatment

Since the HWs will be transported by drums and/or bulks, a storage facility for the HWs has also to be built in MIF. The HWs will be once stored in the pit, then conveyed to the feeding facility.

(6) Operation

Key conditions in the operation are types of cement being used, mixing ratio, types and quantity of additives, and curing conditions. All of these are the important know-how by operators.

11.4 Thermal Treatment

(1) Purposes

The purpose of thermal destruction treatment is to convert hazardous materials into inert and stable condition in order to be able to minimize a risk by the toxicity of HW upon disposing at the landfill. This master plan propose that the HWs contains organic materials shall not be directly discharged at landfill. Therefore, all of the organic HWs has to be thermally treated, so that these will be converted into an inert state.

In addition, some of the organic liquid wastes cannot be sufficiently treated to comply with the wastewater standard, such as organic liquid acids, solvents, and waste oil. These liquid wastes also require to be treated by thermal destruction process.

(2) HWs to be Treated

Wide ranges of organic wastes are subject to be treated by the thermal destruction process. The containers and fibers, which are contaminated with organic hazardous substances also, have to be treated by the thermal destruction process. Even the inorganic sludge, which will be contaminated with solvents and be uncomely with the waste acceptance criteria for landfill, will be a subject to treat by the thermal treatment.

Types of HWs, which will be required with the thermal destruction process for the organic HWs, will be determined depend upon the waste acceptance level of organic materials at landfill. The determination factor is TOC or the ignition loss. For instance in Malaysia, 5% of TOC has been established, however 10% is provisionally applied at present. In Germany, TOC is required with 3%, so that most of HWs shall be require to be treated by thermal destruction process, if being contaminated with even very small quantity of organic materials. The master plan proposes to establish 5% of

TOC as a realistic standard for the acceptance level of organic HW because of that the 3% is too strict standard.

The following HWs, consequently will be subject to treat by the thermal destruction process.

- Organic liquid HWs (waste solvents, organic acids)
- HWs containing hazardous substances (organic sludge, Waste IC and LSI, etc.)
- Toxic wastes (PCBs, insecticides)
- Viscosity wastes (oil sludge)
- Infectious wastes
- Specially controlled wastes (high concentrated cyanide wastes, cyanides, laboratory wastes, highly offensive odor wastes)
- Waste oil

(3) Basic Concept for Designing Treatment Capacity

Since the MIF will be built as a model facility, the capacity for the facility should not be directly reflect on an estimated market. It is an important factor to evaluate the MIF whether will be able to achieve its economical operation by the maximum capacity as possible. And also it may produce a high risk if designed by larger capacity, since the estimated market demand will be unclear.

In fact, the thermal treatment is required with high technologies in the system, however its maintenance cost will be generally higher instead that unit costs will be becoming lower in a larger scale facility as possible. Consequently, a small-scale facility will require with higher unit costs, then produce higher treatment fees. As a result, it may be caused of an illegal dumping, because generators will be unsatisfied with the higher treatment cost. Therefore it is extremely important how to be able to establish a reasonable treatment fee for generators. Setting a thermal treatment fee is uneasy process, however the Study Team estimate that US$300 will be an appropriate cost level per ton, upon reviewed a current treatment cost in Philippines.

Thus, the Study Team is able to estimate the treatment cost when the facility will be operated by 80% of load that will be 60 ton per day, which will be the limited performance capacity as lowest as economically and feasibly.

Figure 11.4.1 shows the relation curve of the treatment capacity and cost on the next page.

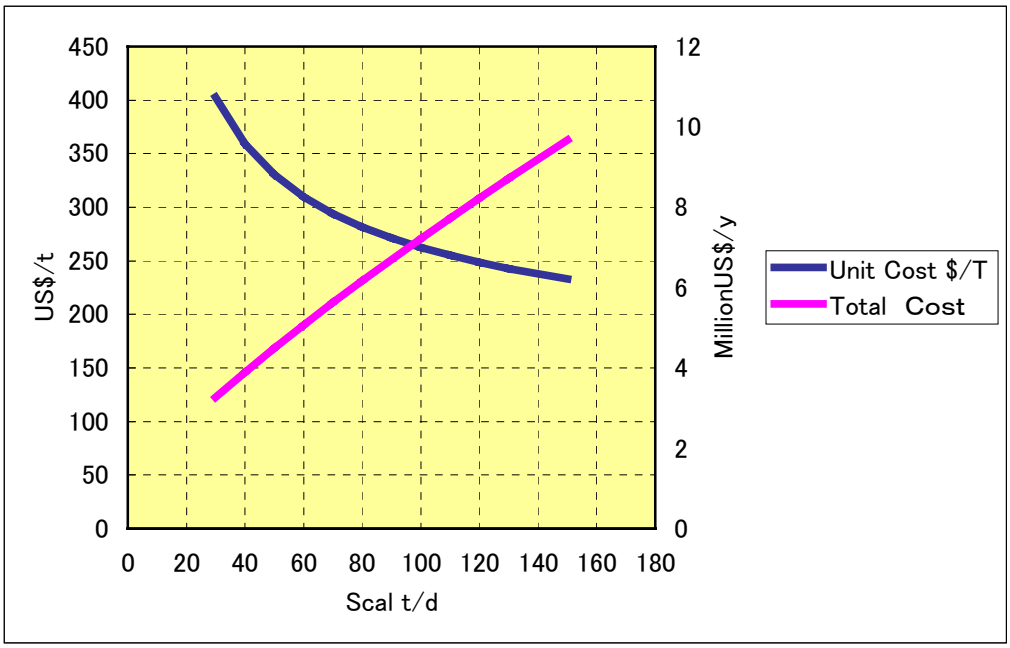

Figure 11.4.1 the Relation Curve of the Treatment Capacity and Cost

(4) Treatment Process

As a premise, an incinerator process will be unable to select in compliance with the Clean Air Act. Therefor, the following technical requirement for the proposed thermal treatment facility is shown on the Table 11.4.1.

Table 11.4.1 Technical Requirement for the Thermal Treatment Facility

FACTOR	REQUIREMENT
Construction	● Provide with a facility to be possible to feed the HWs continuously ● The decomposition gases is able to be kept for more than 2 seconds at 1,200℃, or over ● An auxiliary combustion system shall be provided to regularly keep the 1,200℃ ● The continuous temperature measuring and recording device shall be provided to monitor the gas temperature in the combustion chamber ● Cooling system shall be provided to reduce the flue gas temperature at less than 200℃ in prior an intake of dust collector ● The flue gas temperature shall be continuously measured in the dust collector ● A flue gas treatment system shall be provided to comply with the emission gas standard ● Carbon Monoxide in the flue gas shall be continuously measured ● A construction shall be able to discharge separately fly ashes and slugs

FACTOR	REQUIREMENT
Maintenance And Control	● The decomposition gas shall be kept at 1,200℃, or over ● The ignition loss shall be less than 5% ● Operation shall be basically continuos operation ● Continuously measure and record the gas temperature in the combustion chamber ● Shall be kept the temperature of the flue gas less than 200℃ in the dust collector and continuously measure and record the gas temperature ● Accumulated ashes shall be removed from the dust collector ● The thermal treatment system shall be operated to achieve that Carbon Monoxide in the flue gas shall be kept less than 100ppm (the mean for 4 hours operation/converted with the 12% oxygen content) ● Carbon Monoxide shall be regularly measured and recorded ● The flue gas temperature shall be periodically measured

Accordingly the thermal treatment system shall be capable to keep the temperature at 1,200℃, or over for over 2 seconds, and to be possible to decompose the PCB and the chroline organic solvents by 99.9999%, and also infectious medical wastes shall be perfectly sterilized.

A process that is satisfied with the above requirements will be to be capable to decompose the toxic materials, and melt the ashes in the HWs at 1,200℃, or over by a mean of supporting combustion of the gases and/or oils. For instance, the gasified melting furnace, or high-temperature pyrolysis furnaces, such as the rotary kiln type.

The most important factor in selecting a type of furnace is that there are so many varieties of HWs to be treated by the thermal destruction process and these are uneasy to stabilize. Therefore a furnace shall be capable to equalize a quality of accepted HWs as much as possible and feeding the HWs shall be possible to control constantly. And the temperature of the furnace chamber shall be controllable, if the chamber temperature will be fluctuated, and also the furnace shall be capable to operate by the flexible temperature. In addition, regarding to appearance of HWs, contaminated drum sized containers will be directly treated.

The high temperature process will easily degrade firebricks of the furnace chamber. Therefore thermal endurance of the firebrick is an extremely important factor whether it will be longer enough life upon considering its operation and maintenance cost.

A basic criteria in selecting a furnace is whether the furnace will be able to operate to meet with unstable heat load of the HWs, and firebricks of the furnace will have longer durability life, and as a result, the furnace be possible to operate with less cost.

With regard to the gasification and melting furnace, it is not an adequate furnace type for hazardous wastes due to restricting types of the HWs in operation. A rotary kiln type furnace on the other hand, which employs the high temperature thermal destruction process is a favorable furnace type for any hazardous wastes, because it is able to satisfy with the above all operational requirements. In addition, it is currently more experienced furnace in the world.

(5) Flue Gas Treatment Process

The flue is a subject to be complied with the "emission gas standard at a stationary source" on Sec. 19 of the Clean Air Act. As shown on the following Table 11.4.2, the emission standard for HCl is 10mg and HF is 1mg per a cubic meter on daily average in accordance with the standard of hazardous materials on the Clean Air Act. And the requirement for the standard for both mercury and cadmium content is 0.05mg per a cubic meter in the total average. All of these requirements are the highest standard in the world.

These standards are completely same standards as the "with regard to the incineration for hazardous wastes by EU commission order 16 December, 1994 (94/67/EC)"

Table: 11.4.2 Standard for Emission Flue Gas

	Philippines (Clean Air Act)		EC Directive
	Daily Average Values	Half Hourly Average Values	Daily Average Values
Total dust	10 mg/m^3	30 mg/m^3	10 mg/m^3
Gaseous and vaporous organic substances, expressed as total organic carbon	10 mg/m^3	20 mg/m^3	10 mg/m^3
Hydrogen chloride (HCl)	10 mg/m^3	60 mg/m^3	10 mg/m^3
Hydrogen fluoride (HF)	1 mg/m^3	4 mg/m^3	1 mg/m^3
Sulfur dioxide (SO_2)	50 mg/m^3	200 mg/m^3	50 mg/m^3
Nitrogen monoxide (NO) and Nitrogen dioxide (NO_2), expressed as nitrogen dioxide for incineration plants with a capacity exceeding 3 tonnes per hour	200 mg/m^3	400 mg/m^3	
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as nitrogen dioxide for incineration plants with a capacity of 3 tones per hour or less	300 mg/m^3		
Ammonia	10 mg/m^3	20 mg/m^3	

	Philippines (Clean Air Act)	EC Directive
Cadmium and its compounds, expressed as cadmium (Cd)	total 0.05mg/m^3	total 0.05mg/m^3
Thallium and its compounds, expressed as thallium (Tl)		
Mercury and its Compounds, expressed as mercury (Hg)	0.05 mg/m^3	0.05 mg/m^3
Antimony and its compounds, expressed as antimony (Sb)		
Arsenic and its compounds, expressed as arsenic (As)	total 0.5 mg/m^3	total 0.5 mg/m^3
Lead and its compounds, expressed as lead (Pb)		
Chromium and its compounds, expressed as chromium (Cr)		
Cobalt and its compounds, expressed as cobalt (Co)		
Copper and its compounds, expressed as copper (Cu)		
Manganese and its compounds, expressed as manganese (Mn)		
Nickel and its compounds, expressed as nickel (Ni)		
Vanadium and its compounds, expressed as vanadium (V)		
Tin and its compounds, expressed as tin (Sn)		

* All the average values over the sample period of a minimum of 4 and maximum of 8 hours.

In addition, the emission standard for the dioxin is less than 0.1ng/m^3.

Although the electrostatic precipitator is a typical flue gas treatment process, it is unable to satisfy with 10mg per a cubic meter of the total dust. It is also difficult to guarantee to achieve this figure by applying only a bag filter system. Therefore, it is necessary to apply an additional wet type scrubber system. However flue gas cooling system is also needed in prior the flue gas treatment.

A flue gas treatment system will be required to equip to treat fly ashes, mercury and dioxin, and shall be satisfied with the highest standard for HCl. On the other hand for the nitrogen oxide, a special treatment system will not be required because of not very strict standards.

Anyhow, the highest flu gas treatment system will be required to satisfy with these standards and the wet type scrubber system will be essential process. In order to satisfy with the 10mg/m^3 of HCl emission standard, spraying slaked limes and washing will be essential process. And a system that will be complied with 0.1ng/m^3 of the emission standard for dioxin will be;

- Gas Cooler + Electrostatic Precipitator + Washing System + Washing System
- Gas cooler + Bag Filter + Washing System

These basic processes will be able to apply for HCl treatment, however a double washing process will be required, because the dust collection efficiency will be dropped due to becoming lower flue gas temperature. On the other hand, the bag filter will be able to operate with a single washing system due to be able to secure higher efficiency even in the condition of lower temperature flue gas. However it is required to adopt an activated carbon spray system prior the bag filter system, or necessary to increase unit of the washing system after the bag filter system. And also similar system will be necessary to comply with the standard for heavy metals.

It may be impossible that the HWs will be satisfied with the landfill standard caused by increased fly ashes, even though treated by the solidification when the HWs has been treated through spraying of activated carbons. Increasing unit of the washing system will a primary factor to become higher construction cost. Therefore the flue gas treatment system shall be determined in comparative studying about all requirement as per described.

(6) Dust Treatment

Organic wastes are decomposed, and then ashes are melted and discharged as slugs. A quantity of generated slug will be defined by the ash content, which is estimated 10~30% through an experience of the Study Team. It is necessary to utilize the slugs, which will be recyclable materials.

The fly ash will be collected through the precipitator. Around 5% of the total quantity of the HWs will be generated as the fly ash. Since it includes toxic metals (cadmium, lead, mercury, arsenic), it is generally required with the solidification treatment to comply with the waste acceptance criteria for the landfill in prior to discharge the HWs at landfill site.

(7) Facilities and Equipment

Figure 11.4.2 shows the process flow of thermal destruction treatment. The process will be consisted with the following equipment and facilities.

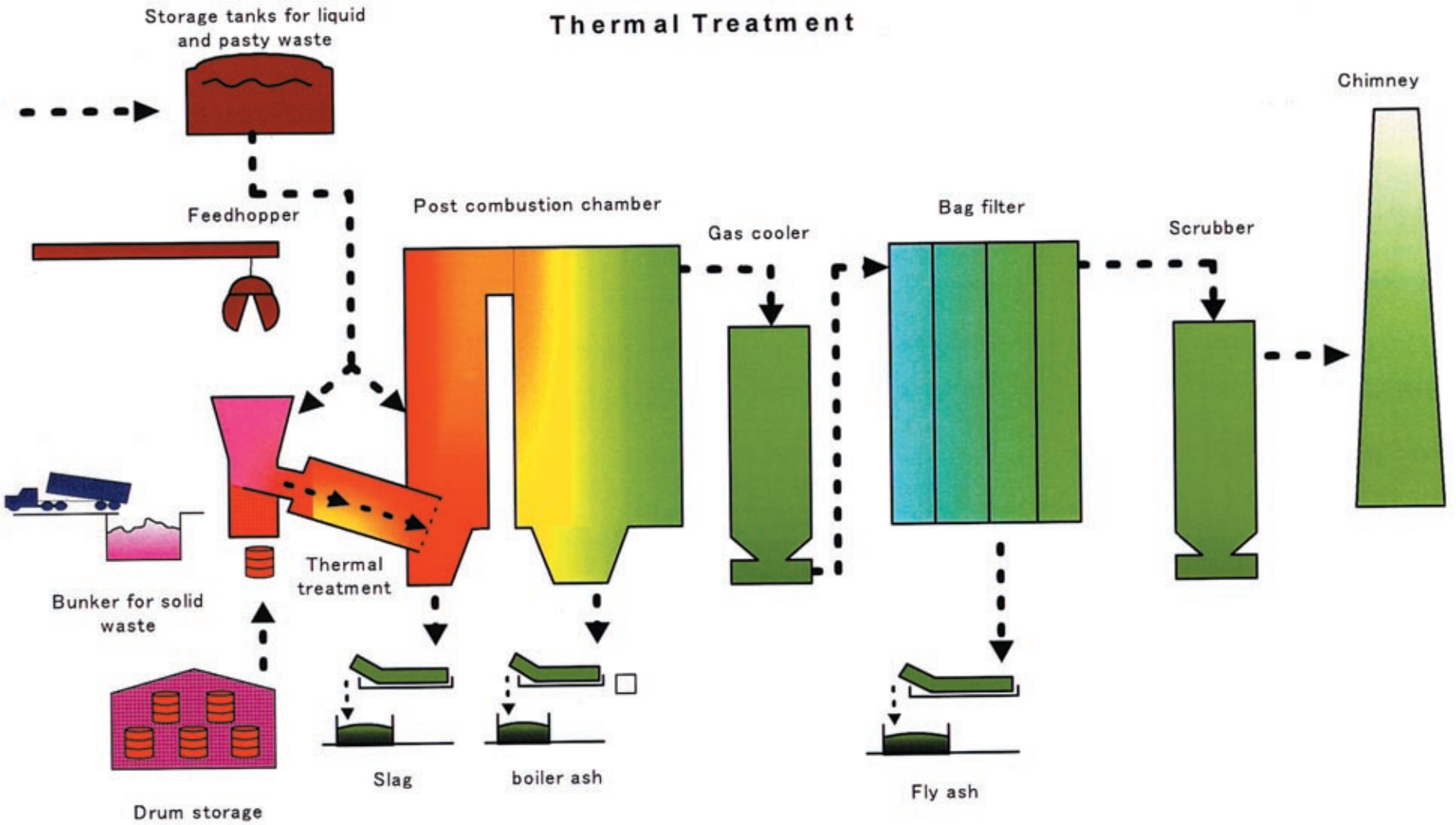

Figure 11.4.2 Process Flow of Thermal Destruction Treatment

- Storage Facility for HWs
- Pre-treatment Facility
- Pit for HWs
- HWs Feeding Facility
- Fuel Tank
- Rotary Kiln and Secondary Combustion Furnace
- Slug Conveyer, Slug Storage Facility
- Waste Heat Boiler
- Flue Gas Treatment System, Fly Ash Silo, Flue Gas Stack
- Monitoring Facility
- Instrumentation, Central Control System

A. HWs Storage Facility

a. HWs in Containers

Liquid organic wastes are normally curried in the facility by containers and/or drums (200 litter). Solid organic wastes, which are carried by specialized waste containers, flexible containers, and exclusive containers.

Storage area for the containerized HWs will be required for 30 days operation that will be satisfied capacity for maintenance or improvement of the facility.

The facility shall be an indoor type building and is provided with a space to store the HWs for 30 days capacity of total 20,000 ton per year (325 days operation). It will be possible to store 10,000 drums (200 litter) and be capable to keep 3 stacking by 4 drums per pallet on racks. The total floor space will be approximately 3,000m^2.

b. Bulky Liquid Waste

The following liquid wastes will be transported into the facility by bulk.

- Non-halogenated organic liquid wastes
  - Aqueous Organic waste
  - Organic wastes containing halogenated substances
  - Waste oil
  - Viscosity wastes

For storing these HWs, separate tanks are required for each HWs. Each capacity of the

tanks will be designed by planning treatment capacity of the facility, which will be around 10~50m^3. These tanks are required with enclosing by concrete fences.

c. Solid Waste by Bulk

Solid HWs will be transported by specialized containers. It will be directly discharged into waste pit. And also temporary space may be needed for storing the HWs in a warehouse.

B. Pretreatment Facility

Organic acids will be once stored in an intermediate tank, and then be neutralized with sodium hydroxides reactor tank.

C. Discharging facility and the Likes

The following tanks and pits shall be constructed to feed the HWs into thermal destruction kilns.

- Vacuum tank
- Separation tank
- Waste oil tank
- Liquid waste tank
- Oily sludge tank
- Toxic wastes tank
- Waste pit
- Drum feeding facility

D. Fuel Tank

Fuel tanks for controlling the furnace temperature shall be constructed.

E. Rotary Kiln and Secondary Thermal Decomposition Furnace

The rotary kiln will be operated at the maximum heat load of 35GJ per hour and the maximum temperature of 1,300℃. The decomposition efficiency shall be achieved with 99.9999% at the exit of the secondary chamber. The temperature in the secondary chamber will be ranged between 900 and 1,300℃. Treated water will be recycled as cooling water for the rotary kiln.

F. Slug Conveyors and Storage Facility

The slug will be dropped into the water pit from a bottom of the furnace, then conveyed by steel belted slug conveyer to the banker site.

G. Waste Heat Boiler

The furnace may not be satisfied with producing enough heat energy for a waste heat boiler, however shall study to utilize the thermal energy source as possible. Recovered heat energy will be converted into the steam for driving the furnace, if possible.

H. Flue Gas Treatment Facility

Flue gas treatment process will be consisted with the following equipment and facilities.

- Temperature cooling system
- Calcium hydroxide and activated carbon spray system
- Bag filter (fabric filter)
- Wet type scrubber
- Fly ash silo
- About 60 m height smoke stack

I. Monitoring Facility (Central Control Room)

A monitoring system shall be required to operate the furnace adequately. Especially the temperature in the furnace chamber will be controlled.

The emission gases shall be regularly monitored with O_2, CO, HCl, SO_2, TOC, etc. In addition, an alarm system, local enunciator and emergency devices will be furnished.

(8) Performance

The operation for the thermal destruction system shall be required with a high-leveled technology due to employing higher technologies in the system. And the flue gas treatment system will be required with an advanced facility, because it shall be complied with the highest standard for the emission gas in the world.

Thus, treatment cost will be expensive cause of satisfying with higher maintenance as well as requirement in operation cost.

11.5 Landfill Facility

11.5.1 Waste Acceptance Criteria

As shown on Table 11.5.1, the landfill facility to be developed in MIF shall not accept the organic HWs unless it is sufficiently detoxified and stabilized.

The acceptance criteria are described summery in next. HWs that has been detoxified and stabilized in compliance with the standard are generally not categorized in the hazardous wastes, which have been treated. However in Philippine, the solidified wastes are still defined as the hazardous wastes in compliance with the DAO92-29. The hydroxides that have been generated though neutralization process may be possible to be defined as the waste alkalis, however these are not hazardous wastes, if be satisfied with acceptance criteria for landfill. Thus in some cases, since the treated hazardous wastes will be unable to be defined as completely non-hazardous states, these shall not be disposed with another general non-hazardous wastes, because these still contains some toxic metals.

Table 11.5.1 Acceptance Criteria for Landfill

Type of Landfill	Strict Controlled Landfill
Types of Acceptable HWs	Landfill-able HWs, or Treated Materials
Ignition Loss	≦ 7-8%
Total of organically bound carbon TOC (C)	≦ 5-6%
Moisture contents	≦ 85%
Arsenic (As)	0.3 mg/l
Lead (Pb)	0.3 mg/l
Cadmium (Cd)	0.1 mg/l
Chrome, hexavalent (Cr)	1.5 mg/l
Mercury (Hg)	0.01 mg/l
Cyanide, easily releasable (CN)	0.7 mg/l
Barium (Ba)	2.0 mg/l
Selenium (Se)	0.3 mg/l

11.5.2 Structural Standard of Landfill

The landfill is generally consisted with surface and lower layers, water collecting facility, leachate treatment facility, monitoring facility, and so forth. Technological

requirement for landfill facility is provided in Chapter 8.

In accordance with ***The Safe Disposal of Hazardous Waste- The Special Needs and Problems of Developing Countries-,*** of the World Bank Technical Paper Number 93 vol.1-3(1989), the following consideration shall be taken with regard to the operation of HWs landfill.

- Landfill is one of the containment facilities. Therefore, liquid waste will not be accepted in the landfill site.
- No mixture of general soil and same day cover soil are required.
- Liner facility is required to isolate the landfill from surrounding areas.
- Leachate collection and treatment facility is required in the facility.
- To prevent groundwater pollution by leakage of hazardous materials elution caused by damages on liners, and elution detection and monitoring system is required in the facility.

There are no criteria in selecting lining facility in the above document, but providing some examples of double liners and combined liners. As to elution detection and monitoring, the above World Bank Paper suggests setting two monitoring wells. One is the background well to be set at upstream of groundwater course, and the other is pollution detection well to be set up at downstream. Figure 11.5.1 shows an example of HW landfill structure.

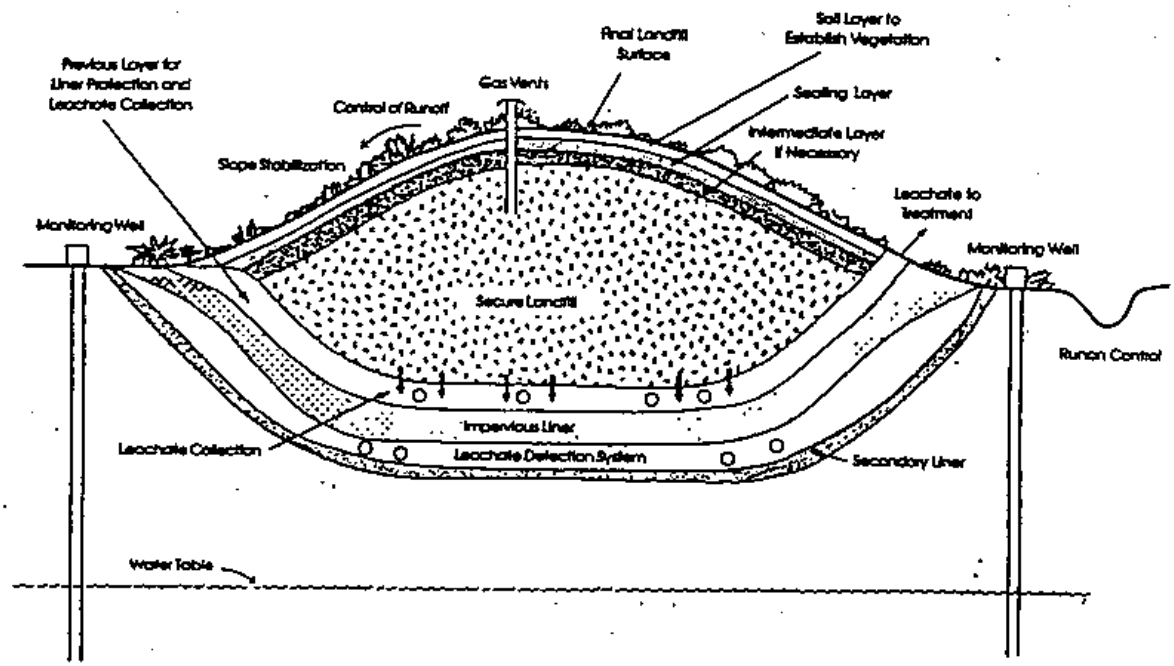

Figure 11.5.1 Example of HW Landfill Structure

Source: The World Bank. (1989). The Safe Disposal of Hazardous Wastes, The Special Needs and Problems of Developing Countries, Volume II

In accordance with the Japanese standard, the following facilities are described.

- Water barrier
- Water collection
- Reservoir
- Leachate water treatment facility
- Monitoring groundwater
- Groundwater drainage facility
- Soil covering (refer to operation standard: intermediate and top cover)

Particularly in Japan, it is required construct reservoir and groundwater drainage facilities. On the other hand in the USA, EPA established the technical standard in 1985 as follows;

- Double liner
- Double channels for collecting leachate water (on the top liner, and between 2 liners)
- Leakage detecting device (collecting and draining system is combined)
- Preventing from inflow and outflow of the rainwater and defusing the top soil by winds
- Construction guarantee (materials by professional engineer, monitoring construction method and final reporting)

In Germany, the landfill standard is quite similar as Japanese. A main discrepancy is ;

- Water barrier on the top soil
- 75mm thickness of the mineral sealing layer under the plastic water barrier sheet (2.5mm)
- No drainage for groundwater as Japanese is required
- The geological barrier should be existed under facility construction

These requirements are the condition for landfill construction.

The structure of the HWs landfill shall be determined in due consideration of geological characteristics, rainfall, costs and so forth. The Study Team herewith only provides basic criteria for the landfill construction.

- Water barrier works are required to reach the level that almost no permeability is detected.

- Groundwater monitoring are required,
- Water barrier works are required at the occasion of surface soil cover.
- Leachate collection and treatment facility is required.
- Landfill is required to divide into several sections so that an each section can be separately controlled.

As described the construction on last clause, it will be able to control a large-scale landfill by section by section of the landfill area.

11.5.3 The Scale of Landfill in MIF

Planning of constructing a large-scale landfill will be extremely difficult to be approved by local residences, because they are heavily suffering from an allergy against for constructing a landfill site in Philippine. Accordingly, instead of that the large-scale landfill will not be planned, the Study Team believe that construction of a small-scale landfill site as attached facility with the MIF will be more realistic proposal.

Because the landfill is essential process for residuals that will be generated from the HWs treatment facilities. Therefore since the landfill is an object as a model facility, the Study Team designs that an operational capacity in the landfill operation will be annually 10 thousand tons in taking into economically feasible scale. Therefore the landfill will be designed to accept this amount of HWs for 10 years of which land space will be required with 3 to 5 hectares.

However, the landfill within the MIF will be unable to enough satisfy with a current market demand. Therefore the Study Team propose that a new land area will be planned for a full-scale-landfill facility sooner after an operation of the MIF.

The new landfill construction will be rather easier, if the MIF will give the local residences with best possible reputations through the operation.

11.5.4 Facilities and Equipment

The composition of landfill facility is shown on the Table 11.5.2 as follows. With regard to the geological condition for the MIF, a permissible layer is required. However, constructing earth liners for buffering proposed will be required to construct in addition to a seepage control sheet. Therefore the landfill construction will be required to prevent from leaching, if the seepage control sheet will be accidentally broken when a permissible layer is non-existed.

The organic leachate will not be discharged, since the landfill materials should be inorganic. The leachate will be mainly elutions of alkalis, salts, heavy metals, and suspended solids. The leachate will be required to treat though neutralization, coagulate precipitation, filtration and chelate processes. The salts are required to dilute to be satisfied with the wastewater standard, and then discharged as effluents due to difficulty by the chemical treatments. However regarding to the wastewater treatment for discharging from the physicochemical and gas washing processes, these will be required with considering to be treated through a total process. And the treated wastewater will be utilized for cooling water, if low salts content.

Table 11.5.2 Composition of Facilities in the Landfill

Category	Sub-category	Items	Spec.	Quantities
Main facility	Reservoir	Excavation, dam		
	Liner facilities	Liner Geotextile Gravel for protecting liner earth liner layer leakage detection system		
	Leachate collection facility	Perforated concrete pipe	ϕ 300	
	Leachate treatment facility	Excavation Liner pipe layings Aerator		8.0
Control Facility	Monitoring equipment	Monitoring wells		2.0
	Management building	Office and storage (partially double-decked)	30m×40m	
	Truck scales		50ton	1.0
	Controlling house for truck scale			1.0
	Tire wash pit			1.0
	Gates			1.0
Related Facility	Hauling route	Paved road (t=5cm)	w=10m	
	Litter prevention equipment	Fence	H=2m	
		Buffer zone		
	Others	Phone, electricity, water		1.0

The following Table 11.5.3 is shown with a list for necessary heavy equipment and machinery for landfill operation.

Table 11.5.3
Necessary Heavy Equipment and Machinery for Landfill Operation

Type of Machinery	Item	Quantities	Unit
Bulldozer	(19-20ton)	1.0	1
Dump truck		2.0	1
motor grader		1.0	1
wheel loader		1.0	1
Pickup truck		1.0	1
sprinkler truck		1.0	1

11.6 HW Collection and Haulage

With regard to collection and haulage, containers to be used in transportation are required to unify. MIF will specify the containers to be used for HW collection and haulage, and then lent the specific containers to HWs generators, when be contracted between MIF.

Recyclable containers, such as drums will be return to HWs generators. Bulky liquid wastes will be collected and transported by tank lorries, and wastes, which are packed in specialized containers, will be curried by container trucks.

Regarding to collecting the HWs by drums, the drums will be palletized at the HWs generator's site, and curried by a 2-stacking capable rack-truck. Small containers on the other hand, these will be packed in a specialized rack, then curried by rack-truck.

11.7 Reception and Analysis of HWs at MIF

11.7.1 Reception of HWs

MIF shall clearly specify qualities for receivable conditions for the HWs when be contracted with generators. And MIF will test and analyze receiving HWs whether will be qualified with the specified conditions when received. Manifest will be used to confirm the amount and quality of HWs. And also MIF will inspect the HWs, which will be temporarily stored on site.

11.7.2 Analysis of HWs

A purpose for analysis of the HWs at MIF includes two functions, which are for controlling qualities of the HWs upon feeding and monitoring the operation of the

facility.

1) Required HWs Quality Analysis by Types of Treatment

Physicochemical	: pH, content of toxic substances, etc.
Solidification	: pH, content of toxic substances, elution test
Thermal Decomposition	:calorific value, water content, content of toxic substances, chemical composition, viscosity, ash content, ignition point
Landfill	: elution test of toxic substances

2) Monitoring MIF Operation

Physicochemical	: pH, electric potential of oxidation and reduction, conductivity
Thermal Decomposition	:calorific value, water content, content of toxic substances, flue gas analysis
Landfill	: water quality of monitoring well, elution test, treated wastewater of treatment system

To conduct the analysis for the HWs perfectly and precisely, MIF will establish a HW analysis laboratory, which will be consisted with the following rooms.

- Control room,
- Equipment room 1 (physical analyzing apparatus, e.g. fluorescent X-rays, etc.)
- Equipment room 2 (chemical analyzing apparatus, e.g. ICP, etc.)
- Analysis room 1 (chemical analysis, etc.)
- Analysis room 2 (various measurement device, e.g. oil and moisture content measurement device, etc.)
- Sampler room (crushing device, ash making device, etc.)
- Sample room
- Chemicals storage

11.8 Other Related Facilities

MIF will establish a training facility that will be equipped with conference and audiovisual rooms. A miniature model of MIF will be exhibited in the facility.

A training and educational program will be provided to all related staff at MIF.

11.9 Location of MIF

MIF is similar with chemical factory in its processes and characteristic. Therefore, the area designated for industrial use is suitable for its location. It is also favorable that public utilities and infrastructure such as electricity, water, and roads are well provided. Taking into account environmental safety, the location where groundwater level is high or shallow well water is used for drinking purposes by nearby residents has to be avoided.

Taking all the above into account, 19 candidate locations were first selected from CALABARZON and Metro Manila areas and their suburbs. After that, on the basis of site selection criteria set by the Study Team, Candidate locations are narrowed down to 6 sites.

11.9.1 Site selection for TSD facility project development

This section describes the example of applying this procedure from site identification to priority site ranking in the area of CALABARZON.

1) Evaluation Process

Initial screening of the long list of candidate site was made using exclusionary criteria. These criteria strengthen the selection process by ruling out those inherently unsuitable areas. Areas to be excluded for sitting consideration are those that are environmentally sensitive areas defined by existing regulations, areas prone to calamities, and socially sensitive areas.

The short list of candidate sites was evaluated using the checklist of technical and environmental criteria for site evaluation. This resulted to a short list of suitable sites. This list is then evaluated using the checklist of social criteria for site evaluation. Procedure for site selection and project development is shown in Figure 11.9.1.

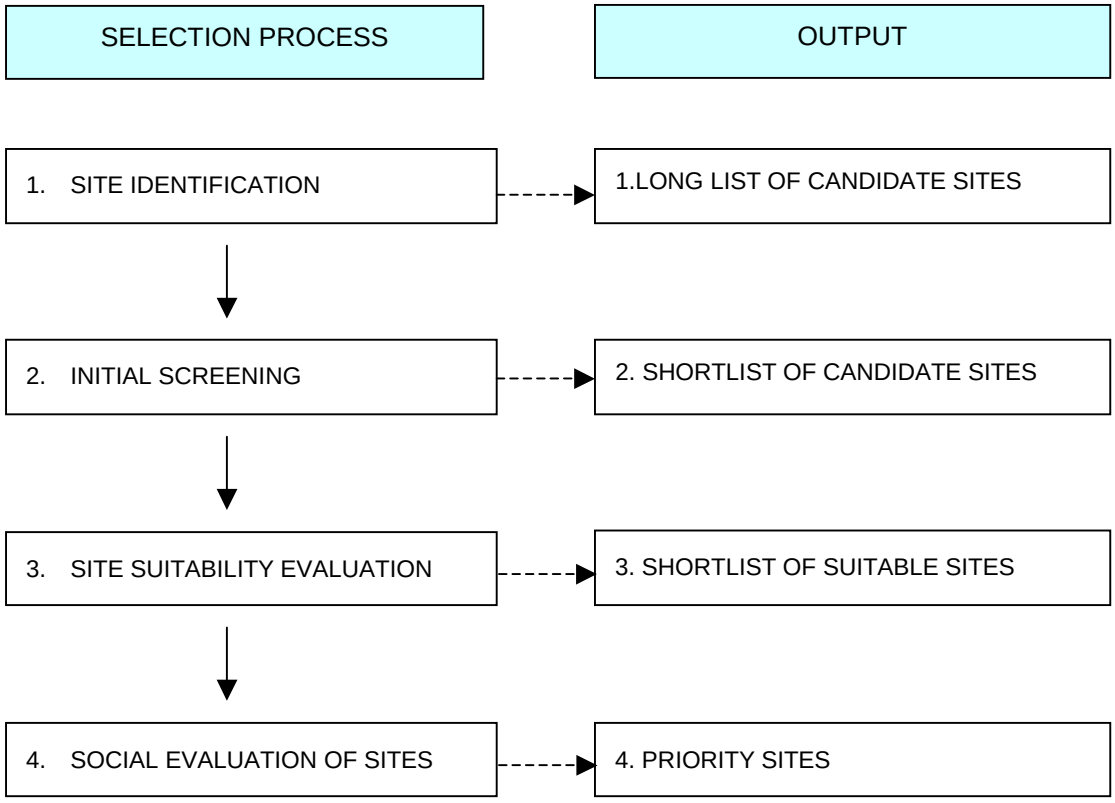

Figure11.9.1 Procedure for site selection and project development

2) Site Identification

There are nineteen candidate sites in the long list provided.
Ten (10) of the sites are proposed by EU-Entec study identified by the Environmental Management Bureau (EMB), while additional nine (9) site are proposed by EMB and JICA study team.
The long list of sites and the distribution per province are as follows;

Proposed site in EU-Entec study (10sites)

1. San Mateo Landfill Site
2. Vicinity Area of Fortune Cement plant Site, Batangas City
3. Carmona landfill Site
4. Bo.Balayong Site, Bauan, Batangas
5. Sta.Maria Site, Laguna
6. Limay Petrochemical Site
7. San Jose Sico site, Batangas
8. Planters Products Site, Limay, Bataan

9. GoP Arsenal Site, Limay, Bataan
10. Bataan Nuclear Power Plant Site

Additional proposed candidate sites (9sites)

1. Brgy. Salaban Uno Site, Municipality of Ibaan,Batangas
2. Brgy. Santo Nino Site, Municipality of Ibaan , Batangas
3. Barangay Kaysuyo Site, Alfonso, Cavite
4. Brgy. Lalaan Site, Silang, Cavite
5. Brgy. Pulong Bunga Site, Silang Cavite
6. Sitio Pinagkamaligan Site, Brgy. San Mateo, Norzaragay, Bulacan
7. Brgy. Numero and vicinity Site, Mabitac, Laguna
8. Sitio Sapang Saging, Barangay San Mateo Site,Norzagaray, Bulacan
9. Vicinity Area of LIMA Technology Center Site, Lipa city

3) Initial Screening of Sites

The long list of candidate sites are screened using exclusionary criteria. These criteria are based on legal and regulatory and other grounds that absolutely prohibit or dispel outright the viability of the site for developing and constructing a TSD/HWM facility. The exclusionary criteria include the following:

- Environmentally sensitive areas
- Areas prone to calamities
- Socially sensitive area.

4) Short list of candidate site

Initial screening of the long list of candidate site is made using exclusionary criteria according to above-mentioned issue. Following six (6) sites are selected as the shortlist of candidate sites.

- Nuclear Power Plant Site (Morong, Bataan)
- Limay Petrochemical Site (Mariveles, Bataan)
- San Jose Sico, Batangas Site (Batangas City)
- Planters Products Site (Lamao, Limay, Bataan)
- Vicinity Area of Fortune Cement plant Site (Taysan, Batangas)
- Vicinity Area of LIMA Technology Center Site (Lipa City, Batangas)

Location of each candidate site is shown in Figure 11.9.2 and 11.9.3.

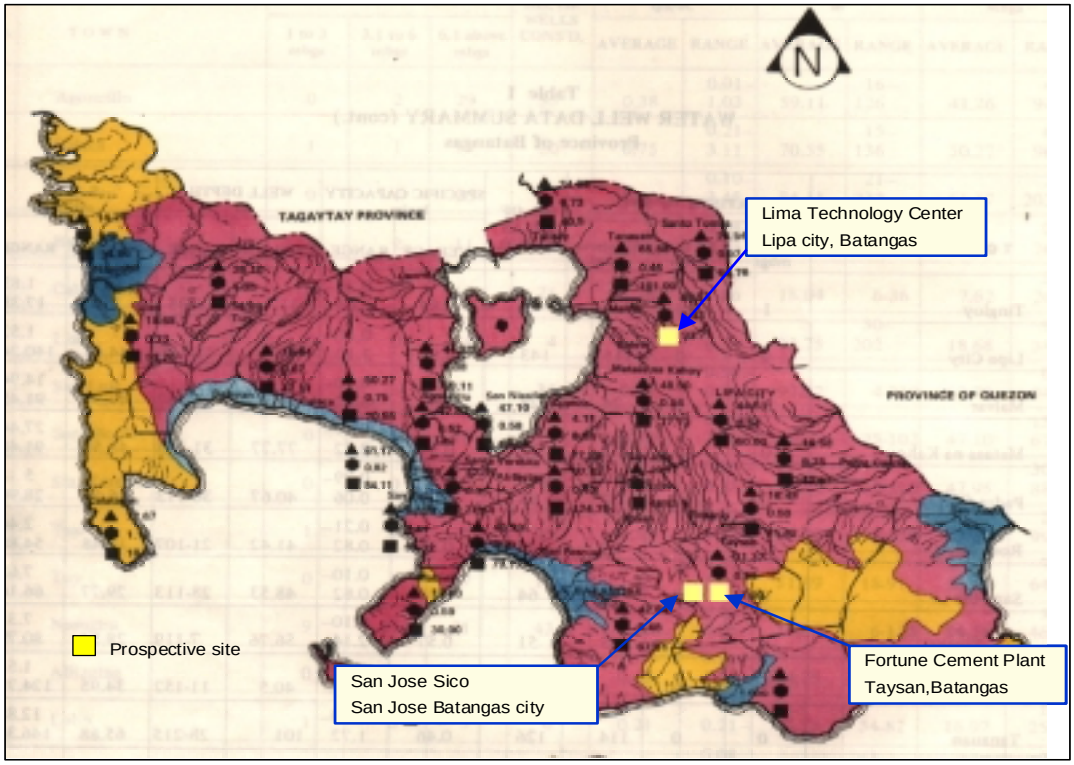

Figure 11.9.2. Location of Short List of Candidate Sites (1/2)

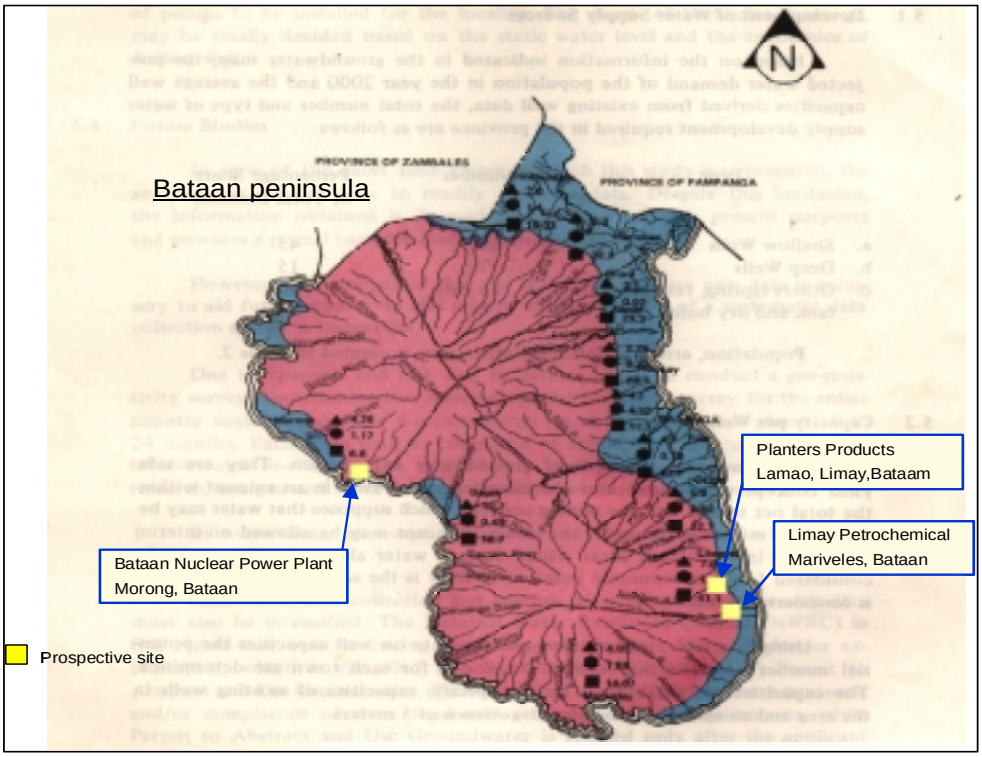

Figure 11.9.3 Location of Short List of Candidate Sites (2/2)

5) Suitability Evaluation of Site

The shortlist of candidate sites is evaluated for site suitability by studying in greater detail selected technical and environmental characteristics of these sites. The technical and environmental criteria deal with the following:

1) Location and accessibility
   (distance from HW generators, transportation(road) system)
2) Infrastructure availability
   (water and sewage, rain drainage facility, electricity, telephone, etc)
3) Climate and Hydrology
   (rainfall depth, flood and storm, wind direction, etc)
4) Geology and Hydrogeology
   (landform, the condition of soil, ground water, surface water, etc)
5) Environmental sensitivity
   (national park, conservation of forest, reservation of ruins, influence to airports)

The result of site suitability evaluation is shown as follows;

Table 11.9.1 The Result of Suitability Evaluation

Candidate Site	Ranking	Score (MAX338)
Vicinity Area of LIMA Technology Center Site (Lipa City, Batangas)	1	54
San Jose Sico, Batangas Site (Batangas City)	2	57
Limay Petrochemical Site (Mariveles, Bataan)	3	61
Planters Products Site (Lamao, Limay, Bataan)	4	63
Vicinity Area of Fortune Cement plant Site (Taysan, Batangas)	5	64
Nuclear Power Plant Site (Morong, Bataan)	6	65

Note: The low score is more favorable

The first ranking site is surrounding area of LIMA technology center site at Lipa city in Batangas province, while the second site is San Jose Sico site at Batangas city. As the difference of score between each site is minimal, no site has been eliminated from the shortlist of candidate sites.

6) Social Evaluation of Sites

The candidate sites short-listed as most suitable based on technical and environmental criteria are subject to further evaluation using social criteria. The social criteria chosen deal with the following

a) Compatibility with other policies
(coordination of development plan and city planning)
b) Neighborhood and neighbors
(scale of place of residents neighboring to sites, distance between resident placee and sites, existence of movement to other projects)
c) Possibility of land acquisition.
(landowner, land area, actual land use and the plan, etc)

The result of site social evaluation is shown as follows;

Table 11.9.2 The Result of Social Evaluation

Candidate Site	Ranking	Score (MAX160)
Vicinity Area of Fortune Cement plant Site (Taysan, Batangas)	1	54
Vicinity Area of LIMA Technology Center Site (Lipa City, Batangas)	2	55
Limay Petrochemical Site (Mariveles, Bataan)	3	56
Nuclear Power Plant Site (Morong, Bataan)	3	56
San Jose Sico, Batangas Site (Batangas City)	5	62
Planters Products Site (Lamao, Limay, Bataan)	6	65

Note: The low score is more favorable

The first ranking site is the vicinity area of Fortune Cement plant site in Batangas, while the second site is the vicinity area of LIMA technology center site at Lipa city in Batangas province.

11.9.2 Priority site ranking

The priority site is selected according to the results of suitability and social evaluation. The Vicinity area of LIMA Technology Center Site at Lipa city in Batangas is selected as the first priority ranking due to its high ranking in both suitability and social evaluation.

Table 11.9.3 The Ranking of Priority Site

Ranking	Candidate Site	Ranking of Suitability Evaluation	Ranking of Social Evaluation	Total Score
1	Vicinity Area of LIMA Technology Center Site	1	2	109
2	Limay Petrochemical Site	3	3	117
3	Vicinity Area of Fortune Cement plant Site	5	1	118
4	San Jose Sico, Batangas Site	2	4	119
5	Nuclear Power Plant Site	6	3	121
6	Planters Products Site	4	5	128

Note: The low score is more favorable

11.10 Construction Cost for Facility

An estimated construction cost as per shown Table 11.10.1 is not precisely built in compliance with a detail specification for the MIF. It is rather rough calculated by utilizing experience costs.

Therefore the total investment cost is estimated to be around 2.3 billion Pesos (approximately 5.7 billion Japanese yen). It is assumed that a treatment capacity will be scheduled with 30,000 ton in 300 days operation per year.

Consequently a Unit cost, such as an investment cost per day will be 23 million pesos. Then a treatment cost will be 15,000 per ton, when the depreciation will be taken for 15 years with no interest in this period.

As a result, the treatment fee will be come more than 1,500 Pesos per ton, when

included with labor cost, operation cost and maintenance cost for MIF. The treatment fee shall be reviewed precisely later.

Table 11.10.1 Construction Cost for Facility (Rough Estimation)

Items	Sum （Million Pesos）
Control Tower	40.0
Truck Scales (2)	3.2
Storage for materials	120.0
Neutralizing facility for waste-acid and –alkali (10 t / day).	80.0
Concrete solidification facility (10 t / day)	40.0
Thermal treatment facility	1,300.0
Disposal site	300.0
Laboratory	88.3
Other and price contingency	197.2
Construction Management Fee	160.0
Total	2,328.7

CHAPTER 12

PROMOTION PLAN

ON

PRIVATE SECTOR PARTICIPATION

AND

PARTNERSHIP

IN

TSD FACILITIES DEVELOPMENT

12. PROMOTION PLAN ON PRIVATE SECTOR PARTICIPATION AND PARTNERSHIP IN TSD FACILITIES DEVELOPMENT

HW generators hold the primary responsibility for proper HWM. HW has to be properly treated on site by generators or off-site by proper HW treaters.

Unlike municipal waste, public authority should not be the development body of TSD facilities for HW. It should be carried out by private sector initiative. However, due to uncertainty of the HW treatment demand and several unfavorable market conditions, Private sector investment in TSD development is still very limited in the Philippines. Therefore, The government is required to take further steps to encourage private sector investment in TSD facilities by creating favorable investment environment. In addition, the government, taking into the present difficulty in TSD facility development, should further promote waste minimization at sources and recycling of HW to the generators. It is also necessary for the government to promote proper storage of HW before proper HW treatment facilities start their operations in the Philippines. This chapter discusses the policies and programs to deal with these issues.

12.1 Basic Policies

Currently, it is very difficult for private sector to invest in TSD facilities development with an exception of recycling facilities. Recycling market is now working in the Philippines. Therefore, some of the valuable wastes are recycled at high rates of recovery and reuse. Present urgent issue is the treatment of non-recyclable HW. The Study Team recommends the following basic policies to promote HW treatment by private businesses.

- Promoting proper storage of HW

  HW generators are required to properly store non-recyclable HWs until proper HW treatment facilities start their operations. Meanwhile, the government should formulate and implement measures to promote development of HW treatment facilities while controlling proper storage of HW by generators.

  - Taking measures to promote development of HW treatment facilities by private

sector initiative

The government should take an initiative in developing a pilot HW treatment facility to provide a development and operation model to private sector proponents. Additionally, the government should formulate a national development plan of TSD facilities on the basis of estimated treatment demand for HW treatment. Promotion of TSD facility development will be conducted according to this plan.

In addition to the above, the following policies will also be important to support TSD facility development by private sector initiative.

- Proper enforcement of laws and regulation on HWM
- Establishing the policy measures to promote TSD operation business.
- Establishing the policy measures to mitigate risks of TSD facility development and operation

12.2 Promotion of TSD Facilities Development by Private Sector

There are three main issues as to TSD facilities development, namely:

- Development of HW storage facilities,
- Region-wise development of TSD facilities, and
- Promotion of HW recycling facility development.

After the development of a pilot HW treatment facility, further TSD facility development should be carried out by private sector initiative. However, the government will control their development according to the national development plan. In this case, control of TSD facility development will be conducted through the controlled issuance of construction and operation permits on TSD facilities. Legal justification may be needed to implement such control over TSD facility development.

(1) Promotion of HW Storage Facility Development

HW storage facility development will be promoted by the following steps:

- Provide information on proper on-site HW storage to the generators,

- Identification on the current state of HW storage by generators,
- Identification of the generators facing difficulty in on-site storage of HW,
- Formulation of the national policy on HW storage management,
- Examination on the feasibility of building common HW storage facilities for the generators having no space of storage on site.
- Discussions among stakeholders on the development of common HW storage,
- Development of common HW storage facilities.

Potential TSD facility operators may develop the storage facilities as a transitional measure before the construction of TSD facilities. In this case, it is also possible to collect storage and future treatment fees in advance from the generators to raise the fund for TSD facility development. However, some measures have to be taken to guarantee proper storage and future treatment of HW received by the facility operators to avoid illegal dumping of HW.

(2) Promotion of TSD Facility Development

Based on the achievement of the pilot HW treatment facility to be developed by the government, it will promote TSD facility development by private sector initiative. The measures to be taken by the government may include:

- Formulation of the national TSD facility development plan.,
- Establishment of facility development rules and regulations,
- Establishment of HW treatment concession and its tendering,
- Establishment of low-interest financing scheme,
- Assisting land acquisition for the facilities (including transfer of state-owned land),
- Promoting partnership of large HW generators in TSD facilities development,
- Assisting consensus building with local authority and community.

The national TSD facility development will be formulated on the basis of the clear demand for HW treatment. It will be an important tool to promote TSD facility development by private sector. Tendering of HW treatment concession is an option to promote private sector involvement in TSD facility development. It will also be important to identify or create favorable financing scheme for TSD facility development from domestic and overseas financial sources. Partnership of HW generators will contribute to guarantee the amount of HW treated in the TSD

facility to be developed. Equity partnership may also be possible from large HW generators facing difficulties in HW treatment.

(3) Promotion of HW Recycling Facility Development

The government shall take note of the following measures to promote HW recycling by private sector.

- Identification of priority areas of HW recycling

Low-polluted solvents, waste oil, sludge of high metal content will be the priority areas of HW recycling.

- Promotion of private sector investment in HW recycling

Providing information to the recyclers, organizing partnership of HW generators, establishment of favored financing scheme will be the measures to be considered.

- `Promotion of waste exchange program

The existing waste exchange program conducted by PAIME should be further expanded to other generators as well as recyclers.

12.3 Policy Measures to Promote Private Participation and Partnership

(1) Capacity Building of HW Treaters

Technical and financial capabilities of domestic HW treaters in the Philippines are very limited. To increase this present capacity, the government should take the following measures.

- Invite foreign capital investment and joint-venture operations by domestic and foreign TSD operators,
- Promote partnership with HW generators,
- Transfer of advanced HW treatment technologies.

To assure proper treatment of HW, domestic HW treaters need to work together with the experienced foreign treaters. Joint-venture operation and technical consultation contract are good options to increase capacity of domestic HW treaters.

Meanwhile, partnership with the generators is also an important factor in proper HW treatment. In addition, large HW generators, especially large-scale foreign industries may have enough experience and know-how on HWM. Therefore, partnership with such generators shall be further promoted.

(2) Economic Incentives

There are number of economic schemes in place, including the environmental special loans from DBP and Investment Priorities Plan (IPP) from the government. Furthermore, following economic incentives shall be examined the on their possible applications.

- Preferred use of government financial institutions (DBP loans or Two Step Loans from JBIC),
- Tax reduction or exemption on the imports of equipment and facilities (IPP),
- Reduction on corporate tax (IPP),

Furthermore, various tax reduction and/or subsidiaries should be examined based on characteristics of hazardous HW treatment facilities.

For TSD facilities:
- Tax exemption on the cost of temporary HW storage, post-closure monitoring cost of landfill, etc.,
- Adjust landfilling period and depreciation for the landfill facilities,
- Accelerated depreciation of TSD facility,

For generators
- Tax reduction for investment on recycling facilities
- Tax reduction for investment or subsidiaries for developing on-site storage facility for no off-site treaters are available,
- Tax exemption on the cost of temporary HW storage for no off-site treaters are available,

In addition, subsidies for private corporations that develop recycling plans or establishment of funds for the future are also measure to be considered.

(3) Measures to Mitigate Investment Risk in TSD Facility Development

The most important investment risk in TSD facility development in the Philippines is market demand risk. The main cause of this market risk is the uncertainty and instability in law enforcement on HWM. Therefore, law enforcement on HWM has to be strengthened by the following measures:

- Strict application of Waste Tracking System,
- Strengthened monitoring and inspection of illegal HW dumping at the existing landfills,
- Strengthened monitoring and inspection over HW generators and treaters.

By strict law enforcement on HWM, non-recyclable HW will come out to the market as the actual demand for HW treatment.

(4) Providing and Exchanging Information and Raising Awareness

(a) Providing Information

The private TDS operators need the information given in Table 12.3.1 below. Since it is difficult for them to collect such information, the government will provide them in the form of guidelines or manuals.

Table 12.3.1 Necessary Information for TSD Operators

Types of Information
- Detailed explanation on the existing laws and regulation on HWM (inc. RA6969,. DAO92-29, etc.)
- The available economic and financial incentives to environment investment
- In-house HWM system by generators and ISO 14001 certification

(b) Training Seminars and Workshops

To disseminate proper knowledge of HWM to the owners and workers of the private TSD operators, the government will hold training seminars and workshops in the same way as for generator'.

12.4 Main Roles of Stakeholders in Promoting Development of TSD Facility

A. DENR/EMB (National Regulating Authority)

- To formulate region-wise TSD facility development plans,
- To conduct preliminary feasibility study on TSD facility development as a material to promote TSD facility development by private sector
- To examine and establish economic incentives,
- To enforce laws and regulations on HWM properly so that clear HW demand can be realized.

B. HW Generators

- To correctly report the conditions of HW generation, treatment, and storage so that clear treatment demand can be identified,
- To build partnership with HW treaters in promoting TSD facility development.

C. TSD Facility Development Proponents

- To propose TSD facility development project proposal according to the national TSD facility development plan.

D. Financial Institutions

- To examine possible favorable financing scheme for TSD facility development (Development Bank of the Philippines, etc.)

E. Local Government

- To assist the TSD facility development in his jurisdiction,
- To assist the TSD facility in providing public utilities and infrastructure,
- To make an environment agreement with TSD facility operator.

F. Other Government Ministries and Agencies

- To provide available land for TSD facility (PEZA, etc.),
- To examine and establish possible investment incentives on TSD facility development (BOI),
- To coordinate between medical waste generators and TSD facility operators (Department of Health),
- To examine tax incentives (Ministry of Finance).

G. Public Service Corporations

- To finance and organize private businesses.

Following bodies should be established to carry out the above-mentioned roles.

- Informal meetings of treaters and recyclers

DENR/EMB is to hold informal meetings with recyclers who show interest in investment. With corporation from the generators, provide information on amount of recyclable wastes, therefore, the needs of recycling facility can be understand.

- Set up a study council in the government to examine economic incentives for HW treatment and recycling.

Set up council/ or meetings to discuss economic incentives especially with DENR/EMB, DBM, DOI/BOI, DOI/PEZA, and DBP. Establish incentive system by utilizing existing or new legislations.

As for financing, it is anticipated many business is short on mortgage (or security) when trying to obtain funds, mechanisms to guarantees, in either public or private, for financing risks for banks by, for example, participation of good corporation with a recourse or organizing corporate finance schemes. Especially for later one, cooperation with financial administration should be sought.

CHAPTER 13

SHORT-TERM ACTION PLAN

13. SHORT-TERM ACTION PLAN

Presented below is the short-term action plan on HWM in the Philippines covering the period of 2001-2003.

13.1 Action Plan

Table 13.1.1 gives the targets to be achieved by 2003.

Table 13.1.1 Targets to Be Achieved by DENR/EMB

	Goals and Target
Overall Goals & Target	- Start construction of the model facility. - Take appropriate measures for storing the waste until the treatment facility is set up, for preventing threat to the human health and the environment. - Establish bases for implement laws and regulation appropriately. - Improve awareness of HW management among the HW registered businesses. - With the efforts mentioned above, establish appropriate HW management in Philippines.
Facility Development	- Promote on-site storage of HW for the waste that can not be treated by the generators themselves. At the same time, begin constructing a model facility with the national government's participation, aiming operation by 2005. Also, prepare scenarios for future development of such facilities.
Strengthening administrative structure	- Replenish legal system to implement laws and regulations, and establish system for managing relevant information. - Double the current capacity - Show concrete progress by increasing HW registration and monitoring.
Private Assistance	- Promote awareness raising among private businesses, and clarify the attainment of system development and recycling efforts.

Meanwhile, Table 13.1.2 describes the policy actions to be taken by DENR/EMB.

Table 13.1.2 Policy Actions and Programs (2001-2003)

Key Areas	Policy Actions and Programs	2001	2002	2003
I. Promotion of TSD facility development				
1. Development of a model TSD facility	①Feasibility study and EIA			
	②Making decision on project implementation			
	③Fund raising			
	④Facility construction			
2. Development of TSD facilities by private sector	①Formulation of regional TSD development plans			
3. Preparation of transitional measures	①Formulation of national HW storage plan			
	②Issuance of official notice of the national HW storage plan to regional offices of EMB			
	③Implementation of the survey on the conditions of HW storage by regional offices of EMB			
	④Assessment of the current HW storage and formulation of the regional HW storage policies			
	⑤Organization of HW generators and promotion of common HW storage facility development			
	⑥Formulation of the HW storage development plan			
II. Strengthening Institutions and Capacity of HWM Administration				
1. Preparation of laws and regulations	①HW treatment standard			
	②HW acceptance criteria for landfill			
	③Technological requirement for TSD facility of HW			
	④Rules and regulations on HW analysis			
	⑤Rules and regulations on HW collection and haulage			
	⑥Manual for categorizing HW			
2. Information and data management system	①Renewal of the existing data and information			
	②Establishment and operation of HW database			
	③Preparation of computers for the use of HW database at regional offices of EMB			
3. Monitoring and inspection	①Formulation of the national monitoring and inspection plan			

Key Areas	Policy Actions and Programs	2001	2002	2003
	②Preparation of monitoring and inspection manual			
	③Formulation of the regional monitoring and inspection plan			
	④ Formulation of the survey plan on non-registered generators			
	⑤Implementation of monitoring and inspection			
	⑥Increasing the registration of HW generators			
	⑦Increasing the human and financial resources			
II. Strengthening Institutions and Capacity of HWM Administration				
4. Law enforcement	①Preparation of the manual for prosecution of violators			
	②Build a network with the Police, Prosecutors, and local authority			
5. Human resources development	①Development of training programs			
	②Implementation of training programs			
6. Financial Capacity	①Establish of the special fund for implementing RA6969			
	③Examination on the introduction of HW taxation			
III. Promotion of HW Recycling by Private Sector and Awareness Raising				
1. Promotion of HW recycling	①Formulation of the national promotion policy on HW recycling			
	②Issuance of official notice on the national promotion policy of HW recycling to the regional offices of EMB			
	③ Guidance of HW recycling to the generators by regional offices of EMB			
	④ Establishment of the council for HW recycling organized by the government and recyclers			
	⑤ Providing information on HW recyclers to the generators			
	⑥Supporting the development of HW recycling facilities			
2. Awareness Raising	①Seminars for owners of HW generators			
	②Seminar on in-house HW managers			

13.2 Promotion of TSD Facilities Development

(1) Development of Model Integrated TSD Facility

A. Objectives

- To establish and visualize proper flow of HW treatment,
- To raise awareness of the peoples on proper HWM,
- To establish a model of TSD facility development.

B. Policies of MIF

MIF must completely comply with all the technological requirement for TSD facilities. In addition, MIF will be built in accordance with the following policies.

- MIF will be built and operated in a economically feasible manner,
- MIF will provide everyone with the opportunities to learn about HWM,
- MIF will be reliable in every operation of HW treatment in terms of environmental protection,
- MIF will be operated in a completely safe manner.

C. Design Treatment Capacity

Design treatment capacity of MIF is established at the financially feasible lowest level as the pilot facility.

(Designed treatment capacity)
Physicochemical treatment: 1,500 tons/year
Thermal treatment: 20,000 tons/year (60 tons/day multiplied by 310 days)
Landfill: 100,000 tons (10,000 tons/year multiplied by 10 years' operation)

The capacity of MIF established above is small in comparison with the generation amount of HW in the southern of LUZON, but the government will install immediately a facility, taking the performance into the account, or will promote a private participation to MIF development if the quantity of HW collected is beyond the capacity of the pilot facility.

D. Facility Specification

The overall treatment flow of HWs in MIF is given in Figure 13.2.1.

E. Other Facilities

A facility control building, waste analysis lab, and training facility will be established.

F. Other Services

Besides Hw treatment and landfill operations, MIF will also provide HW hauling and analysis, as well as sale of HW containers.

G. Location of MIF

MIF will be located in CALABARZON or Metro Manila areas, where HW generating activities is the most intensive in the Philippines. Treatment and disposal facilities will be integrated in MIF. 5 to 10 hectares of land will be acquired for MIF.

H. Estimated Facility Construction Cost

The total cost is estimated to be around 2 billion pesos of the Philippines.

I. Project Structure

The government constructs a facility, and puts it under private management. The fund will be supplied by "soft loan" invested from overseas. The proponent will be examined with the public company affiliated to the country.

J. Facility Operation Policies

MIF will be operated by the following policies:

- Providing reliable HW treatment services,
- Efficient operation of the facility to minimize HW treatment fees,
- Information disclosure to all the peoples concerned,

K. Project Implementation Schedule

Construction and operation of MIF will be carried out in accordance with the schedule given in Table 13.2.2 below. It will take at least 5 years to initiate facility operation.

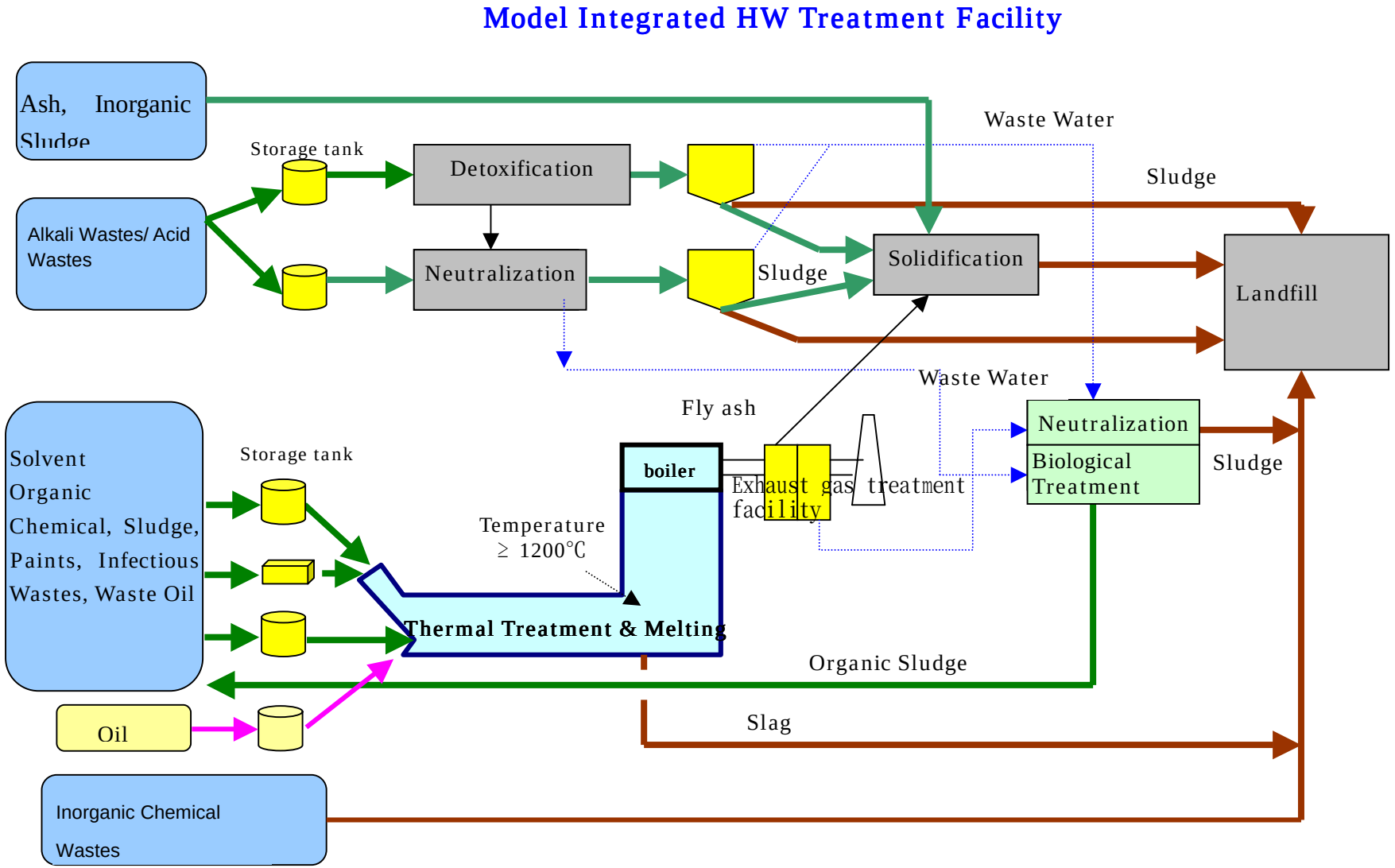

Figure 13.2.1 HW Treatment Flow in the Model Integrated HW Treatment Facility

Table 13.2.1 Project Implementation Schedule

	2001	2002	2003	2004
Select project body				
Select project site				
F/S				
EIA				
Mutual agreement				
Develop implementation plan				
Consent with community				
Fund raising				
ECC				
Prepare ordering spec				
Bidding on facility construction				
Construction of the facility				
Bidding on operation & maintenance				
Commencement of partial-operation				
Commencement of full-operation				

13.3 Implementation and Reviewing Process of the Master Plan

13.3.1 Authorization of the Master Plan

To authorize the master plan, the Secretary of DENR shall make it public and after it is discussed at and approved by the Inter-Agency Technical Advisory Council. DENR will also ask the public to comment on the master plan.

13.3.2 Allocations of Roles

To establish proper HWM system in the Philippines according to this master plan, each stakeholder is required to accomplish the following roles and tasks:

(1) HW Generators

HW generators have the primary responsibility for proper HWM in compliance with the laws and regulations in the Philippines. They are also required to cooperate with the regulating authority in the efforts of establishing proper HWM System in the Philippines. By accomplishing these roles, HW generators will obtain reliance from the peoples on their activities.

(Roles)

- Accomplish the responsibility of proper HWM in compliance with the laws and regulations,
- Maximize the efforts of HW minimization and recycling,
- Make efforts of proper storage of the HWs until proper HW treatment facilities are available,
- Cooperate together with other generators in proper HWM,
- Cooperate with treaters in developing proper TSD facilities.

(2) Regulating Authority at National Level (DENR/EMB)

The roles of regulating authority at national level should be focused on policy making works and supervision of policy implementation.

(Roles)

- Prepare laws, regulation, and other supporting legal tools (guidelines and manuals),
- Formulate policies and annual plans of their implementation, and their reviews,
- Formulate TSD facilities development plan on the basis of HW treatment demand surveys,
- Promote and control private sector participation in TSD facilities development according to the TSD facilities plan,
- Manage the HWM information,
- Provide necessary information properly to regional regulating offices and regulating communities,
- Examine and develop economic incentives and MBIs for proper HWM,
- Cooperate with bilateral and multilateral aid agencies to establish proper HWM.

(3) Regulating Authority at Regional Level (Regional DENR/EMB, LLDA)

The main role of regional regulating authorities is the implementation of the policies formulated by the national regulating authority.

(Roles)

- Manage registration and reports and manifests of HW generators, treaters, and the likes,
- Monitor and supervise proper HWM in the regions,
- Issuance of TSD facility permits, ECCs, and the likes,
- Operating all the HWM information services in the regions (providing manifest sheets, information tools and materials, etc.)

- Organize regional level seminars, workshops, and meetings on HWM.

(4) Line Ministries and Other National Government Agencies Concerned

The national government authorities, especially in charge of HW generators' business activities and waste management (municipal, industrial, medical wastes) are expected to cooperate and coordinate with DENR/EMB in establishing proper HWM in the Philippines. Mentioned below are the examples of such activities.

- The Philippines Economic Zone Authority (PEZA) is expected to cooperate in providing information on HWM and guidance to the HW generators on proper storage of HWs on-site to the invited enterprises. It is also expected to promote establishment of common HW storage facilities and also treatment facilities in the economic zones.
- Board of Investment (BOI) is also expected to take the same roles as PEZA's to their registered investors. In addition, it is also expected to put a high priority on TSD and recycling facilities of HW in IPP. Further examination and introduction of new economic and investment incentives regarding TSD operation businesses will also be carried out jointly by BOI and DENR/EMB.
- Department of Health is expected to coordinate with DENR/EMB as to the treatment of medical wastes.

(5) Local Government

Local government is expected to support development and operation of proper TSD facilities in its jurisdiction.

(Roles)
- Support in acquisition of the land for TSD facilities,
- Support in obtaining public consensus on development of TSD facilities,
- Support in building a mutual trust between the public and TSD facility operators (environmental agreements, etc).

(6) Financial Institutions

Financial supports from the National Economic Development Authority (NEDA) and Development Bank of the Philippines (DBP) are of great importance in promoting TSD facilities development. Private financial institutions are also expected to finance these facilities in favored conditions.

(7) Industry Groups and NGOs

Industry groups are the keys in raising awareness of HW generators on HWM. NGOs are also expected to cooperate with DENR/EMB in increasing the capacity of HW generators in HWM.

13.3.3 Review of the Master Plan and its Implementation

The implementation of the master plan has to be annually reviewed and reflected to the next year's implementation. To clearly evaluate the achievements, quantified targets should be established in the annual implementation plans. Such quantified targets may include, for example,:

- Number of registered HW generators,
- Number of monitored and inspected non-registered HW generators,
- Number or ratio of submitted quarterly reports,
- Number of patrolling the illegal damp sites,

The regulating authority will prepare an evaluation report to the Secretary and other relevant government authorities. It will also be disclosed to the public.

CHAPTER 14

CONCLUSIONS AND RECOMMENDATIONS

14. CONCLUSIONS AND RECOMMENDATIONS

This report described the policies and strategies to develop proper HW management, in which the generators and the treaters will comply with the laws, regulations and rules in the field of HWM, in the Philippines

In this regard, the roles of regulators (governments) are very important to control HWM properly in the Philippines.

14.1 Enhancement of Regulations and Rules Related with RA6969/DAO92-29

The structure on Environmental Problem in HW is generally shown in Figure 14.1.1. The structure of HW can be divided into four compartments. The first compartment is the field of business activities and environmental impact created by these activities. HW generators and treaters are in this room. HWs are generated, treated, and disposed in this compartment. These activities create impacts on Natural and Living Environment.

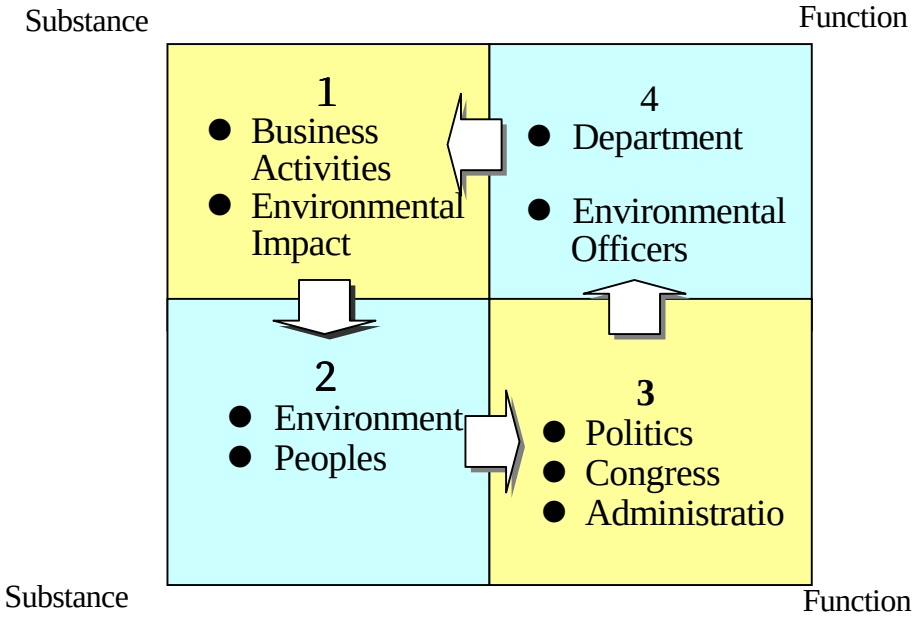

Figure 14.1.1 Structure of Environmental Problems in HW

The second compartment indicates the environment and the peoples. They are the sensors of impacts posed by business activities. If these sensors take environmental impacts seriously, attention to the environment will be increased and make the peoples take some actions.

The third compartment is created on the basis of these activities in the second compartment.

This is the compartment of laws and regulations. Key actors here are politicians and government officials. This compartment created the RA6969/DAO92-29 for HWM in the Philippines.

The fourth compartment indicates law enforcement and administration on HWM. Key actors here are the regulators. Their mission is to make generators and treaters to comply with the laws and regulations on HWM.

Above four compartments in the universe of HW can also be described as Figure14.1.2 below. This figure inclined by ninety degrees of Figure 14.1.1.

There are two structures, namely superstructure and understructure. The superstructure is originally built on the basis of understructure. But once the superstructure is established, it regulates and controls the understructure.

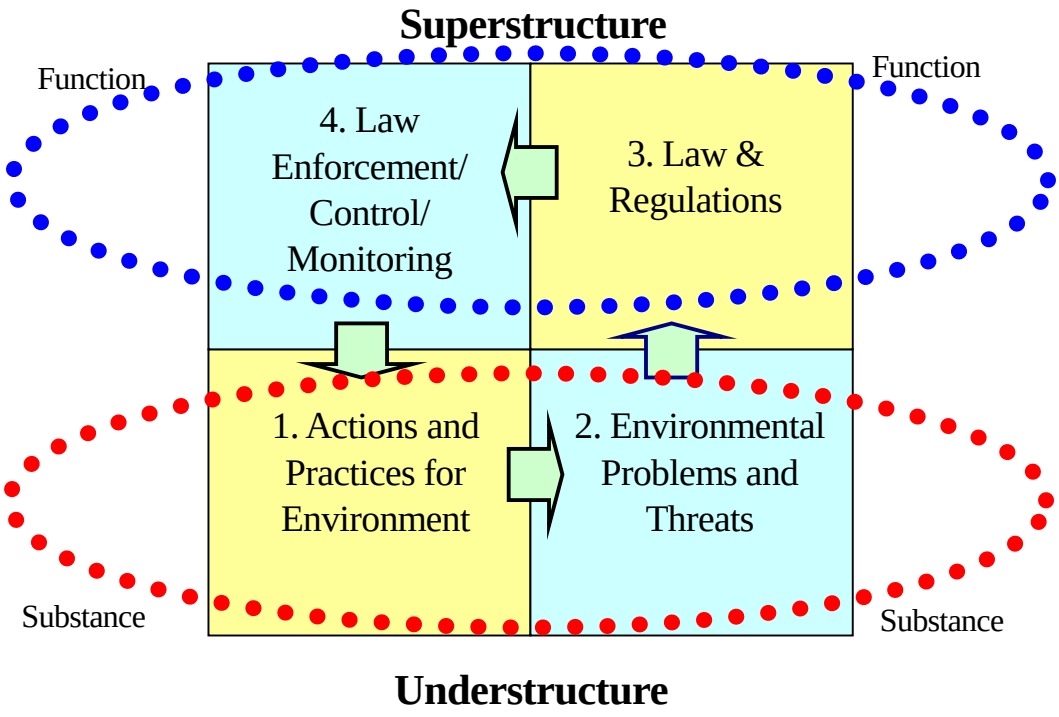

Figure 14.1.2 Superstructure and Understructure of Environmental Problems

What this study discussed here all belongs to the superstructure. It means that the superstructure on HWM has not been established sufficiently yet in the Philippines. That is the reason why the study has focused on the superstructure. Confusions in understructure on HWM are mainly lead by such situation.

One of the important issues in the superstructure is insufficient establishment of laws and regulations in the third compartment. The current situation can be described as Figure

14.1.3 below.

Grids of laws and regulations are expressed in the figure as a large-meshed net. Their outline of will also be unclear. This situation lead regulators in the forth compartment to be difficult to operate effective administration and law enforcement on HWM.

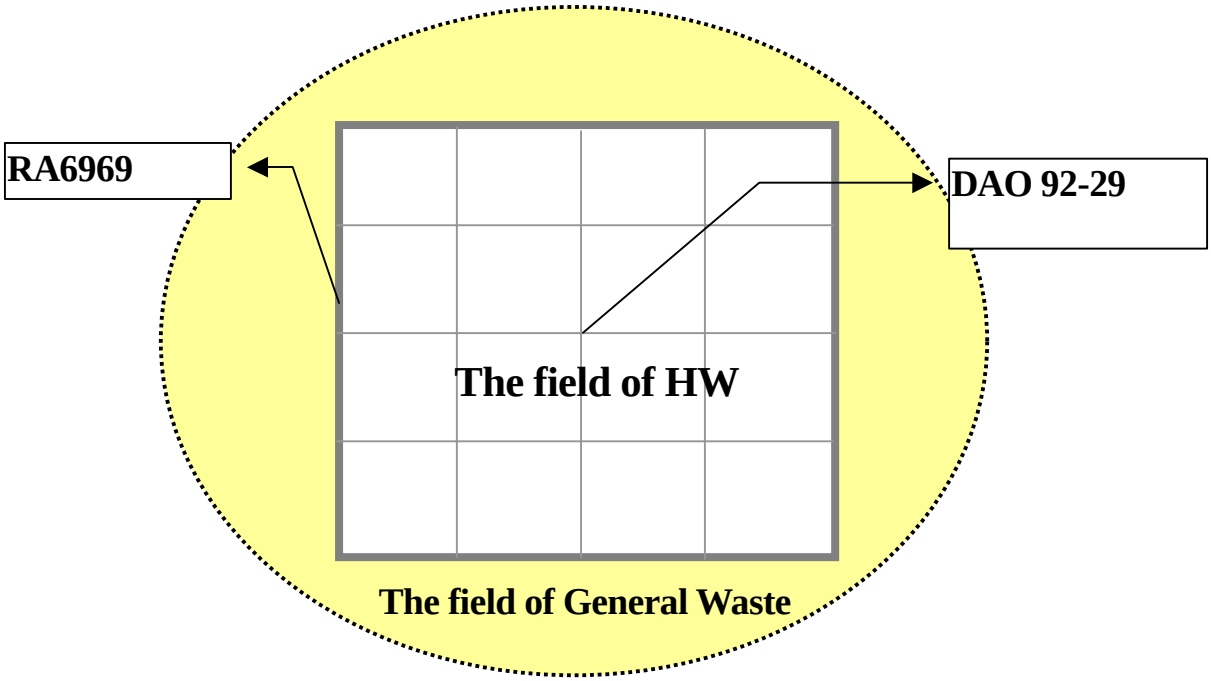

Figure 14.1.3 Image of Insufficient Establishment of Laws and Regulations in Superstructure

The frame line above indicates RA6969 and grid line within the frame implies DAO92-29. Presently, this meshed net is so rough to control HW streams. Consequently, it is difficult for regulators to prevent irregular waste streams from running away from the existing grids.

It should also be pointed out that the field of general waste is also not well established. It attracts HW generators to get away from the field of HWM. This also makes HWM difficult.

However, it is expected that the new waste management law, RA9003, enacted in January 2003, will improve such situation. It is also expected that both RA9003 and RA6969 should be integrated in their enforcement.

As to the aspects of laws and regulations on HWM, the important issues to be addressed are as follows:

1. Absence of HW management standard
2. Absence of technical requirements for TSD facilities
3. Inadequate complementary rules and regulations for operating DAO 92-29

The Government should first address these issues.

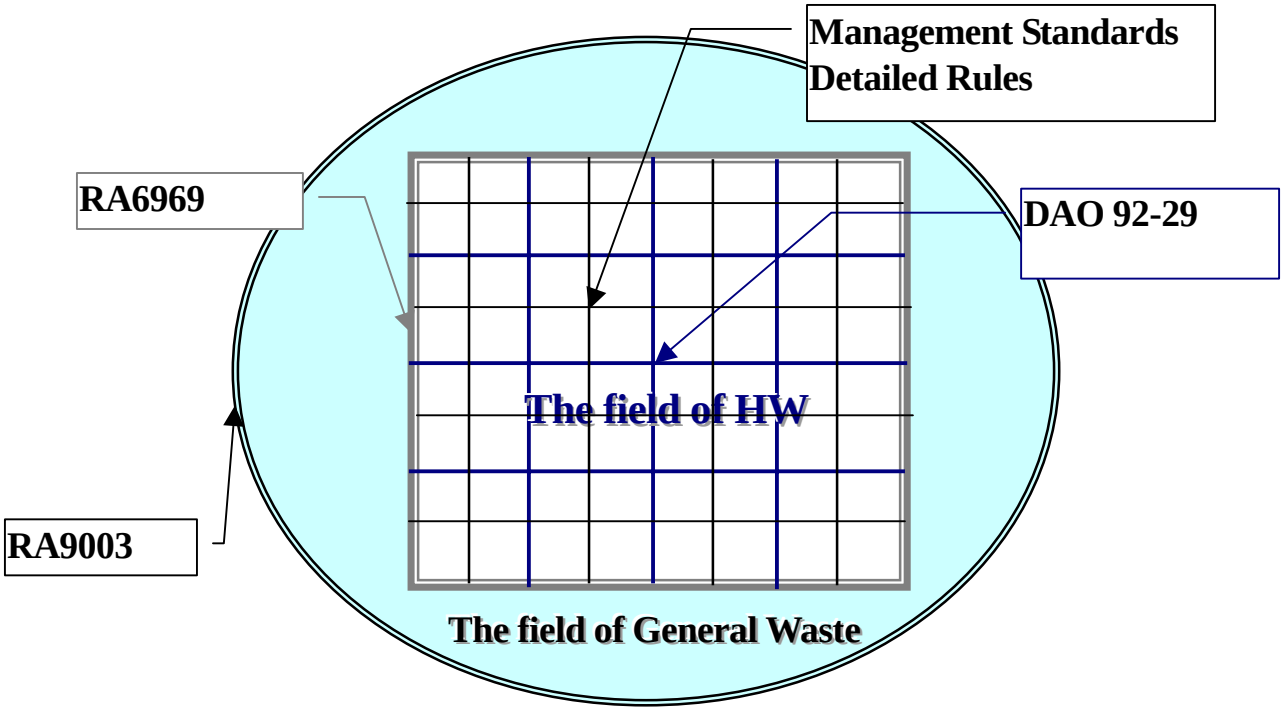

Figure 14.1.4 Image of Sufficiently Established Laws and Regulations in Superstructure

14.2 Setting Philosophy/Principles for HWM

The Study Team proposed that the philosophy and principles of HWM should be given great importance. The philosophy and principles of HW are universal, and constitute the spirit of law.

The philosophy and principles become the criteria for determining the rules of discharging HW to the environment. In fact, this master plan is formulated based on the philosophy that;

1. Everybody has the right to enjoy equally the blessings of nature, and
2. Everybody has the right to enjoy equally the living environment in safely and peacefully..

The Study Team also set up the principles of HWM that:

4. Minimize a burden on the environment generated by HW,
5. Minimize the risk on human health caused by HW, and
6. Do not leave the environmental debt to the next generation.

14.3 Administration Tools and Their Effective Use

GOP has already held some effective tools for the administration of HWM, namely DAO92-29. DAO92-29 has 3 major policy tools as follows;

- Registration
- Reporting
- Manifest

Unfortunately, GOP cannot make full use of them. Information control related to DAO92-29 is required to make a maximized use. EMB and its regional offices are not yet well prepared to face generators. GOP cannot control generators if they cannot control and manage their information. Therefore, the Study Team strongly proposes the establishment of information and data management system.

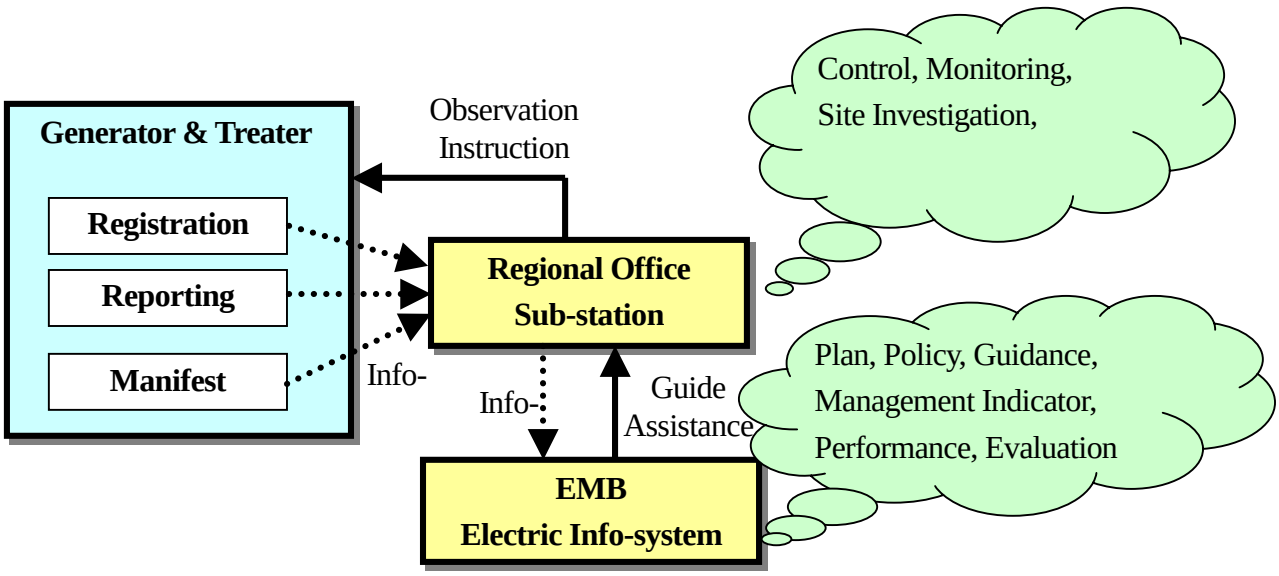

Figure 14.3.1 Image of Data Management System on HWM

14.4 Institution and Capacity Building

It is obvious that HWM is not carried out sufficiently by EMB, but nobody can blame them because of its organizational limitation. There is a basic organizational problem that the staff members in HWM section cannot concentrate on planning and policy making on HWM. They spend a lot of time for operational routine works. It is important to establish an independent unit exclusively in charge of planning and policy making in EMB.

Although the human resources on HWM are very limited in EMB, the government cannot easily increase them due to tight financial conditions. Therefore, EMB is required to concentrate on further increasing the capability of the existing staff.

14.5 Establishing Economic Instruments and Measures

The Study Team also emphasizes that economic instrument is an important factor to promote waste recycling and reduction at sources. Waste tax introduced in UK, Holland, Denmark and France will be examined in the future. It is also to consider the fund for restoration of contaminated areas.

14.6 Establishing In-House HWM System by the Generators

HW generators play main roles in HWM. They are responsible for treating their wastes in compliance with the law. Generators must have sufficient knowledge and information on HWM. In this regard, the Study Team suggests establishing in-house HWM system by generators.

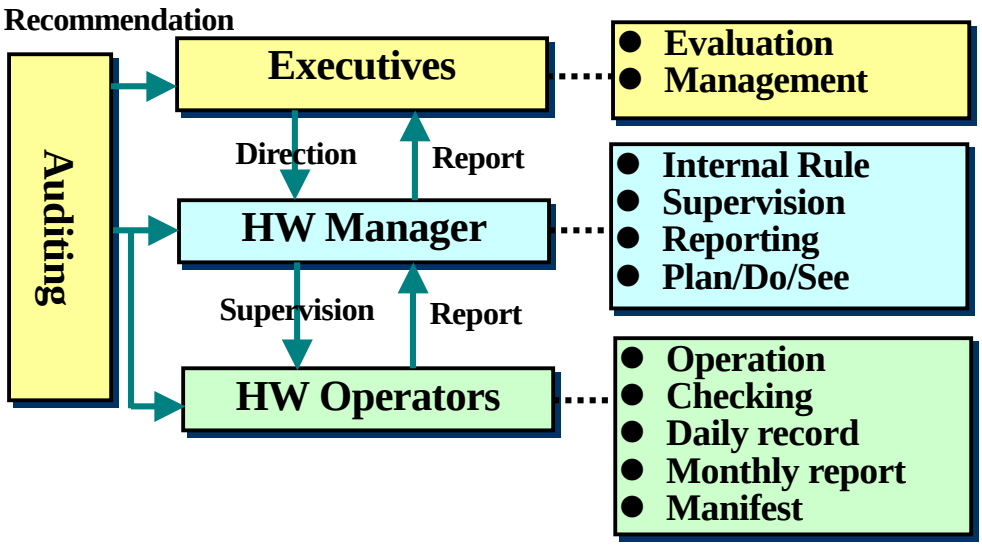

Figure 14.6.1 Image of HWM System at Generators

The HW generators willing to obtain the certificate of ISO14001 need to develop so-called environmental management system (EMS). EMB may encourage generators to obtain not only EMS, but establish the in-house HW management system. To do this, EMB will have to develop and implement the training programs for in-house HW managers by generators.

14.7 Transitional Measures

Development of TSD facilities, especially for thermal treatment plant and landfill facilities, require huge construction costs while posing high market risks in current condition. Thus, investment from private sector can not be expected into this arena. Even if invested, it takes at least 3 to 4 years to start operation during which HW is continuously generated. Non-recyclable wastes that require thermal treatment and/or landfill disposal must be properly stored until proper treatment and landfill facility start their operation. Therefore, the government is to consider policies to tackle this issue at once.

Measures needed are as follows;

- Develop and operate nation-wide treatment/disposal facilities within seven years, and public notice on proper HW storage on-site to the generators for this period,
- Properly store HW by generators,
- Systematically implement record keeping and reporting duties,
- Examination on the feasibility of building common HW storage facilities for the generators having no space of storage on site.

Information on current level of HW storage will be very useful for promoting TSD facilities in the regions.

14.8 Developing A Model HW TD Facilities by DENR/EMB Initiative

We have proposed to develop an integrated HW treatment facility as a model. Physicochemical treatment, solidification, thermal treatment, and landfill are all in this facility. As mentioned above, market risks on investing HWM is currently too high for private investors. Hence, project should be formulated in such ways that the government takes construction cost and repayment risks when private sector takes operation and market risks.

Current demand for HW treatment in the Philippine requires 4 integrated TSD facilities nation-wide, and therefore, the government is to set up a development plan for systematically establish these facilities.

It is important to establish proper flow of HW by developing model TSD facilities with the government initiatives. Even if the proper flow of HW is very limited in the beginning, the authority will be able to expand such flow by utilizing various administrative techniques.

14.9 Organizational Systems for Implementation

It will be meaningless if this Master Plan never implemented. Actions need to be taken

according to the plan, and establishing following organizational system is an inevitable.

- National government

It is necessary to set up a project promotion unit that is dedicated to effectively implement the plan. This unit needs to be composed of at least 4 personnel:

- legal staff
- administrative staff (section chief of HWM)
- technical and monitoring staff
- staff for data management and public relation

- Relevant Organizations

Project promotion section should be set up within the public service corporation, i.e. construction body of the MIF.

- NGOs and other related Organizations

Request NGOs to establish HWM conferences with HW managers of the generators, and develop a system to publish manuals and held seminars on HWM.

14.10 Review of Plan-Do-Check-Action

The government should aim for gaining credibility on HWM and establish Plan-Do-Check-Action in the environmental management system. Consequently, for this project, established targets and their achievements will be checked annually and make any necessary amendments to reflect the review in implementation for the next year. In 2003, the Master Plan should be reviewed, and second phase plan be develop for year 2004 and on. This operational management is critical as achievement for a year is to be reported to DENR director and also reported to the 'Inter-Agency Technical Advisory Council' under RA 6969.