EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. Background and Objective of the Study

With the recent progress in industrialization, industrial waste generation has been increasing in the Republic of the Philippines (hereinafter referred as ROP). Due to the limited capacity for recycling and treatment of the hazardous wastes generated within ROP, industries handling waste acid, waste alkaline, waste oils, and sludge containing heavy metals, in particular, are facing difficulty in managing their hazardous wastes.

ROP enacted the RA6969 (Toxic Substances, Hazardous and Nuclear Waste Act) in 1990. In 1992, implementing Rules and Regulation (IRR), DAO92-29 (Department Administrative Order 29) of the Department of Environment and Natural Resources (hereinafter referred as DENR), was issued for enforcing the RA6969. In addition, systems for Environmental Impact Assessment (EIA) and Environmental Compliance Certificate (ECC) were put in place to lead proper Hazardous Waste (HW) treatment facilities.

However, due partly to insufficient mechanisms of enforcing the RA6969, the flow of HW that complies with the law and regulations has not been established. In other words, a considerable amount of untreated HW has been stored on-site at the sources since there is no proper HW treatment facility available off-site. Under such conditions, a mass of HW might be improperly treated and dumped, which would be a potential threat to the environment and public health.

The Government of the Philippines (hereinafter referred as GOP) has been promoting foreign investment by creating industrial and free trade areas, called Export Processing Zones (EPZ). Many of the factories started operation in EPZ have been forced to store hazardous wastes generated inside their premises. This is due to the lack of appropriate HW treatment facilities within ROP as well as high costs and long time associated with exporting their HWs for treatment in overseas, if they desire to do so. This situation has resulted in harming not only the environment but also the potential growth of national economy by keeping away foreign investments. This is true when acquiring Environmental Management Certificate, ISO 14001, is becoming increasingly important in the international trade market.

Hence, establishing proper hazardous waste management has become one of the most important issues to be solved for achieving environmentally as well as economically sustainable development in ROP.

In response to the current condition, the Government of Japan (hereinafter referred as GOJ) has decided to conduct a master plan study on industrial hazardous waste management as the technical cooperation program of the Japan International Cooperation Agency (JICA) with request/cooperation from GOP.

The study aims at formulating the master plan for proper management of industrial hazardous waste with the target year of 2010 to promote desirable investment climate and development of environmentally sustainable industry in ROP. The master plan includes 1) capacity building of the public institutions, 2) policies for proper recycling and treatment of HWs in the private sector, and 3) a short-term action plan for implementing the master plan.

2. Scope of the Study

1) Target HWs

Target HWs of the study are those defined and categorized in DAO92-29 of RA6969, except medical wastes.

2) Study Area

The master plan covers the whole area of ROP, however generator's survey is focused on Metro Manila and CALABARZON.

3) Contents of the Study

The Study covers the following issues:

1. Socioeconomic conditions in ROP
2. HWM in the private sector
3. Foreign donor's assistance to HWM
4. HWM in the neighboring countries
5. Present status of generation, transport, recycling and treatment of HW
6. Present regulatory and administrative mechanisms of HWM
7. Database and data management system
8. Estimates of current and future HW generation
9. Identification of problems and issues of HWM
10. Basic policies of HW recycling and treatment
11. Basic concept of HW treatment technology and facility development
12. Policies to promote proper HW treatment and recycling at sources
13. Plan to develop a model integrated HW treatment facility
14. Plan to strengthening enforcement of law and administrative capacity concerning HWM

15. Plan to promote the private sector participation in HWM
16. Short-term action plan

3. Study Period and Study Team

The Study Team started its work in September 2000. It collected and analyzed basic information until the end of November 2000 and prepared the master plan from December 2000 to February 2001.

The Study was conducted by GOP and GOJ jointly.

4. Structure of the Report

The study report is composed of Volume I (Analysis of Present Conditions), Volume II (Master Plan), and Annex. Volume I has 5 chapters covering the items 1 through 8 listed in "2. Scope of the Study, 2) contents of the study," and Volume II has 9 chapters covering the items 9 through 16. The contents of the report are summarized in the following sections.

5. Current status of HWM in the Philippines (Volume I)

5.1 Chapter 1 summarizes socioeconomic information relevant of HWs and its implication. Based on the analysis of the information obtained, electric and electronic equipment manufacturing, which contributes to HW generation, is a rapidly growth sector. In addition, foreign investment accounts for a large part of the investment in the Philippines; establishment of proper HWM would have a significant implication to investment climate in the Philippines.

5.2 Chapter 2 summarizes current status of generators, haulers, and treaters of HWs. The registered sources of HW number in 1,079 by the end of 2000, which is estimated to be a mere fraction of potential sources. There is a large room for the registered sources (generators) to improve their practices in storage, treatment, and disposal of HWs and in relevant data management. Low awareness of HWM among the generators and insufficient management system in the factory were observed during the site survey.

The registered waste haulers are 52, of which haulers specialized in only transporting wastes are 35. Problems concerning waste haulers include 1) those equipped with no vehicle have been licensed, 2) some of the haulers do not have vehicles required for transporting hazardous wastes, and 3) haulers often fail to handle manifest forms properly.

There are 21 business entities who treat hazardous wastes (treaters) in the Philippines,

most of which are engaged in recovering valuable materials from wastes and operate small facilities. Noteworthy progress in treaters in the Philippines is establishment of a treatment facility of metal plating wastewater in Cebu Island and an incineration plant for medical wastes in Laguna; both of them are in proper operation. Main problems in the field of hazardous waste treatment are lack of thermal treatment facilities and disposal sites of HWs, and inability of GOP to grasp actual practices of HW treatment inside the premises of generators.

Hopes for future development in HWM include trends of obtaining ISO14001 by generators, starting recycle business by the private sector, and relevant activities by NGOs such as promoting exchange of wastes.

5.3 Chapter 3 shows current status of legal and institutional development in HWM. RA6969 and DAO92-29 provides a framework of HWM in the Philippines. RA6969 defines basic idea of HWM as follows:

1. Prohibition of HW entry from outside of the Philippines even as a transit,
2. Promotion of waste management hierarchy of minimization (most preferred), recycling and reuse, treatment and disposal (least preferred),
3. HWM to avoid pollution, adverse impacts on human health, plants, and animals, and constraint on beneficial use of the environment,
4. HW generator's responsibility for proper HWM, and
5. HW generator to pay costs of proper treatment, storage and disposal ("polluter-pays-principle").

Although legal framework for HWM has been established, there is lack of HW treatment standards and regulations on technical requirements for TSD facilities. Moreover, EMB has not been able to properly operate the waste tracking system nor enforce the law and regulation especially in the case of taking offenders to a court. Such situation is attributed to a lack of human and financial resources in EMB, which had not had lower branches because it was a staff bureau. Since the enactment of CAA, EMB has been under transition to a line bureau; it may be possible for EMB to strengthen its institutional capacity and human development.

5.4 Chapter 4 summarizes current status of the private sector participation in HWM and policies to promote their participation. There are various economic incentives to promote private participation in HWM while their applicability is another story. Fund raising for HWM by the private sector is very difficult; government intervention for helping the private sector to get a loan from international sources is desirable.

5.5 Chapter 5 estimates amount of HW generation from 719 registered sources whose registration data is valid. Although the 719 registered sources accounts for only 0.5%

of 150,000 business entities that may generate HWs, they amount to about 20% of the business entities with more than 200 employees because the 719 registered sources have a relatively large number of employees.

About 280 thousand tons of HWs are estimated to be generated from the 719 registered sources. About 140 thousand tons per year (50% of the HWs generated) are recycled or treated at sources. The rest of the HWs is unable to be treated at sources. Some of them might be treated by private treaters, but about 100 thousand tons per year are estimated to be stored on or off-site waiting for proper treatment and disposal, otherwise they may be improperly dumped somewhere.

With an assumption that the number of registered sources reaches 6,500, HWs generated from the registered sources are estimated to be 2,400 thousand tons per year, which is about 10 times as much as the estimate for the present. Considering HW generation in neighboring countries and Japan, 2,400 thousand tons per year would be overestimate and should be taken as just information.

6. Master Plan (Volume II)

6.1 Chapter 6, the first chapter in Volume II, identifies the current issues in HWM in the Philippines based on the current situation analyzed in Volume I so as to incorporate them into the master plan.

The main issues of present HWM in the Philippines are outlined as follows:

- There are only 1,079 HW generators officially registered at EMB as of the year 2000, which is much smaller than the potential number of HW generators.
- The amount of HWs generated by the registered generators is approximately 280 thousand tons per year. Generators are forced to store about 100 thousand tons per year of HWs in their premises due to limited availability of proper HW treatment facilities.
- The regulating authority cannot properly identify and control the flow of HW from generators to TSD operators. Therefore, the authority cannot grasp the situation whether HW generators and TSD operators treat HWs in compliance with the laws and regulations.
- There are no serious environmental impacts of HWs revealed in the Philippines. However, they may exist but cannot be identified by the government due to limited capacity of monitoring and inspection.

Key factors contributing to insufficient HWM in the Philippines include:

- Lack of awareness and management system of HWM at sources (generators),

- Limited technical and financial capacity of private TSD operators, and
- Lack of and insufficient enforcement of laws and regulation on HWM.

Considering the issues identified above, the master plan will focus on the followings for realization of proper HWM in the Philippines:

- Promotion of 3R (reduction, reuse, and recycling) of HWs by generators, and establishment of proper HWM at sources based on PPP,
- Promoting the development of TSD facilities for proper treatment and disposal of HWs, and
- Strengthening laws, regulations, and enforcement capacity of the regulating authority on HWM.

6.2 Chapter 7 recommends basic policy for HWM and recycling. Based on the idea of RA6969 and DAO92-29, the basic idea for HWM is set as '*Preventing possible damages on human health and environment, contributing to the development of sustainable society, and leaving no environmental liabilities for the future generation.*' Policy for HWM has given priority to reduce (waste minimization and detoxification at sources), reuse, recycle, and proper treatment (intermediate treatment to reduce environment load at final disposal) in the order mentioned. The policy goal of HWM is set as formation of proper flow of HWs in compliance with the law and regulation. To achieve the policy goal, the following actions have been planned.

- Development of TSD facilities needed for proper treatment and disposal of HWs
- Establishment of proper management of HWs at sources and promotion of 3R
- Complete law enforcement and full-fledged establishment of HWM administration by the Government

The overall HWM policy mechanism recommended in this chapter is outlined in Figure1.

6.3 Chapter 8 shows proposed treatment methods of HWs and development concept of a treatment facility, which contributes to achieve the first policy target and comprises the main part of the master plan. Disposal of HWs means returning HWs to the nature; acceptance criteria of HWs to the disposal site have been formulated based on the basic policy of HWs mentioned in 6.2 and EU Landfill Directive (1999/31/EC). Therefore, the acceptance criteria do not allow disposal of organic HWs into a landfill. Setting the criteria has clarified the policy of HW treatment by waste type and made roles of thermal treatment before HWs being landfilled and of solidification clear.

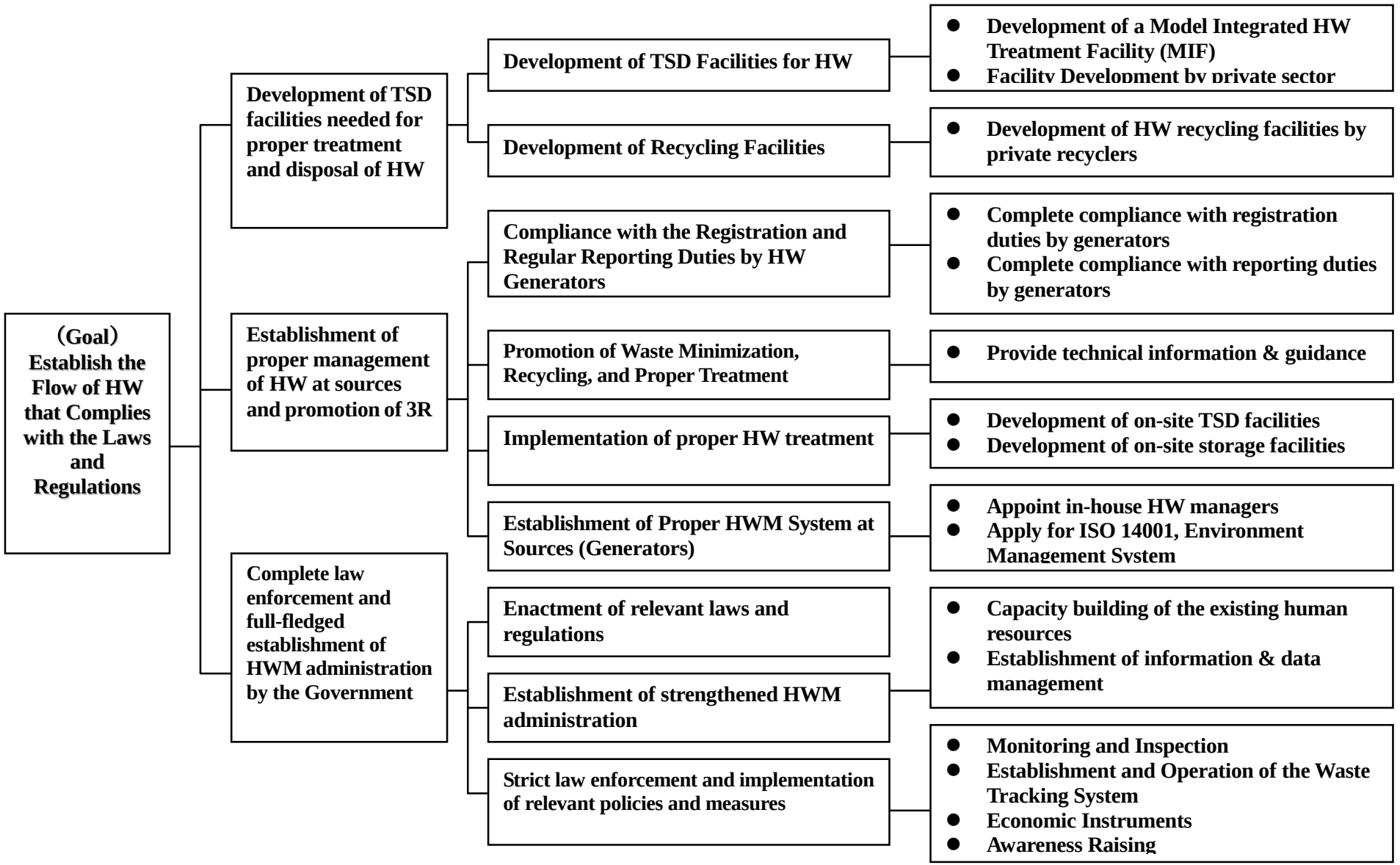

Figure 1 Recommended Overall HWM Policy Mechanism in the Philippines

In addition, the acceptance criteria set technical requirements for TSD facilities. CAA prohibits incineration but allows thermal treatment of wastes; pyrolysis process has been proposed as a technology that meets the requirements. Development of TSD facilities was considered based on current amount of HWs generated from the registered sources. Based on the current conditions of generation, treatment, and disposal of HWs by the registered sources by geographical area (Luzon1, Luzon2, Visayas, and Mindanao), development scenario of TSD facilities has been created as the following.

1st Step	Develop a Model Integrated HW Treatment Facility (MIF) in CALABARZON, Luzon by 2002-2004
2nd Step	The next step is to establish a storage/ transfer facility in the regions where development of treatment facility in the foreseeable future is difficult. The HW will be regularly transported to MIF above. In VISAYAS and MINDANAO regions, a landfill will be developed to accept HW temporarily until proper treatment facility becomes available.
3rd Step	Develop the 2nd integrated treatment center in Luzon2 by a private sector initiative. HW treatment facilities will be further developed and operated nationwide as a response to the increasing HW treatment demand.

Figure 2 images development of TSD facilities in the Philippines as of the year 2010.

If developing TSD facilities is relied solely on voluntary initiatives by the private sector, it would not be realized due to high market risk in HW treatment. Leaving the situation with little progress in developing TSD facilities would increase threat to human being and the environment; prompt facility development is strongly required. However, it is difficult to reduce the market risk in HW treatment if the government intervention is limited to control HW treatment through a facility and operation permit and to show necessary size of the market. Therefore, TSD facilities should be established with the financial support from GOP. The study team proposes the project structure that GOP shares the financial risk and contracts out the facility operation to the private sector and that the private sector shares the market risk. The project would have immeasurable positive effects on HWM in the Philippines, leading prompt realization of TSD facilities and promotion of private business in HW treatment, providing a golden opportunity for the evolution of national administration of HWM.

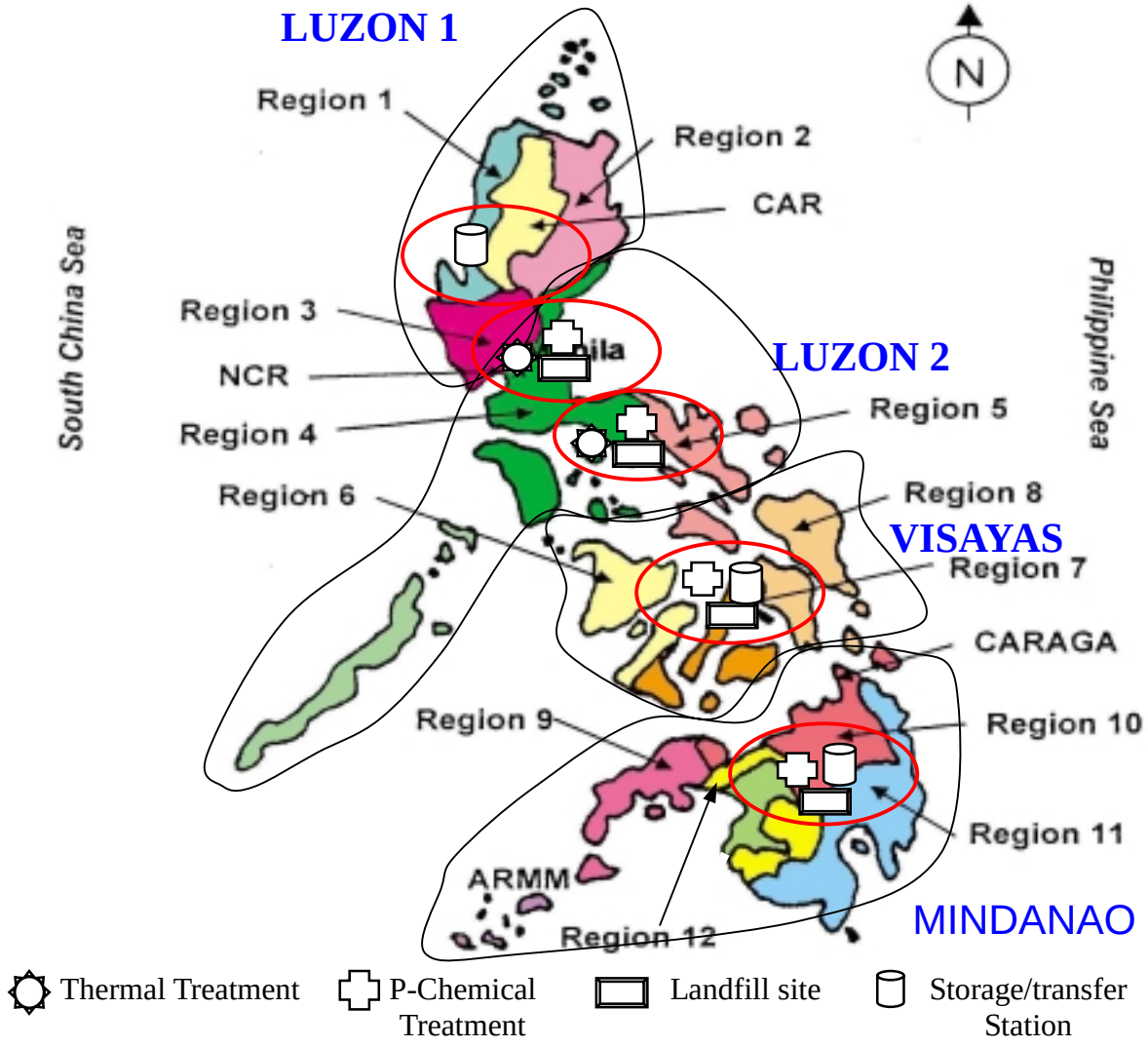

Figure 2 Distribution of TSD Facilities in 2010

6.4 It is the basic principle that the responsibility of HWM resides in the sources of HW. To realize proper treatment and recycling at sources based on the basic principle of HWM, Chapter 9 describes steps of policy implementation for HWM. The objectives of the policy is to increase the number of registered sources, establish the proper treatment by registered sources by the year 2004, and develop a proper management system of HW at sources.

6.5 Chapter 10 recommends concrete measures for strengthening laws and regulations and institutional capacity. To strengthen laws and regulations, it is required without loss of time to set standards of HW treatment, acceptance criteria for a disposal site, technical requirements for TSD facilities, rules of analysis methods of HWs, and rules of licensing treaters and haulers. So as a manual on categorization of HWs and a

notification regarding temporal storage of HWs.

It is also necessary to develop electronic database and its management system so that EMB could make use of information on the registered sources, treaters, operation records, and the like for the administration of HWM. Other measures include monitoring and inspection of HWM in conjunction with the development and implementation of training programs for EMB staff and fulfilling the requirements for implementing the proper waste tracking system.

6.6 Chapter 11 examines a development plan of the model integrated TSD facility by the government initiative based on the development scenario of treatment and recycle facilities described in Chapter 8. The model integrated TSD facility is planned to have a capacity of physicochemical treatment of 3,000 ton/year, thermal treatment of 60 ton/day, and disposal of 10,000 ton/year, and its overall treatment capacity is 20,000 ton/year, which is the minimum size to meet economic profitability. Based on the site survey, 6 prospect sites with 5 to 10 hector of land area and better conditions for the model TSD facility have been selected out of the nineteen sites in CALABARZON, Manila Metropolitan Area. Construction costs of the facility have been roughly estimated as 2.3 billion pesos (5.7 billion yen). Figure 3 shows an outline of the model integrated TSD facility.

6.7 Chapter 12 recommends policies to be implemented by GOP in order to promote the private sector's treatment of HWs that are difficult to be recycled. Policies include promotion of proper HW storage, promotion of TSD facility development by the private sector, proper law enforcement, incentives for business in HW treatment, and reduction of investment risk in TSD facility development.

6.8 Chapter 13 summarizes action plans regarding policies and measures proposed in Chapter 8 through 12 for the next three years. Policy goals are shown in Table 1.

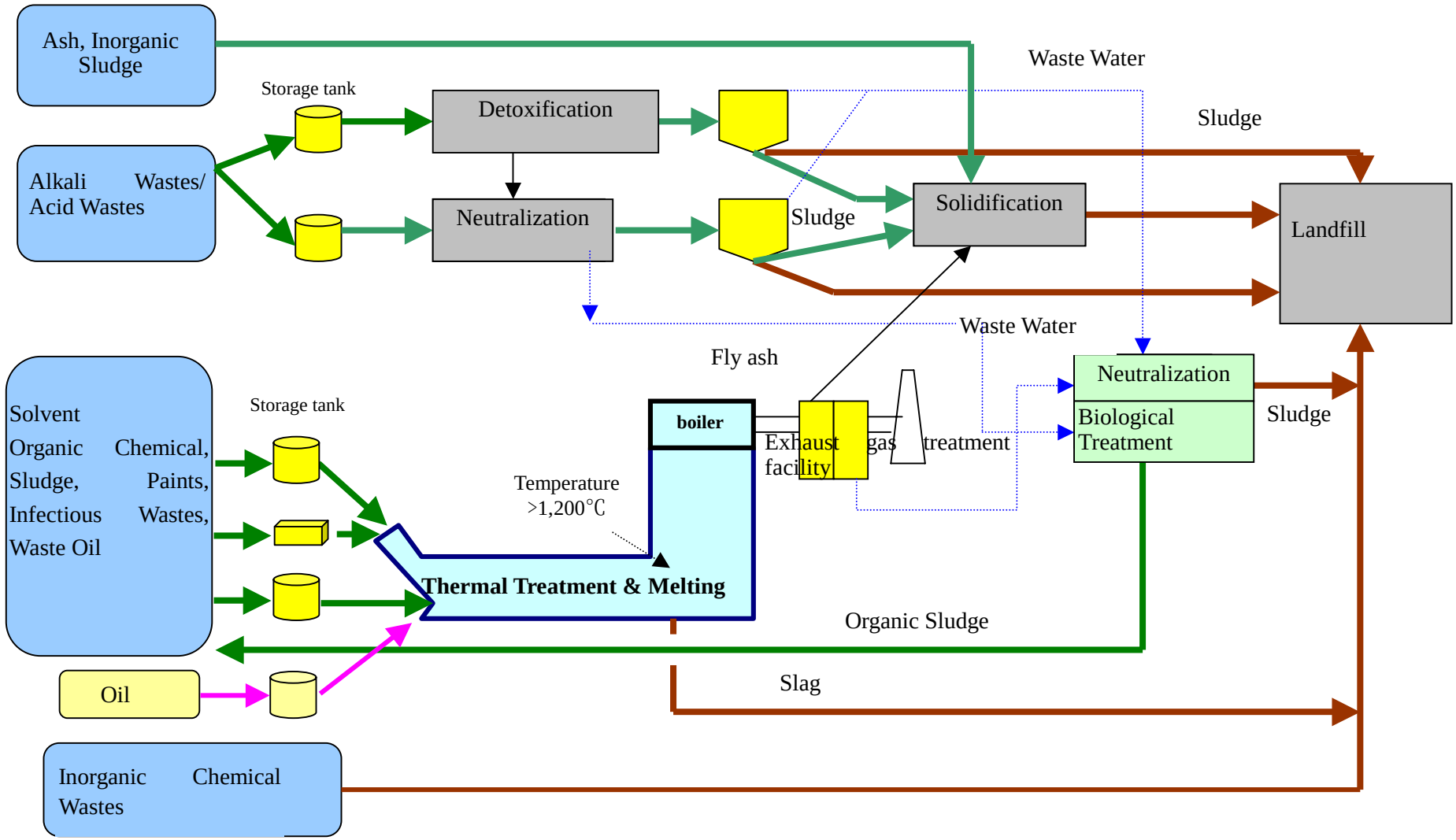

Figure 3 HW Treatment Flow in the Model Integrated HW Treatment Facility

Table1 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.

Table 2 shows planned actions to achieve the above goals for the next three years. GOP should take an initiative to develop a detailed plan of the model integrated TSD facility development, designate a public corporation as a business entity, and obtain financial resources for the facility development. Recommendation on government actions from the stage of carrying out a feasibility study to that of commencing the TSD facility operation and its schedule are shown in Table 3. Chapter 13 also shows roles of DNER/EMB and other national institutions, EMB regional offices, financial institutions, waste generators, industry groups, and NGOs to carry out the Short-term Action Plan. The management of the plan should employ the PDCA （Plan-Do-Check-Action）cycle and set evaluation criteria; the results of the plan should also be made public.

Table 3 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				

6.9 Chapter 14, the final chapter, again lists what the government should promptly tackle in order to realize the Master Plan and the Short-Tem Action Plan. Emphases are placed on strengthening laws and regulations as the basis of HWM and establishing the model integrated TSD facility with the direct involvement of GOP as the indispensable factor for the evolution of administration of HWM. Therefore, it is necessary to start a feasibility study of the project immediately.

Table 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			
	⑤ Organization 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			

Key Areas	Policy Actions and Programs	2001	2002	2003
3. Monitoring and inspection	①Formulation of the national monitoring and inspection plan			
	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			
	②Examination 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			
	③Guidance of HW recycling to the generators by regional offices of EMB			
	④Establishment of the council for HW recycling organized by the government and recyclers			
	⑤Providing 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			

INTRODUCTION

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1. Background

With the recent progress in industrialization, industrial waste generation has been increasing in the Republic of the Philippines (hereinafter referred as ROP). Due to the limited capacity for recycling and treatment of the hazardous wastes generated within ROP, industries handling waste acid, waste alkaline, waste oils, and sludge containing heavy metals, in particular, are facing difficulty in managing their hazardous wastes.

ROP enacted the RA6969 (Toxic Substances, Hazardous and Nuclear Waste Act) in 1990. In 1992, implementing Rules and Regulation (IRR), DAO92-29 (Department Administrative Order 29) of the Department of Environment and Natural Resources (hereinafter referred as DENR), was issued for enforcing the RA6969. In addition, systems for Environmental Impact Assessment (EIA) and Environmental Compliance Certificate (ECC) were put in place to lead proper Hazardous Waste (HW) treatment facilities.

However, due partly to insufficient mechanisms of enforcing the RA6969, HW business in the private sector has not grow to meet the demand for proper HW services. Consequently, the flow of HW that complies with the law has not been established completely. In other words, a considerable amount of untreated HW has been stored on-site at the sources since there is no proper HW treatment facility available off-site. Under such conditions, a mass of HW might be improperly treated and dumped, which would be a potential threat to the environment and public health.

The Government of the Philippines (hereinafter referred as GOP) has been promoting foreign investment by creating industrial and free trade areas, called Export Processing Zones (EPZ). Many of the factories started operation in EPZ have been forced to store hazardous wastes generated inside their premises. This is due to the lack of appropriate HW treatment facilities within ROP as well as high costs and long time associated with exporting their HWs for treatment in overseas, if they desire to do so. This situation has resulted in harming not only the environment but also the potential growth of national economy by keeping away foreign investments. This is true when acquiring Environmental Management Certificate, ISO 14001, is becoming increasingly important in the international trade market.

Hence, establishing proper hazardous waste management became one of the most important issues to be solved for achieving environmentally as well as economically

sustainable development in ROP.

Under the situation above, the Government of Japan (hereinafter referred as GOJ) has decided to conduct a master plan study on hazardous waste management as the technical cooperation program of the Japan International Cooperation Agency (JICA) with request/cooperation from GOP.

2. Objective of the Study

The study aims at formulating the master plan for proper management of hazardous waste until the year 2010; including, 1) capacity building of the public institutions, 2) promoting a policy for proper recycling and treatment of HW in the private sector, and 3) a short-term action plan for implementing the master plan which contribute to the promotion of investment and development of industry in ROP in harmony with sustainable environment.

3. Scope of the Study

1) The HW to be covered

The hazardous wastes, except medical wastes, defined and categorized in DAO92-29 of RA6969 are covered in the study.

2) Study Area

The master plan will cover the whole area of ROP, however generator's survey will be focused on Metro Manila and CALABARZON.

4. Key Issues of the Study

The Study focuses on the following issues in formulating the master plan.

I Current Conditions

1. Socioeconomic conditions in ROP
2. HWM in the private sector
3. Foreign donor's assistance to HWM
4. HWM in the neighboring countries
5. Present status of generation, transport, recycling and treatment of HW
6. Present regulatory and administrative mechanisms of HWM
7. Database and data management system
8. Estimates of current and future HW generation

II Master Plan

9. Identification of problems and issues of HWM
10. Basic policies of HW recycling and treatment
11. Basic concept of HW treatment technology and facility development
12. Policies to promote proper HW treatment and recycling at sources
13. Plan to develop a model integrated HW treatment facility
14. Plan to strengthening enforcement of law and administrative capacity concerning HWM
15. Plan to promote the private sector participation in HWM
16. Short-term action plan

5. Organization of the Study Team

The Study Team started its work in September 2000, and collected and analyzed basic information until the end of November 2000. The master plan was prepared from December 2000 to February 2001.

The Study was conducted by GOP and GOJ jointly with the following members.

JICA Study Team	EMB Counterpart
1. OHNO, Masato: Team Leader 2. TANAKA, Tadao: Industrial Waste Treatment Technology (1) 3. ANAI, Junji: Industrial Waste Treatment Technology (2) 4. KIMURA, Toshimune: Hazardous Substance Management Technology (A) 5. TAKANO, Fujio: Hazardous Substance Management Technology (B) 6.NAKAMURA, Shoji: Industrial Waste Monitoring 7. CARDENAS, Marlito L.: Administrative and Regulatory System in Industrial Waste Management 8. WILLIAMS, David G.: Promotion of Industrial Waste Treatment Industry 9. SUGIMOTO, Satoshi: Management /Financial Analysis 10. SATO, Naofumi: Site Evaluation /Database Development 11. ISHIBASHI, Kunito: Industrial Waste Data Management System	1.Mr. Peter Anthony ABAYA: Director 2. Ms. Angelita T. BRABANTE: OIC-Environmental Quality Division 3.Mr. Geri G. R. SANEZ: Chief, Hazardous Waste Management Section 4.Mr. Solon C. RATIVO: Senior Environmental Management Specialist 5.Ms. Leah Aurea U. TEXON: Science Research Specialist II 6. Ms. Elizabeth L.CARINO: Science Research Specialist II 7.Ms. Ma. Resancleire P. Villanueva: Science Research Specialist II

The steering committee by the following member was installed under DENE-EMB in conducting the study.

Members of the Steering Committee

Mr. Arturo Noel Zafra	Philippine Economic Zone Authority (PEZA)
Ms. Clarissa C. Cabacang	Department of Energy (DOE) -EPMD
Mr. Gulllermo Laquindanum	Board of Investments (BOI)
Mr. Joaquin G. Mendoza	Laguna Lake Development Authority (LLDA)
Mr. Rogelio U. Uranza	Metro Manila Development Authority (MMDA)
Ms. Erlinda Gonzales	Environmental Management Bureau Region Ⅳ-A
Mr. Sixto Tolentino	Environmental Management Bureau NCR
Ms. Elainet T. Quintos	Bureau of International Trade Relations

6. Structure of the Report

The report is composed of Volume I (Current Conditions), Volume II (Master Plan), and Annex. For the Annex, the Study Team omitted Japanese version and made out only in English.

The Volume I (Current Condition) is consisted of 5 chapters. In Chapter 1 great contribution of growing electric and electronic machinery sector in generating hazardous wastes is revealed through analysis of basic information of the economy and industry involved in HW generation. Moreover, the Study Team recognizes and points out the importance of foreign capital investment in development of national economy in ROP, as well as the significance of establishing proper HWM to sustain inflow of foreign investment.

The current system on HWM is described in Chapter 2, in which the study team finds HWM system among the generators and treaters has not sufficiently matured. Accordingly, the generators are to develop HWM system through acquisition of ISO14001 certification while the treaters are getting into the recycling business. Also, activities of NGO and the like cannot be ignored in developing HWM in ROP.

Chapter 3 states the present regulatory, administrative and institutional mechanisms on HWM. Although the current laws and regulations do provide a broad framework, details still need to be worked. Likewise, the Study Team also identifies the deficiency of institutional mechanisms and human resources required for implementing the laws.

The Study Team analyzes the current condition and issues on private sector participation in

HWM in Chapter 4. HW generators are mandated to properly treat their HW under the laws. Since treating HW on-site is NOT economically efficient for the generators, they generally seek outside HW treaters to deal with the HW concerns; however, there are not much treatment facilities installed in ROP. Thus, the Study Team points out the reason why law enforcement has not successfully completed, as well as the reason why the characteristics of HW makes the private sector reluctant to invest in HWM business. Additionally, this chapter deals with the present status of policy on economic incentive for promoting HWM in the private sector.

The present status of HW generated by registered generators is referred in Chapter 5, in which the future HW generation amount is estimated based on a summation of verified registration data.

Volume II (Master Plan) is composed of 9 chapters, whose structure is shown in Figure-1.

Chapter 6 identifies the current issues in HWM in the Philippines based on the current conditions analyzed in Volume I so as to incorporate them into the master plan.

Chapter 7 clarifies the basic policy framework of HW recycling and treatment. With an enhancement of the principles in RA6969 and DAO92-29, 'Preventing possible damages on human health and environment, contributing to the development of sustainable society, and no environmental liabilities for the future generation' are agreed policy objectives on HWM. The basic policies to achieve these objectives are given by '3Rs and 1P' policies, namely 1) Reduce (waste minimization and detoxification at sources), 2) Reuse, 3) Recycle, 4) Proper treatment (intermediate treatment to reduce environmental load at final disposal site). The Study Team set up a target to 'establishing HW flow in compliance with landfill standards,' and prepared HWM policy recommendations to achieve the goal.

In Chapter 8, the technical requirements for HW treatment facilities are discussed along with the standards and criteria for HW landfill. Since the establishment of Treatment, Storage and Disposal (TSD) facilities is vital for controlling HW, the basic strategies and plans are laid down for developing the TSD facilities to establish the proper HW flow from sources to recyclers/treaters by the year 2010. The Study Team strongly advises the GOP to involve in the development of TSD facilities as it is an urgent task.

In Chapter 9, the basic principles of HWM is explained, in which HW generators have responsibilities for properly treating their own HWs, whereas the government needs to promote policies for proper treatment of HWs by the generators.

Chapter 10 discusses measures to strengthen laws and regulations and institutional capacity.

They include setting standards of HW treatment, acceptance criteria for a disposal site, technical requirements for TSD facilities, and the like. Also included is the development of electronic database and its management system indispensable for proper HWM.

Chapter 11 examines a development plan of the model integrated TSD facility by the government initiative. The model integrated TSD facility is planned to have a capacity of physicochemical treatment of 3,000 ton/year, thermal treatment of 60 ton/day, and disposal of 10,000 ton/year, and its overall treatment capacity is 20,000 ton/.

Chapter 12 proposes the promotion plan on private sector participation and partnership in TSD facilities development.

The action programs for the period of 2001-2003 that the government needs to tackle are presented in Chapter 13, relating the policies and measures described in chapters 8-12.

Chapter 14 concludes the proposals and recommendations of the Study, including basic plans and action programs that GOP is advised and/or should put efforts immediately.

The Study Team produces Annex in English including the findings in the study as below. In addition, the Study Team has developed the electronic information system to deal with registration and reports of HWM.

ANNEX

Annex1 HW Generation Sources
Annex2 Transporters, Recyclers and Treaters
Annex3 HWM in the Neighboring Countries
Annex4 Initiatives Affecting HWM-Donors, Agencies, Projects
Annex5 Institutional Context and the Private Sector in HWM
Annex6 Analysis of EMB's Organization and Regulatory Activities
Annex7 Monitoring Methodology and Laboratory Analysis of HW
Annex8 Technical Guideline
Annex9 Operation Manual of RA6969, DAO92-29
Annex10 Database and Data management System
Annex11 Forecast of HW Generation Amount
Annex12 Requirements for TSD facilities
Annex13 Site Selection of TSD facilities
Annex14 Database Users' Manual for HWM

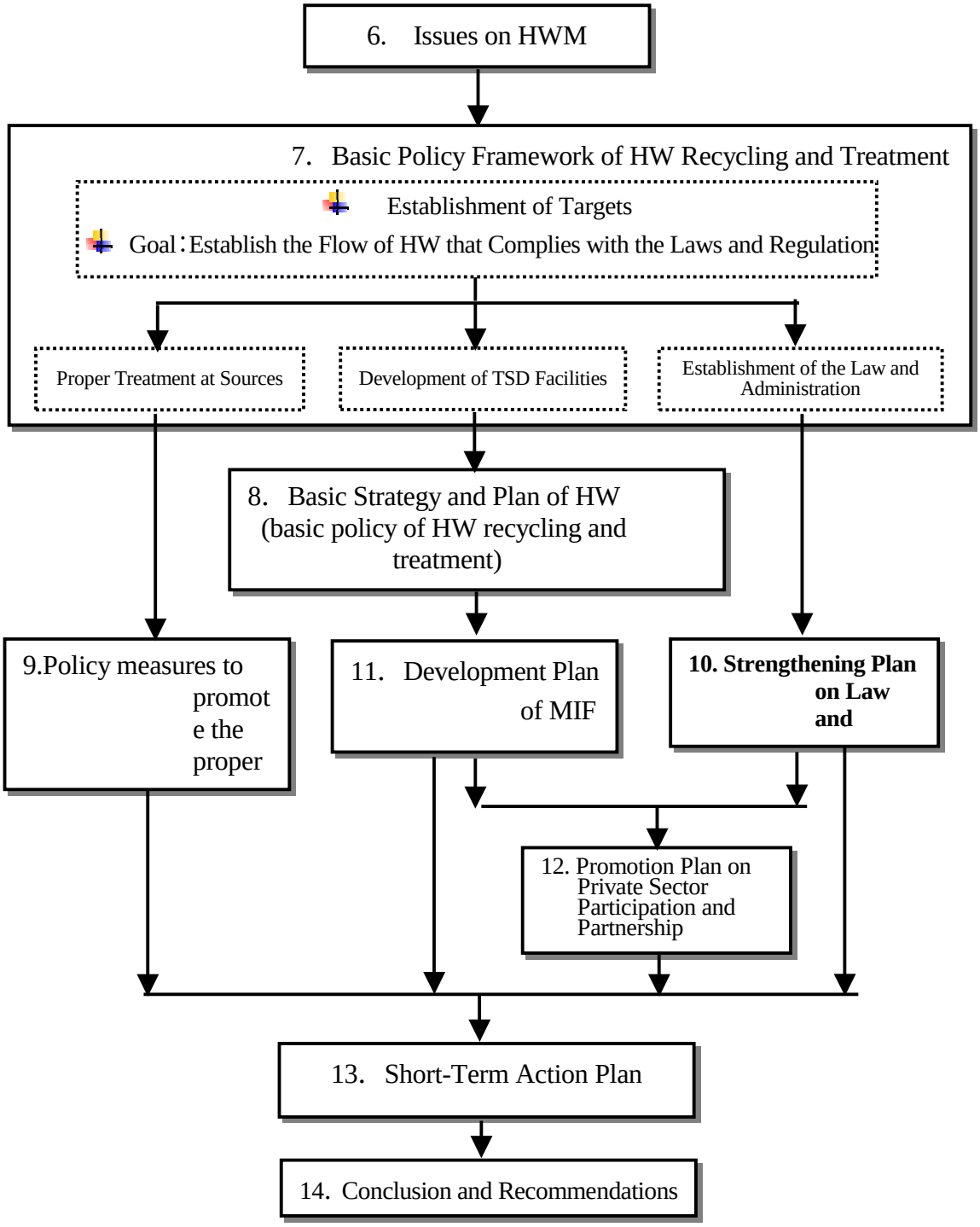


Figure-1. Structure of the Master Plan

VOLUME 1:
CURRENT CONDITIONS

CHAPTER 1

ECONOMY, INDUSTRY AND HWM

IN

THE PHILIPPINES

1. ECONOMY, INDUSTRY AND HWM IN THE PHILIPPINES

1.1 Economic and Industrial Development in the Philippines

In response to the economic crisis caused by decline in the prices of import and export products in 1980s, the Philippines promoted import substitution industries to protect domestic primary industries. Manufacturing industry was stagnated in this period.

Growth of the secondary industry, represented by manufacturing industry, started in the beginning of 1990s. The Ramos administration, which had started in 1992, actively promoted export-oriented industry by deregulation of investment, establishment of export products processing zones, and so forth. Service industry also showed continuous growth in this period and occupied 45% of GDP in 1998.

Table 1.1.1 Trend of Economy and Industry in the Philippines (1995-1998)

Year		1995		1996		1997		1998	
Item \ Unit		Million peso	Growth Rate (%)	Million peso	Growth Rate (%)	Million peso	Growth Rate (%)	Million peso	Growth Rate (%)
GNP	current	1,958,555	12.8	2,261,339	15.5	2,522,884	11.6	2,794,068	10.7
	constant	824,525	4.9	884,226	7.2	930,363	5.2	931,127	0.08
GDP	current	1,905,951	12.6	2,171,922	14.0	2,421,306	11.5	2,667,108	10.1
	constant	802,224	4.7	849,121	5.8	892,860	5.2	888,075	-0.54
Agriculture, Forestry, Fishery	current	412,197	10.7	447,803	8.6	452.546	1.1	449,888	-0.6
	constant	172,848	0.9	179,451	3.8	184,713	2.9	172,445	-6.6
Mining	current	611,097	11.0	696,881	14.0	779,786	11.9	841,145	7.9
	constant	283,858	6.7	302,126	6.4	320,689	6.1	314,554	-1.9
Manufacturing	current	438,247	11.3	495,389	13.0	540,305	9.1	582,894	7.9
	constant	203,271	6.8	214,613	5.6	223,672	4.2	221,151	-1.1
Services	current	882,657	14.8	1,027,238	16.4	1,188,974	15.7	1,376,075	15.7
	constant	345,518	5.0	367,554	6.4	387,458	5.4	401,076	3.5

Sources: Philippines Statistical Yearbook 1999.

1.2 Increasing Importance of Manufacturing Industry and HWM

As shown in Table 1.1.1, manufacturing and service industries have grown together with the development of the Philippines economy. Both have played important roles in the socio-economic development of the nation.

Particularly, electric and electronic machinery sector is one of the most grown industries in these 10 years in the Philippines. According to the latest data, the shipment value of electric and electronic industry increased by 120% between 1999 and 2000. During 1990-2000, it grew by about six-fold.

Electric and electronic products also contribute to the international trade in the Philippines. In 1998, their total export value reached approximately 17 billion dollars US, occupying around 60% of the total exports.

Table 1.2.1 Trend of Manufacturing Industry by Sub-Sector

Year	1990			1995		
Sub-Sector	No. of establishment	No. of Employees	Shipment Value (milion peso)	No. of establishment	No. of Employees	Shipment Value (million peso)
Food, Beverage and Tobacco	2,688	213,218	176,159	2,616	198,528	278,401
Textile, Garment and Leather	2,544	281,695	45,021	2,440	223,133	67,779
Wood and Wood Products	1,205	81,623	13,429	786	45,050	12,823
Paper, Pulp and Printing	749	36,920	17,589	837	42,385	33,681
Chemical Products	720	62,899	62,326	841	69,366	108,889
Petrochemical Products	16	2,986	63,631	20	3,262	121,603
Rubber Products	179	29,326	8,211	175	19,894	9,687
Non Metal Products	456	35,640	17,215	372	32,913	33,897
Iron and Steel	184	21,780	40,049	236	27,047	66,787
Non-Ferrous Metals	412	23,975	8,535	548	33,343	17,208
Machinery	463	19,852	3,284	451	28,919	19,234
Electric/Electronic Machinery	228	76,003	43,528	287	127,058	120,250
Transport Machinery	241	21,302	21,571	253	25,309	54,842
Other Manufacturing	361	26,780	4,462	357	35,014	10,297
Total	10,446	933,999	525,010	10,219	911,221	955,378

Sources: Philippines Statistical Yearbook 1999.

The sub-sectors meshed in Table 1.2.1 nearly or more than doubled their shipment values during 1990-1995. The growth of manufacturing industry contributes to the economic development of the nation while it increases generation of waste. Naturally, some of these manufacturing industries generate hazardous waste (HW) as well. It implies that how to manage HW becomes the issue of primary importance in the Philippines.

Table 1.2.2 below shows the trend of major export products in the Philippines. The

percentage of electric and electronic products reached about 60% of the total export. They are the best earners of foreign currency in the Philippines.

Table 1.2.2 Trend of Exports by Major Exporting Products

Year / Products	1995		1998	
	Export Value (million $US)	Ratio(%)	Export Value (million $US)	Ratio(%)
Electric/Electronic Products	7,409	42.6	17,156	58.2
Garments	2,566	14.8	2,356	8.0
Coconut Products	965	5.6	831	2.8
Mining Products	893	5.1	591	2.0
Agricultural Products	571	3.3	465	1.6
Others	5,043	28.6	8,097	27.4
TOTAL	17,447	-	29,496	-

Thus, the roles of manufacturing industry in the development of the Philippines' economy are of great importance in view of raising domestic industries as well as expansion of international exports. It also means that proper HWM in these industries is not just the issue of environmental management, but also the issue of economic development in the Philippines. The increasing environmental concerns in the international trade market, represented by worldwide dissemination of ISO14001 and bilateral/multilateral environmental agreement such as NAFTA, will influence the competitiveness of the products in the Philippines in the near future. In this respect, it is necessary to take further steps of proper HWM immediately in the Philippines.

1.3 Investment-Induced Domestic Economy and HWM

A series of policies and programs in the Ramos administration, such as deregulation on foreign investment, liberalization of electricity, telecommunication, and financial businesses, promotion of export-oriented industry, have increased the foreign capital investment in the Philippines to create a nationwide booming of investment. Although foreign investment is recently decreasing in value due to shift from large to medium and small size industries, it still plays an important role in the development of domestic economy.

On the other hand, many foreign firms showed their concern on proper management of HW in the Philippines, according to the survey conducted by the Study Team. Failure in HWM may also decline foreign capital investment in this country in the future. The significance

of proper HWM can also be emphasized in terms of maintaining the present trend of foreign capital investment.

1.4 Conclusion

The importance of proper HWM in the Philippines first comes from the protection of human health and environment. However, it is also necessary in terms of sustaining and further developing the economy and industry in the Philippines. In this respect, there is no conflict between development and environment concerns. Poor management of HW will destroy the environment as well as economy in the Philippines.

CHAPTER 2

PRESENT STATE OF HWM IN THE PHILIPPINES

2. PRESENT STATE OF HWM IN THE PHILIPPINES

2.1 HWM at Sources (by Generators)

To identify the present state of HWM at sources (by generators), the JICA Study Team analyzed the existing registration of generators at EMB, as well as conducted a series of questionnaire and interview surveys to the generators. Mentioned below are the results of these activities.

2.1.1 Registration Data of the Generators

All the HW generators are required to register with the EMB. The number of generators registered as of October 2000 is 1,079. The number of potential generators is estimated to be 150,000. This is based on the assumption that the facilities classified under Philippine Standards for Industrial Classification (PSIC) are generating hazardous wastes. This includes the registered generators. Based on this estimated volume of generators using the PSIC classification, the number of registered generators is comparatively small.

As to the quality of registered data, there are many shortages. To analyze the present situation of HW generation by using registration data, the JICA Study Team tried to validate and improve them based on the information given in the registrations. For example, revision of PSIC code, standardization of the HW amount unit to "tons per year", and so forth.

However, 127 registrations were found useless due to no-entry of PSIC code or number of employees, which are indispensable for the analysis of HW generation. Moreover, 231 registered generators were identified not to generate HW. After removing these registrations, the remaining 721 registered generators are subject to the analysis of HW generation.

2.1.2 Analysis of the Registration Data

(1) Regional Distribution

A. Generators

As shown in Table 2.1.1, 30% of 721 HW generators are concentrated in Southern Tagalog (CALABARZON area) and 27% in the National Capital Region (NCR). The next highest number of registered generators is in Southern Mindanao and followed by Central Visayas. The total number of HW generators from the 4 regions is 569, accounting for about 80% of the total registered generators nationwide.

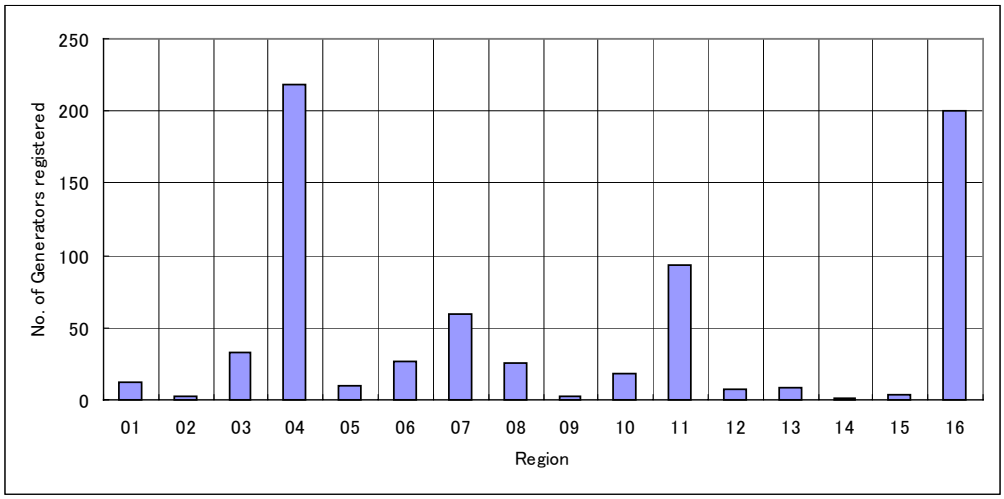


Figure 2.1.1 Regional Distribution of HW Generators

Table 2.1.1 Regional Distribution of HW Generators

Region	No. of Generators		Region	No. of Generators	
01: Ilocos	12	1.67%	10: Northern Mindanao	18	2.50%
02: Cagayan Valley	2	0.28%	11: Southern Mindanao	93	12.93%
03: Central Luzon	33	4.59%	12: Central Mindanao	7	0.97%
04: Southern Tagalog	216	30.04%	13: CARAGA	8	1.11%
05: Bicol	10	1.39%	14: ARMM	1	0.14%
06: Western Visayas	27	3.76%	15: CAR	4	0.56%
07: Central Visayas	60	8.34%	16: NCR	200	27.82%
08: Eastern Visayas	26	3.62%			
09: Western Mindanao	2	0.28%	Toral	719	100.00%

In terms of distribution of the HW generators by employees scale, comparatively large scale of facilities of more than 50 employees concentrate in Southern Tagalog and NCR. Medium or small scale facilities of 10 to 100 employees are mainly located in Southern Mindanao.

Table 2.1.2 Regional Distribution of HW Generators by the range of Employees

(Unit: person)

Region	1-4	5-9	10-19	20-49	50-99	100-199	200-499	500-999	1000 <	Total
01 Ilocos	2	2	2		2	2	2			12
02 Cagayan Valley		1	1							2
03 C. Luzon		2	4	2	4	4	6	4	7	33
04 S. Tagalog	10	8	18	22	27	34	46	28	23	216
05 Bicol	1	3	3		1		1	1		10
06 W. Visayas	1	3		5	3	4	5	6		27
07 C. Visayas	2	5	8	4	12	5	9	9	6	60
08 E. Visayas	4	4	4	4	4	3	2	1		26
09 W.Mindanao				1		1				2
10 N. Mindanao			1	1	2	6	1	5	2	18
11 S. Mindanao	4	10	21	16	15	8	10	4	5	93
12 C. Mindanao	1	1		1	1		1	1	1	7
13 CARAGA		3	1	1		1		1	1	8
14 ARMM			1							1
15 CAR			1				1		2	4
16 NCR	3	6	11	36	33	37	31	22	21	200
Total	28	48	76	93	104	105	115	82	68	719

B. Regional Distribution of HW Generators by Industrial Category

Regional distribution of the registered generators by the industrial category is shown in Table 2.1.3. 65% of HW generators are classified as “Manufacturing industry”, and the next is “Electricity, Gas and Water supply” (17%). The HW generators categorized as manufacturing industry mainly include manufacture of fabricated metal products, machinery, and equipment” and manufacture of chemicals and chemical petroleum, coal, rubber, and plastic products.

67% of the above manufacturing industries concentrate in CALABARZON. It is remarkable that the summation of number of generators in CALABARZON and Region 7 (Cebu) covers around 90% of the major registered HW generators in manufacturing industry. There are also many foreign facilities located in these areas, and most of them are classified as manufacturing industry.

Table2.1.3 Regional Distribution by Industrial Category

PSIC		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	Total
1	12	1			1							4						6
Sub total - 1		1			1							4						6
2	21			1	1	1			1	1		1		1		1		8
	22	1						1									2	4
Sub total - 2		1		1	1	1		1	1	1		1		1		1	2	12
3	31	4		4	8		10	5	3		10	21					11	76
	32				2			1	1								6	10
	33											4	1	2			1	8
	34							1				2					4	7
	35		1	9	35	2	1	3	1		3	5	2	1		1	82	146
	36				1			2			1		1				3	8
	37	1			7			2			1	3	1			1	6	22
	38			9	94			23			2	2				1	37	168
	39				9		1	4									5	19
Sub total - 3		5	1	22	156	2	12	41	5		17	37	5	3		3	155	464
4	41	1	1	9	41	6	6	17	12	1	1	5	2	4	1		7	114
	42			1		1			8									10
Sub total - 4		1	1	10	41	7	6	17	20	1	1	5	2	4	1		7	124
5	50				3													3
Sub total - 5					3													3
6	61											1					11	12
	62	4			1		2					21					2	30
Sub total - 6		4			1		2					22					13	42
7	71							1									1	2
	72				1													1
Sub total - 7					1			1									1	3
8	84				1													1
	85				1													1
Sub total - 8					2													2
9	92				1													1
	94				8		7					24					17	56
	95				1												1	2
	97																2	2
	98																2	2
Sub total - 9					10		7					24					22	63
Total		12	2	33	216	10	27	60	26	2	18	93	7	8	1	4	200	719

PSIC
1 Agricultural Industries
2 Mining
3 Manufacturing
4 Electricity, Gas and Water works
5 Construction
6 Wholesale Trade
7 Transportation Services
8 Financial Services
9 Public Administration and Date

C. Regional Distribution of HW Generation Amount by Type of HW

The regions generating all types of HW are located in Southern Tagalog (Region 4) and NCR (Region 16). Companies located in Central VIsayas (Region VII) generate all types of wastes except immobilized wastes while used oil is generated in all regions.

From the viewpoint of HW generation amount by types, the biggest generation is inorganic chemical wastes (24.5%), subsequently followed by alkali waste (20.2%), putrescible / organic wastes (11.0%), and acid waste (9.7%).

The plating wastes are concentrated in Central Visayas (Region 7) and NCR (Region 16). Adding Region 4 to the above, summation of generation amount of plating wastes becomes 98% of the total generation of the registered generators.

Table 2.1.4 Regional Distribution of HW generation amount by type of HW

Reg	A	B	C	D	E	F	G	H	I	J	K	L	M	Total
01		249	126	160			2,965		432			5		3,937
02				0					0					1
03		0	195	531	79	16	7,434		2,083	4		8,596	1	18,939
04	393	17,627	4,701	11,244	2,467	1,225	9	3	7,117	541	479	71	10,735	56,613
05		2	65	3	1				27					97
06		2	2,982	77			855		2,434	50		0	810	7,210
07	1,446	638	164	106	526	283	2,636	11	3,085	2		11	5	8,912
08			321	10,816		0			185				0	11,323
09									60					60
10	0	451	4,846	1,706	0		34		378	13	3	6,726	21	14,178
11	45	4	412	11	74		2,384		1,366	1,222	0		2,253	7,771
12	6	63	286	6,402	10,027	8		1	447	118		4	20	17,383
13	0	31	7	0					4				1	42
14									10					10
15	116	27	436	1		13			30					622
16	9,228	7,808	41,559	37,046	1,595	671	14,271	65	4,890	1,549	33	812	11,768	131,295
Total	11,233	26,900	56,099	68,103	14,769	2,216	30,588	81	22,549	3,499	516	16,226	25,614	278,393
	4.0%	9.7%	20.2%	24.5%	5.3%	0.8%	11.0%	0.0%	8.1%	1.3%	0.2%	5.8%	9.2%	100.0%

HW

A Plating wastes
B Acid wastes
C Alkali wastes
D Inorganic chemical wastes
E Reactive chemical wastes
F Organic solvent
G Putrescible / Organic wastes
H Textile
I Oil
J Containers
K Immobilized wastes
L Organic chemicals
M Miscellaneous wastes

(2) Distribution by Industrial Category

Manufacturing industry generates 64.5 % of the total HWs, and its total number of employee accounts for 80.7% of the total employees of registered HW generators. The next biggest generating activity is public administration and defense, accounting for 8.8% of the total HW generation while number of employees occupies 8.2%.

The mean number of employees per registered generator is 389.

Table 2.1.5 Number of Generators and Employees by Industrial Category

Industrial Code	No. of Generators		No. of Employees		Employees / Generator
1 Agricultural Industries	6	0.8%	232	0.1%	39
2 Mining	12	1.7%	6,671	2.4%	556
3 Manufacturing	464	64.5%	226,670	80.7%	489
4 Electricity, Gas & Water	124	17.2%	18,778	6.7%	151
5 Construction	3	0.4%	193	0.1%	64
6 Wholesale Trade	42	5.8%	2,459	0.8%	59
7 Transportation Services	3	0.4%	969	0.3%	323
8 Financial Services	2	0.3%	2,015	0.7%	1,008
9 Public Administration & Defense	63	8.8%	22,906	8.2%	364
Total	**719**	**100.0%**	**280,893**	**100.0%**	**391**

2.1.3 Interview Survey of HW Generators

Based on the Hazardous Waste Registration Database installed through USAID, there are 632 HW generators that are located in the CALABARZON area. The JICA Study Team selected 229 hazardous waste generators from the database, considering the need for wide variety and broad representation of industrial categories and types of hazardous waste generated and their potential impacts on the environment.

(1) Selection of HW Generators to Be Surveyed

The JICA Study Team selected 229 HW generating facilities from the database by the following steps:

Step 1: Categorizing the HW generating facilities by regions and types of industries,
Step 2: According to the number of employees, selecting the largest 200 HW generators that are located in CALABARZON area
Step 3: Adding additional 29 HW generators, which are not covered in the above 200 HW generators, in terms of the types of HW generated and/or types of industries.

Table 2.1.6 Distribution of the Selected facilities to be surveyed

Region Code	Region Name	Province Code	Province Name	Data Base	98-00 by JICA	Total Facilities	Selected Facilities	SF/TF
4	Southern Tagalog	10	Batangas	25	9	34	13	38%
4	Southern Tagalog	21	Cavite	31	54	85	48	56%
4	Southern Tagalog	34	Laguna	53	78	131	75	57%
4	Southern Tagalog	56	Quezon	1	3	4	1	25%
4	Southern Tagalog	58	Rizal	13	5	18	6	33%
16	NCR	77	1st District, MM	16	8	24	4	17%
16	NCR	79	2nd District, MM	24	21	45	23	51%
16	NCR	78	3rd District, MM	32	36	68	6	9%
16	NCR	80	4th District, MM	100	28	128	53	41%
	TOTAL			295	242	537	229	43%

(2) Survey Method

The HW generators survey was conducted by the following steps:

Step 1: Preparation of the questionnaire

To obtain basic information about HWM in a written form from each generator, the JICA Study Team prepared a questionnaire asking about the following data and information:

1. Profile of the Premise (name of the company, address, major products/services, number of employees, annual turnover, etc.)
2. Raw materials and chemical substances used (types and amounts)
3. Conditions of HW generation, and treatment (types, amount, treatment measures, etc.)
4. Wastewater discharge and treatment (types, amount, treatment measures)
5. In-house environment management system
6. Others (Issues and difficulties in HWM, willingness-to-pay for proper HWM, etc.)

Step 2: Interview Survey

The JICA Study Team conducted an interview survey of the HW generators through the local consultant. The JICA Study Team employed six surveyors recommended by the local consultant, considering their experience with the same kind of survey and/or deep knowledge of the hazardous industrial waste.

At the beginning, the JICA Study Team sent the letter prepared by DENR-EMB and the questionnaire to the 229 facilities by fax, and then made an appointment by telephone.

To avoid misunderstanding of questions due to different individual interpretation by respondents, the JICA Study Team conducted interview surveys together with the local surveyors. The questionnaire forms filled by generators are cross check and confirmed at

the time of interviews.

(3) Results of the survey

There were many facilities where addresses and the designated pollution control officers were already changed. The JICA Study Team was able to visit only 100 facilities, originally scheduled within 2 months. Therefore, the interview survey was continued by the local consultants even after the JICA Study Team left the Philippines in October 2000. Finally, the Study Team obtained 145 of the questionnaires from the generators in which some were collected directly through interviews and some were received through fax. The followings show the results of this interview survey.

1) Number of Facilities Surveyed

Number of responses collected is 145, of which 120 generators were interviewed. Because of the concentration of economic zones in Cavite and Laguna area, the facilities surveyed in these areas accounted for 61% of the generators surveyed.

Table 2.1.7 Facilities surveyed

Region	Province	Interviewed generators	Collected Questionnaire
04 SouthernTagalog	10 Batangas	5	8
	21 Cavite	30	36
	34 Laguna	44	53
	56 Quezon	1	1
	58 Rizal	2	2
Southern Tagalog total		83	100
16 NCR	39 1st Dist. MM	4	4
	74 2nd Dist. MM	6	7
	75 3rd Dist. MM	5	6
	76 4th Dist. MM	22	28
NCR total		37	45
G total		120	145

2) Industrial Category of the Facilities Surveyed

Most of the facilities surveyed are classified as “Manufacturing industry”, and its breakdown is shown in Table 2.1.7.

The mean number of employees is 878 per generator. Manufacture of fabricated metal products, machinery, and equipment sectors are large in number of employees. Their mean number of employees is around 1,200 per generator.

Table 2.1.8 Scale of HW Generators Surveyed by Industrial Category

PSIC		No. of Generators	No. of Employees	Employees/ facility
3111	Slaughtering, preparing, and preserving meat	2	1,870	935
3114	Canning and preserving of fruits and vegetable	2	805	403
3117	Manufacture of vegetable and animal oils and fats	1	200	200
3133	Malt liquors and malt	13	15,182	1,168
3134	Softdrinks and carbonated water manufacturing	3	2,233	744
31 total	**Manifacture of Food, Beverage, and Tobbaco**	**21**	**20,290**	**966**
3211	Spinning, weaving, texturizing and finishing textiles	11	11,853	1,078
32 total	**Textile, wearing apparel, and Leather Industries**	**11**	**11,853**	**1,078**
3313	Millwork plants	1	158	158
33 total	**Manufacture of Wood and Wood Products, Including Furniture and Fixtures**	**1**	**158**	**158**
3511	Manufacture of basic industrial chemicals, except fertilizers	21	13,707	653
3513	Manufacture of synthetic resins, plastic material, and manmade fiber, except glass	1	10	10
3521	Manufacture of paints, varnishes, and lacquers	1	60	60
3522	Manufacture of drugs and medicines	2	624	312
3529	Manufacture of chemical products, not elsewhere classified	1	46	46
35 total	**Manufacture of Che,micals and Chemical Petroleum, Coal, Rubber, and Plastic Products**	**26**	**14,447**	**556**
3712	Steel works and rolling mills	1	150	150
3724	Non-ferrous foundries	1	118	118
3729	Non-ferrous metal basic industries, not elsewhere classified	1	492	492
37 total	**Basic Material Industries**	**3**	**760**	**253**
3813	Manufacture of metal containers	1	400	400
3814	Metal stamping, coating and engraving mills	22	16,874	767
3815	Manufacture of fabricated wire products	1	450	450
3825	Manufacture of office, computing and accounting machinery	4	4,955	1,239
3831	Manufacture of electrical industrial machinery and apparatus	6	16,114	2,686
3833	Manufacture of electrical appliances and housewares	1	300	300
3842	Manufacture of railroad equipment	1	4,000	4,000
38 total	**Manufacture of Fabricated Metal Products, Machinery, and Equipment**	**36**	**43,093**	**1,197**
3903	Manufacture of sporting and athletic good	1	32	32
3905	Manufacture of ophthalmic goods, eq. eyeglasses and spectacles	1	226	226
3909	Manufacturing industries, not elsewhere classified	1	79	79
39 total	**Other Manufacturing Industries**	**3**	**337**	**112**

PSIC		No. of Generators	No. of Employees	Employees/ facility
4110	Generating and distributing electricity	3	654	218
41 total	**Electricity**	**3**	**654**	**218**
6280	Petroleum and other fuel products, retailing	1	588	588
62 total	**Retail Trade**	**1**	**588**	**588**
Total		**105**	**92,180**	**878**

3) Type of HW and Industrial Category

The results of the survey show that 7,400 tons per year of inorganic chemical wastes are generated by the 145 facilities, which amounts to 34% of the total generation. The second is 3,500 reactive chemical wastes (16% of the total generation), followed by 3,200 tons per year of waste oil (15%).

Based on the industrial category (PSIC), the amount of HW generated by the manufacturers of fabricated metal products, machinery, and equipment is 5,600 tons per year, which accounts for 26% of the total HW generated. 5,000 tons per year (23.2% of the total) is generated by the electricity, gas and water supply sector and 3,300 tons per year (15% of the total) comes from the food, beverage, and tobacco sectors.

Table 2.1.9 HW generation amount by type and industrial category

(unit: tons/year)

HW1	37	31	32	33	35	37	38	39	41	62	**Total**	
A		282			7	2	1,010				**1,300**	6.0%
B	73	965	4		231		178		525	360	**2,336**	10.7%
C		112	2		284	402	316				**1,116**	5.1%
D	2,153	226	45		106	0	430	1	4,410		**7,372**	33.9%
E		139	2,105	330	267		636	35			**3,511**	16.1%
F		4	104		0		3				**112**	0.5%
G		9			2		1				**12**	0.1%
H		1									**1**	0.0%
I		1,507	67		425	48	1,144	2	21		**3,214**	14.8%
J		26			194	0	53	9			**282**	1.3%
K			246		274		3				**523**	2.4%
L					18		4	14			**36**	0.2%
M		0	24		15		1,814		80		**1,934**	8.9%
Total	**2,226**	**3,270**	**2,597**	**330**	**1,822**	**452**	**5,593**	**61**	**5,036**	**360**	**21,747**	100.0%
	10.2%	15.0%	11.9%	1.5%	8.4%	2.1%	25.7%	0.3%	23.2%	1.7%	100.0%	0.0%

4) Issues/Concerns Confirmed through Survey

A. General

- The generators do not well recognize the present HW category provided in the "Orientation Manual for DAO92/29 of R.A.6969". Moreover, due to unclear legal or regulatory status of the Manual, most of the HW generators are not well aware of the importance of HW categorization and segregation at sources for proper HWM.
- The difference of the policies for manifest system between the generators is very evident. In most of the actual cases, transporters prepare the manifest. It seems that the manifest system in the Philippines is not functional considering the inspection carried out by EMB regional office.
- Cardboard, plastic vessels and wooden pallet, etc., generated from the facilities surveyed are recycled. The collector of municipal wastes also acts as the recycler. In the event that the collector of municipal waste gathers waste oil etc. classified as HW, it is questionable that waste is treated properly through the recycling route. We cannot deny that other HW is mixed with the municipal waste and disposed to the municipal landfill site.
- It seems that the concept of intermediate treatment of HW is absent considering that there are no landfill standards for the industrial waste and no landfill site for HW. The HWs that can be recycled by local treaters are organic solvents and waste oil with low moisture content, solder dross and a part of sludge such as the copper compounds. However, it is observed that the waste collectors called as recycler also collect HW that is difficult to be recycled. Some of these collectors are keeping the HW in their own premises, but it seems the others are disposing it illegally. Some of the generators are obliged to commission local treaters, which are doubtful in terms of their treatment capability, only because these treaters are registered with EMB and there may be no other alternative.
- Some of the industries, represented by foreign-affiliated firms, have no choice but to export their HWs for proper recycling and treatment or store them on site because of insufficient HWM system in the Philippines. Since many of the foreign firms conduct strict environment management system (EMS) under the ISO 14001, they need proper HW treaters to be developed in the Philippines. Meanwhile, there are some foreign firms introducing advanced HW recycling and treatment technologies on site.
- Public awareness of the possible environment pollution caused by landfill and waste treatment facilities is so high that NIMBY syndrome is very strong.

B. Description of each type of HW

a. Inorganic Waste (Industrial Solid Waste)

- Semiconductor and electronic industries produce a large amount of metal bearing sludge. Normally, sludge containing copper is discharged as hydroxide after neutralization. In addition to this process, some Japanese facilities dry this sludge to reduce its volume before this is sent to the local treaters as oxides. According to a PCO of one of these facilities, sludge treatment by drying is a priority to reduce its volume and thereby reducing the final treatment cost.
- Calcium hydroxide ($Ca(OH)_2$) is commonly used in neutralization, however, the waste volume generated is high compared with other reagents. To reduce the volume of waste during neutralization, a 2 step-process using NaOH and $CaCO_3$ + $Ca(OH)_2$ should be studied.
- The metal bearing sludge copper generated from the semiconductor industries contains a few impurities. Metals such as copper are extracted from the metal bearing sludge by the local treaters. On the other hand, some Japanese factories export the metal bearing sludge to the refinery of a mother company in Japan. According to the interview survey, a large amount of copper is being discharged in the CALABARZON area. The metal bearing sludge copper generated from the semiconductor industries contains a few impurities.
- Some local recyclers for solder dross are in the Philippines, because of the ease of recycling. Local treater can refine solder dross through the process of melting and then removing the oxidation film. Therefore, treatment method of oxidation film containing lead, which is HW, is simple. The use of solder containing lead is prohibited in developed countries because of its toxicity. Therefore, if the Philippines would like to implement international regulations on the use/recycling of lead and lead compounds, it is no longer necessary to further establish treatment/recycling facilities of solder dross.

b. Inorganic Chemical Waste (Liquid)

- The plating industries use many kinds of chemical reagents such as organic/inorganic solvents, surface treatment agent, plating solvent in the process of removing grease and plating, and generating many kinds of wastewater. Treatment of these wastes is troublesome.
- There are some electroless nickel-plating facilities. COD and BOD of the wastewater generated from the process of electroless nickel plating need to be solved in the future.

c. Organic Chemical Wastes (Industrial Solid Waste)

- Some plastics and resins are used as fuel by cement plants. Municipal waste collectors also collect the rest of these wastes, however, treatment of these wastes is not clear.

Recyclable wastes might be recycled but the residual wastes need to be properly treated and disposed.

d. Organic Chemical Wastes (Solvent)

- Chlorinated organic compounds such as trichloroethylene are now being substituted in Japan because of its carcinogenecity. However, considerable volume of trichloroethylene is still being used because of its efficiency in removing grease. Some companies in the Philippines are using alternative solvents such as: isopropyl alcohol (IPA) and distilled water washing. The use of IPA is not favorable to most companies because of its flammability. Since the Philippines has no existing environmental quality standards for groundwater, the use of TCE is not yet regulated.
- These organic solvents can be easily recycled by distillation because the recycling business is active in the Philippines. However, the working conditions of the local treaters are poor and unsafe. Occupational safety in recycling facilities should be improved.
- Some generators using organic solvent have their own on-site treatment facilities.

e. Others

- The treatment method including recycling of the refrigerant should be developed.

C. Treatment unit cost

Some facilities generating solvents and waste oil sell their wastes to recyclers and/or treaters and the others pay for the disposal of these wastes. This implies that some treatment/recycling facilities charge treatment costs to wastes depending on the impurities.

It seems that each generator does not exchange the information concerned with the treaters.

Table below shows the unit costs for the treatment and selling prices of the recyclable wastes by HW type, which were obtained from the interview survey

Table 2.1.10 Treatment Unit Cost and Selling Price

HW code	Unit cost (peso/ton)	Selling price (peso/ton)
B299: Mixture of acids	19,333	
C306: Lime-neutralized metal sludge	2,000	
C399: Other alkaline materials	12,500	
D406: Lead compound	30,275	31,500
D411: MC sludge	11,000	
D499: Other salts and complexes	15,125	
E601: Aqueous-based	14,500	
E602: Solvent-based	30,742	
E610: Sludge based on the ink product	23,000	
E699: Other mixed	15,000	
F701: Organic solvent flash point > 61℃	38,075	
F704: Non-chlorinated solvent	27,500	
G802: Grease trap wastes from industrial or commercial premises	20,000	
I101: Waste oil	11,004	875
I103: Vegetable oil	20,000	
I105: Oil/water mixtures	15,000	
J201: Portable containers previously containing toxic chemical substances	15,000	
K301: Solidified and polymerized wastes	52,500	
K302: Chemically fixed wastes	9,500	
L499: Other organic chemical substances	35,000	
M501: Pathogenic or infectious wastes	20,000	
Average	21,237	16,187

D. ISO 14001 Certification

33 facilities in 120 have already acquired ISO14001, and another 47 are applying or planning to obtain it in the near future. This shows that around 66% of 120 are required to secure appropriate treatment of HW so as to obtain ISO 14001.

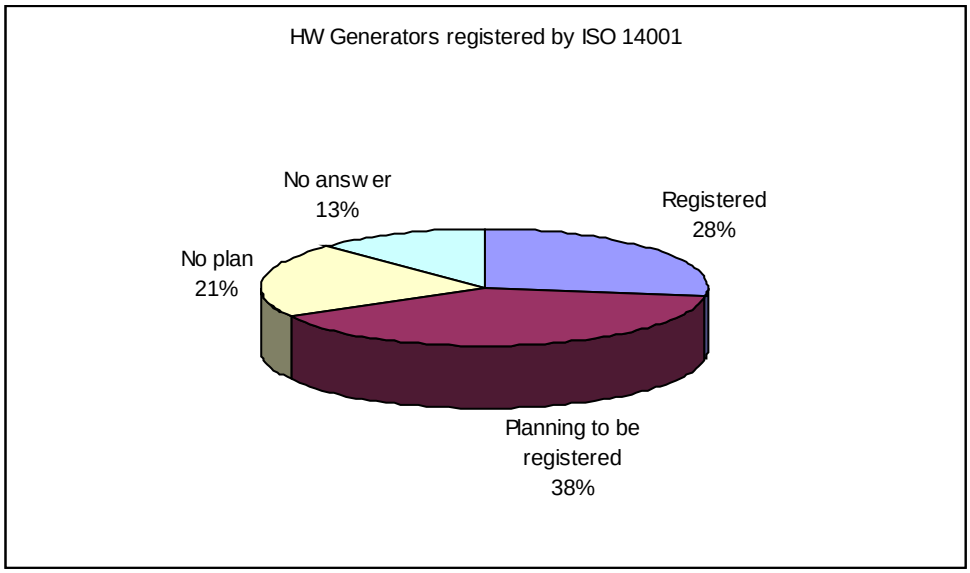


Figure 2.1.2 Conditions of ISO 14001 Acquisition by HW Generators

Table 2.1. 11 Conditions of ISO 14001 Acquisition by HW Generators

Region	Province	y	P	n	o	Total
04 Southern Tagalog	10 Batangas	1	3		1	5
	21 Cavite	4	16	7	4	30
	34 Laguna	21	14	4	5	44
	58 Rizal			2		2
	56 Quezon				1	1
04 Sub total		26	33	13	11	83
16 NCR	77 1st Dist. MM	1	1	2		4
	78 2nd Dist. MM		2	3	1	6
	79 3rd Dist. MM		1	3	1	5
	80 4th Dist. MM	6	10	4	2	22
16 Sub total		7	14	12	4	37
G total		33	47	25	15	120

y: Acquired n: No plan to acquire p: Planing to acquire o: No answer

2.2 Current Conditions of HWM by Private Haulers

2.2.1 HW Haulers

In compliance with the DAO 92-29 series of 1992, Section 27, any individual or entity interested to be a transporter of HW is required to register and must obtain a Transport Permit from the EMB. As of October, 2000, 52 enterprises are registered as transporters of hazardous wastes and categorized into the following 3 sectors.

Operated by Generators	: 11 companies
Operated by Recyclers/Treaters	: 6 companies
Independent Transporters	: 35 companies

2.2.2 Types of HW Haulers

(1) HW Haulage by Generators

A total of 11 generators (manufacturers) transports HWs from their own facilities to contracted recyclers/treaters or their own treatment facilities.

(2) HW Haulage by Recyclers/Treaters

The recyclers/treaters can also transport HW through a contract with their clients (generators). Based on the contract, they can convey the waste by owned, or subcontracted vehicle to their facility.

6 companies have their own vehicles to collect HWs from the contracted facilities. They can transfer the HWs to other recyclers/treaters if they cannot properly treat it at their own facilities.

(3) Independent HW Haulers

Although there are currently 35 registered independent HW haulers, 7 haulers has closed down or suspended their services so far.

There are 2 companies, which collect and export HW to the third countries for recycling and/or treatment. Both of them do not have their own hauling vehicles, but sub-contracted with the forwarding agents for haulage of HW from generators to the ports.

There are only 5 haulers who owns more than 4 HW hauling vehicles, as given in Table 2.2.1 below. Many of other registered haulers sub-contracted with other forwarding agents.

Table 2.2.1 Tops 5 HW Haulers

#	Name of Company	Operating Fleet	
1	Explorer Fright Corp.	Closed Van	25
		6 Wheeler	4
		10 Wheeler	4
		L300 Van	2
		TOTAL	35
2	Jadez Concrete Products	10 Wheeler	4
		14 Wheeler	1
		6 Wheeler	4
		Dump Truck	1
		TOTAL	10
3	Nav Trading Corp.	4 Wheeler	2
		6 Wheeler	2
		10 Wheeler	2
		TOTAL	6
4	Haz Chem Enterprises	Tank Lory	4
		Trailer	1
		TOTAL	5
5	Dieseltron Marketing	Elf Truck	1
		L300 Van	2
		Jeep	1
		TOTAL	4

In addition, the above 5 haulers does not always provide HW hauling services. Instead, they sometimes rent their vehicles to generators, recyclers, or treaters.

2.2.3 Legal and Regulatory Requirement for HW Haulers

(1) Basic Requirement for HW Transporter

In compliance with Section 27 and 28 of DAO92-29, HW generators are responsible for proper packaging of HW for transport. HW generators must place waste in properly labeled containers that are in good condition and made of proper materials. HW generators are also responsible for providing the transporter with a spill response plan that includes instructions to the transporter for cleaning or spills of HW in the event of an accident. HW transporters must be officially licensed by DENR.

The Labels of HW containers shall include the following information and should be clearly exhibited in paint or other permanent form of marking:

- Class of the HW as described on DAO 92-29
- Sub-category of the HW as described on DAO 92-29
- HW number as described on DAO 92-29

- Name and address of the HW generator
- Maximum capacity or volume of the vessel, container or tank
- Date when the HW must be removed from storage and transported off site or treated on site (for containers only).
- HW transport record number (manifest number) when the HW is shipped off site in the same container

The followings are the minimum requirements established for transporters of HW, in addition to all the air, sea, and land transport requirements established by the DOTC (Department of Transportation and Communication).

- All HW transporters must register with DENR. They must also complete the HW registration form and obtain:
    - A DENR Identification Number, and
    - A license to transport HW.

- The transporter is required to deliver the entire quantity of HW accepted from either the generator or another transporter (if applicable) to designated TSD premises listed on the Manifest.

- If the HW cannot be delivered as indicated in the Manifest, the transporter must so inform to the generator. The generator will instruct the transporter either to return it or transport it to another TSD premises.
- Before a HW shipment is made, the transporter must be properly trained and equipped with tools to contain spills. In the case of spills, the transporter is also liable for the cost of clean up.

- The transporter must immediately notified DENR, DOTC, and the local police in case of accidents or spills.

- The transporter must file within 10 days a detailed report to DENR, describing the accident, spill, and containment or clean-up measures taken.

- The transporter may store the HW received from a generator at a transfer station not longer that 10 days depending on stability of HWs packaging conditions.

- All transporters of HW must have warning signs, markings, and other requirements by DOTC regarding shipment of HW.

- All transporters must submit an annual report to DENR.

- Exemptions from Manifest requirement
    - Generator and transporter of putrescible organic waste,
    - If the waste is less than 200 liters in each shipment,
    - Transporters handling only reclaimed wastes provided that the vehicle,
    - Transporting the waste belonging to the reclaiming premises

- The registered Transporter must be properly insured for public and pollution liability. All shipments must be covered with the same liability insurance.

(2) Potential Problems in HW Transportation Process

A. Storage Space for HW in Trucking Station

Transportation Companies has almost no storage space, and/or facilities for HW in their trucking station. Consequently trucking companies are unable to store HW within the station, if an unexpected storage will be needed upon occurring an emergency event.

However, basically delivering distance between generators and recyclers/treaters facilities is short and possible to deliver within a day, therefore most of transporters are required with no storage space, and/or facilities within their station at this moment.

B. HW Signboard on Truck

In compliance with DAO 29, all vehicles transporting HW are required to display appropriate warning signages on the fleet/vehicle in transporting HW. However, except for tank lorries, most fleets/vehicles are transporting HW without any warning signage. In some cases, transporters are loading used batteries inside vans, used oil in drums and/or HW sludge in open trucks without using sign boards, and transport them to a treater's facility. This is strictly illegal, but no enforcement has taken place before.

2.3 Recyclers, Treaters and Reusers

2.3.1 Present Conditions

There are 28 companies registered as recyclers or recyclers/treaters. However, 7 enterprises of the above has closed or suspended their services so far. Of the remaining 21 companies, 6 are large-scale but others are relatively small business firms in terms of their HW treatment capacity.

15 companies are located in the CALABARZON or Metro-Manila area and the remaining 6 companies are located outside of these regions.

Those companies are categorized into the following four types.

- Recyclers: 9 companies

Recyclers purchase the waste from contracted generators, then recover saleable materials from the waste and sell them in the market or re-purchase back by the generators depending upon the contract. Mostly, recyclers operate in waste oil (lubricant) and spent solvents recycle business. The revenue comes from sales of the recycled materials.

- Treaters: 6 companies

Much of the waste from the generators is given free although some pay for their waste to be treated through contracts with the Treaters. Treaters then treat the waste and in some cases sell the recovered materials in the market. However, most revenues come from the treatment fee.

- Recycler/Treaters: 3 companies

These companies function for both as recyclers and treaters. Consequently the revenue comes from both treatment fee and sales of the recovered materials.

- Reusers: 3 companies

Reusers purchase the waste materials from the generators, and then mostly use them as the auxiliary fuels for boilers. However, cement companies usually only accept waste oil for free of charge to burn it as the fuel for their rotary kilns.

The Study Team selected 19 candidate facilities located within Cavite, Laguna, Metro Manila, Zambales, Tarlac and Cebu. The geographical distribution of TSD operators surveyed is given in Table 2.3.1 below.

Table 2.3.1 The location of TSD Facilities Surveyed

Location	Number of facilities
Cavite	2
Bulacan	4
Laguana	3
Metro Manila	2
Las Pinas	1
Tarlac	1
Subic	1
Bataan	1
Cebu	2
TOTAL	17

The following List shows the location and name of the Treater/Recycler with the type of the HW;

Table 2.3.2 The List and Details of TSD Facilities Surveyed

LOCATION	NAME OF COMPANY	TYPE OF WASTE
Bulacan	Enviro-Means Industry, Inc.	Solvent, painting waste
	Inchem Environmental, Inc.	Solvent, used oil, sludge
	Ecology Specialists, Inc.	Bunker oil, oil sludge
	Philippine Recyclers, Inc.	Used battery
Cavite	E. Technology Phils., Inc	Solder dross
	O.M. Manufacturing Phils., Inc.	Solder dross
Laguna	Integrated Waste Management Inc.	Medical wastes
	Oil Tech Resources, Inc.	Used oil
	Metaforms Trading	Sludge recycle
Las Pinas	Solchem Phils., Inc.	Solvent
Metro Manila	Ortho Consolidated	Solvent
	Bensan Indusries, Inc.	Used lub oil
Tarlac	Ampchem Industries	Solvent, used oil
Bataan	Philsin Marine Services, Inc.	Tanker sludge, used oil
Subic	Pacific Rare Metal, Inc.	Co, Ni, Se, Te concentration
Cebu	Cebu Common Treatment Facility	Plating waste water
Cebu	Benson Industries, Inc.	Used bunker oil

More detailed information is available in Annex 2.

2.3.2 Issues on Recycling, Treatment and Disposal of HW

(1) Shortage of TSD Facilities and Extending HW Storage

Most of the presently operating recyclers and treaters only deal with easily recyclable or treatable HWs, such as waste oil, solvents, and inorganic sludge containing valuable metals.

On the other hand, there is no treatment facility handling the HWs that need special processes for their detoxification, such as thermal decomposition, solidification, and so forth. There is no landfill facility available to safely dispose these HWs.

While TSD facilities development still remains a low priority in the Philippines, proper HWM is enforced in accordance with the RA6969 and its implementing rules and regulation of DAO92-29. As a result of this, a large amount of non-recyclable and non-treatable HWs is stored on site by generators, or handled improperly by recyclers and treaters.

Since HW treatment and landfill facilities often require highly advanced technologies and large capital investment, it will take much more time to build and operate all these facilities.

Therefore, one important issue to be addressed immediately is how to properly store the HW in the transitional period to full-scale development and operation of proper TSD facilities.

(2) Issues on Treatment and Disposal of Hazardous Treatment Residues

Many of the recycling and treatment processes of waste oil, solvents, and inorganic sludge, generate residues including toxic metals (mostly heavy metals). However, due to prohibition of incinerating treatment by the Clean Air Act, as well as so limited availability of landfill facilities, there is no proper way of handling these residues. Consequently, they are piled up on site or may be illegally damped somewhere.

(3) Data Availability, Law Enforcement, and Feasibility of TSD Facility Operations

The delayed development of TSD facilities in the Philippines comes from insufficient management of HW by the regulating authority, due to the limited availability of data on HW generation and treatment demand, unclear standards and criteria for HW treatment and disposal, limited capacity of law enforcement on HWM, and so forth. All of these issues create uncertainties regarding the prospects of TSD facility business in the Philippines.

In this respect, strengthened law and administrative enforcement on HWM is an important key of promoting TSD facility development and operation in the Philippines.

2.4 Initiatives Affecting HWM-Donors, NGOs, and Industry Groups

2.4.1 Donors

(1) History of Donors' Activities Affecting HWM

Over the past five years, a considerable effort has been put into studies and promotion for industrial pollution control (IPC), including both improving the legal and regulatory basis as well as partnership initiatives with industries, their associations and environmental NGOs. Much of these activities have been supported by international and bilateral aid agencies.

Donors' interest in HWM grew out of industrial pollution control (IPC). In 1989 the World Bank (WB), through its Metropolitan Environmental Improvement Program (MEIP) sponsored the Industrial Efficiency and Pollution Control Project (IEPC), in partnership with DENR. This prepared an environmental strategy for Metro-Manila, and identified HWM as a high priority, especially in the Laguna Lake watershed. This was followed up with Cleaner Production (CP) workshops and audits for industry, and obtaining funds from the European Union (EU) for a major study on HWM in the Metro-Manila and

CALABARZON region (the EnTec Study). An investment project on IPC using a WB loan was not taken up by the government since the Development Bank of the Philippines (DBP) thought it could get loan funds on more favorable terms elsewhere, but in the end, the alternative funding did not come through. The WB also undertook a study of pollution in Batangas, but the subsequent investment there is focussed on SWM. At present, the Bank has no other initiative in IPC or HWM, but it does have a loan to assist MWSS to improve its septic tank de-sludging capacity.

Other donors who have had some involvement with HWM include the Netherlands Government which sponsored a study of hospital wastes disposal in Metro-Manila area, UNCTAD which supported a study on the disposal of lead-acid batteries, UNIDO which has provided technical assistance to improve pollution control of tannery wastes, and the Japanese Government which prepared a short HW survey and made recommendations. During the 1990s, the Danish government assisted the Pasig River clean-up program, which was recently transferred to the Pasig River Commission, including a database on industries. The Asian Development Bank (ADB) has followed up this preparation work with further technical assistance to prepare a loan. Other environment-related activities included JICA assistance to MWSS for a sewerage master plan.

Yet other donors have concentrated on industries, through assistance on strengthening public policy and regulations, and advisory services to the private sector. This has gained momentum after the passage of Toxic and Hazardous Waste Act (RA6969). The USAID, through its Industrial Environment Management Project (IEMP) assisted EMB to prepare implementing regulations and action plan for the Act (DAO 92-29), and ADB has provided technical assistance to study legislation for implementing clean technology (EESSIS)

(2) Current Activities

USAID also supports the International Initiatives for a Sustainable Environment (IISE) Project which, through its work with EMB and its Philippines Environmental Partnership Program (PEPP), is primarily helping companies obtain environmental certification under ISO 14001. Indeed, ISO 14001 is a major incentive for export-oriented industries and their suppliers to improve their environmental management. Other donors interested in cleaner production in industry include IDRC (Canadian Aid) which is assisting the NGO Philippine Business for the Environment (PBE), as is the US Asia Environmental Partnership (USAEP) through its CTEM program (Clean Technology for Environmental Management). DOST with EMB has prepared a proposal for UNIDO to assist with a technology verification project called ETAC, which would include a Center for Cleaner Production especially to assist SMEs, to be housed in DOST.

The most extensive effort in this area at present is the UNDP-assisted Private Sector

Partnership in Managing the Environment (PRIME) project. This comprises four modules, with a project management unit located in the Board of Investment (BOI). Module 1, implemented by PBE, works with 73 business associations to prepare their action plans for the Philippines Business Agenda 21. Module 2, implemented through BOI, focuses on industrial ecology, to work with businesses and industrial estates to develop integrated resource recovery systems, and information linkages between firms. Module 3, implemented through DTI and BPS assists firms to prepare their environmental management systems (EMS) and achieve ISO 14001 certification. It also promotes product eco-labeling and greening of the supply chain. Module 4, implemented through EMB, seeks to strengthen environmental monitoring and laboratory services provided through the private sector, establishes an SME desk to offer a one-stop regulatory service, and a web-based information service on regulations and guidelines.

Yet other donors who are involved with the "brown" environmental sector include the Global Environment Facility (GEF), which, together with UNIDO, is about to study persistent organic pollutants (POPs). Finally, following the recent passage of the Clean Air Act, ADB is providing technical assistance to EMB, DOTC and PNB, to strengthen their organizations.

With this range of activities underway, it will be important to coordinate the recommendations emerging from the various studies and technical assistance, especially those intended to adjust roles and responsibilities and strengthen institutions.

(3) Summary of Projects in Industrial Waste Management

A. Toxic and Hazardous Wastes Management Study for the Philippines (by EnTec consultants)

This is a very comprehensive study, which was funded by the EC, and supervised by the World Bank. It has many sound recommendations that are too numerous to list here. However, due in part to changes in DENR/EMB administration and lack of staff, it has not received much attention by EMB. Due to the time when the study was undertaken, the reliability of information on HW arisings and net wastes from generators is rather weak, and one of the objectives of the present JICA-assisted study is to improve and up-date this information.

B. Philippines Environmental Partnership Program (PEPP)

Funded by USAID, PEPP works with EMB, BOI and DTI to develop incentives for businesses to improve their environmental management. PEPP is proposing: i) simplification of the permitting process to those industries who agree to undertake an EMS,

ii) amnesty period from enforcement for firms of 18 months providing they implement an EMS. DENR would also certify them in compliance, thus enabling firms to get financing from DBP and Land Bank

C. International Initiatives for a Sustainable Environment (IISE)

Funded by USAID, the program is co-managed by DENR/EMB and DTI. The project contractor is Chemonics. It focusses on industries located in coastal areas, particularly SMEs (but now also assisting larger enterprises), mainly in the Visayas and Mindanao. The program is assisting 300 firms to implement EMS, leading to ISO 14000 certification (75% of firms) with the objective also of lowering the cost of certification to smaller firms. Sectors include electroplating, semiconductors, paints and solvents. Legislation also being examined. Lessons to date: Amnesties for environmental performance and taxes may be counter-productive incentives.

D. Private Sector Participation in Managing the Environment (PRIME)

Assisted by UNDP, PRIME has 4 modules and a project management unit (PMO). Their activities are as follows:

PMO: Oversight of components, liaison with UNDP, produces "Business and Environment" magazine. Based in BOI.

Module 1. Business Agenda 21 (implemented by PBE). Works with 73 Business Associations which agree action plans with their members, undertake workshops.

Module 2: Industrial Ecology – "Closing the Loop" focus (with BOI and PEZA). Includes; i) "Eco-Estates" - works with 5 industrial estates to develop an Integrated Resources Recovery System (IRRS), with assistance of TetraTech (see report due Dec.2000) which examines products and wastes linkages among firms, ii) promotes products and waste linkages among firms (EMS, CP etc), and iii) runs waste exchange information system (IWEP). Issues it recommends for attention: need standard guidance in taxing wastes, improve inconsistent DENR monitoring, introduce "one stop shop" for permits, clarify rules & regulations to accredit Treaters and Haulers.

Module 3: Environmental Management Systems: (implemented by BOI and BPS with involvement of PEAP): Focus on assisting SMEs through training, implementation of EMS, assistance to achieve ISO 14,001, certification of environmental auditors, product eco-labelling, greening production chain. Issues: a test with 10 SMEs revealed that the documentation for ISO 14,000 is too onerous and expensive. There is almost a total lack of understanding of EMS among SMEs.

Module 4: Environmental Entrepreneurship (implemented by EMB): Focusses on i) facilitating environmental monitoring services by the private sector, initially through accrediting laboratories, and ii) creating an SME desk which will provide a one stop

shop and information center, including a web-based data-base. The module has also prepared a policy study on developing incentives for private entrepreneurship (TetraTech consultants). Issues: industry surveys can be best done by universities; seminar attendance increased when charges were imposed.

E. Clean Technology for Environmental Management (CTEM)

This USAEP-funded project focusses on greening the supply chain through i) helping firms achieve ISO14,000 certification, ii) establishing public-private partnerships, iii) arranging contacts with US companies, iv) arranging study visits, and v) establishing and operating a library on industrial environmental management. The library is the most comprehensive on this topic in the Philippines.

2.4.2 NGOs

Most of environmental NGOs in the Philippines mainly focus on green environment (natural environment protection and conservation) with some exceptions focusing on brown issues represented by SWM in the Metro-Manila.

As to HWM, however, some of NGOs carried out very active lobbying in the process of formulating the Clean Air Act. As a result, the article providing the prohibition of waste incineration was included in the Act.

There are also some NGOs actively involved in brown issues relating to waste management, namely 'The Philippines Business for the Environment (PBE)' and 'The Pollution Control Association for the Philippines Industry (PCAPI)'.

PBE is the one who formulated 'The Philippines Business Agenda 21' while PCAPI operates various education and training courses on cleaner production technology and environmental management system. PCAPI also operates so-called 'Waste Information Exchange Program'.

Involvement of such NGOs is very important as a channel of disseminating technologies and knowledge on HWM to business establishments as well as citizens. The roles of NGOs need to be duly considered in strengthening HWM capacity in the Philippines.

2.4.3 Industry Groups

Among the industry groups, the Philippines Chamber of Commerce and Industry (PCCI), is

going to be active in environment management activities. Presently, 73 regional CCIs are preparing the 'Environmental Action Plan (EAP)'. The actions to be taken for proper HWM should also be incorporated into EAP so that it might be disseminated at industry group level.

CHAPTER 3

PRESENT REGULATORY, ADMINISTRATIVE AND INSTITUTIONAL MECHANISMS

3. PRESENT REGULATORY, ADMINISTRATIVE AND INSTITUTIONAL MECHANISMS

Hazardous waste management in the Philippines can properly and effectively function if, among other key driving forces, there is a sufficiently strong regulatory system put in place and working as intended. The HWM regulatory framework consists of:

- Legal and Policy Framework
- Institutional Framework
- Administrative Systems and Procedures
- Technical, Legal and Logistical Support Services
- Financial and Economic Instruments.

The current status of these aspects of the present regulatory, administrative and institutional system for hazardous waste management will be discussed in this chapter. More detailed discussion is made in Annex 6.

3.1 Legal and Policy Framework

The present legal and policy framework of HWM derives from four bodies of documents, namely: 1) The Philippines Constitution of 1986, 2) Legislations and Administrative Issuances, 3) Jurisprudence, and 4) International Agreements.

3.1.1 Constitutional Basis

The Philippine Constitution of 1986 spells out the basic environmental policy with the following provisions: 1) Constitutional Policy on Environment, 2) Constitutional Policy on Resource Utilization, and 3) Constitutional Policy on Due Process and People Participation.

The Constitutional Policy on Environment is stated as an affirmation of the right of citizens to ecological security, as follows: It is the duty of the State *"to protect and advance the right of people to a balanced and healthful ecology in accordance with the rhythm and harmony of nature" (Art. II, Section 15).* This policy specifically mandates the State to undertake proper hazardous waste management as a precondition for ecological security of the people, their ancestors and ecosystems.

The Constitutional Policy on Resource Utilization states that the State owns all natural resources (forests, fisheries, timber, energy sources and lands or waters in the public domain)…only *"agricultural lands may be alienated by the State for private or individual use."* This is the principle of encompassing ownership of resources by the State – called the Regalian Doctrine. This policy determines the mode and ownership of

resource utilization for hazardous waste management. A particular case in point is the allocation and conversion of suitable space or land area for waste management uses to qualified parties – a critical concern in land use planning for local authorities in the light of competing and incompatible land uses. As it is, there prevails the "Not-in-my-backyard" or NIMBY syndrome, which severely curtails opportunities for suitable and successful siting of waste management facilities.

The Constitutional Policy on Due Process and People Participation mandates that due process and people participation should be integrated in hazardous waste management. This finds application in identification of sites for HWM premises, permitting for waste generators, transporters, treaters, and recyclers, monitoring and enforcement, and litigation and prosecution. People participation can also benefit proper HWM through community-based efforts such as segregation and proper disposal of post-consumer hazardous wastes. This policy can also mitigate the "Not-in-my-term-of-office" or NIMTOO syndrome among politicians through building up of a stronger constituency and public support for HWM measures.

3.1.2 Laws, Regulations and Jurisprudence

Five environmental laws are highly relevant to HWM, namely: (1) Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990, (2) Environmental Impact Statement System Decree of 1978, (3) Pollution Control Decree of 1976, (4) Clean Air Act of 1999, and (5) Ecological Solid Waste Management Act of 2001. The respective implementing rules and regulations (IRR), which are administrative issuances, are part of the law.

(1) Toxic Chemicals and Hazardous and Nuclear Wastes Control Act (1990)

Enacted in 1990, Republic Act or R.A. 6969 is the principal legislation on hazardous waste management. The Implementing Rules and Regulations (IRR) are spelled out in DENR Administrative Order No. 29, Series of 1992 (DAO 92-29). This law mandates control and management of import, manufacture, process, distribution, use, transport, treatment, and disposal of toxic substances and hazardous and nuclear wastes in the country. Five policy thrusts are defined for proper HWM, namely: 1) prohibition of HW entry even in transit, 2) promotion of waste management hierarchy of minimization (most preferred), recycling and reuse, treatment and disposal (least preferred), 3) HWM to avoid pollution, danger to the public, harm to plants and animals, or limit the beneficial use of environment, 4) HW generator's responsibility for proper HWM, and 5) HW generator to pay costs of proper treatment, storage and disposal ("polluter-pays-principle").

Implementation of DAO 92-29 started in late 1994, but has yet to operate fully well due to constraints in logistics, manpower and institutional capacity. In fact, the regulated community is

yet to be fully informed about the minimum requirements of RA 6969. More discussion particularly about the current administrative system of Title III, DAO 92-29 may be found in later sections.

(2) Pollution Control Decree of 1976

Issued as Presidential Decree or PD 984, this is the main legislation on managing and controlling air, water and land pollution due to emissions, effluents or discharges from point sources. The IRR were last revised as DAO 93-14 (air quality management) and DAO 94-34 and 94-35 (water quality management). The air and water quality standards for ambient and point sources include parameters for hazardous substances, such as heavy metals and toxic organic chemicals and substances.

(3) Environmental Impact Statement System Decree of 1978

The Philippines Environmental Impact Statement (EIS) System Decree (PD 1586) requires development plans, programs and projects to undergo an environmental impact assessment (EIA) process prior to approval and implementation. Project-based EIA process is being implemented by EMB while the programmatic EIA procedure is being piloted. The latest IRR are issued as DAO 96-37 and Procedural Manual (2nd edition, 1999) for project-based EIA and DAO 2000-5 for programmatic EIA.

Proponents of projects involving the use of toxic substances and generating wastes prescribed by DAO 92-29 are required to undergo an EIA and acquire an Environmental Compliance Certificate (ECC) prior to implementation. In case the project may pose significant public risk, an Environmental Risk Assessment is required as well. A process of public participation and social acceptability is a central requirement of the EIA. The main output is an environmental (and risk) management plan. Provisions for an Environmental Guarantee Fund, an Environmental Monitoring Fund, Multipartite Monitoring, EIA Review Support Fund, and liability statements of owner and preparer are incorporated in the latest procedural manual.

(4) Clean Air Act of 1999

The Clean Air Act (CAA) of 1999 (RA 8749) is significant to HWM in three ways. First, the CAA sets ambient air quality and emissions standards for a number of hazardous substances such as toxic metals and organic compounds such as dioxins and volatile hydrocarbons. Second, the CAA prohibits the use of incinerators which to date have presented a safe and cost-effective option for HWM. Third, the CAA makes EMB a line bureau, which allows the expansion of the entire organization involving creation of new staff positions and appropriation of additional budget items. These translate to new opportunities to strengthen staffing and funding of the HWM

regulatory system.

(5) Ecological Solid Waste Management Act of 2001

This most recent environmental law spells out the policy of an integrated, comprehensive and ecological approach to solid waste management (SWM) planning, programming and implementation. The Ecological Solid Waste Management Act (ESWMA) created institutional mechanisms, incentives and disincentives including penalties to implement the law. It establishes a National Solid Waste Management Commission consisting of 14 government and 3 private sector members, chaired by DENR and co-chaired by a private sector representative. The Commission's secretariat is the EMB. Also to be set up is a National Ecology Center, headed by the EMB Director, to provide consulting, information, training and networking services for implementing the provisions of the act.

The key strategy is to formulate a National SWM Framework that will be translated to local waste management plans by provincial, city and municipal SWM boards. There are legal innovations in this Act that can be adjusted to make the implementation of RA6969 more effective.

3.1.3 Jurisprudence

In terms of jurisprudence, there is not much to contribute to effective HWM. Litigation and prosecution of cases related to RA 6969 are still rare although recent episodes of violations are being legally acted upon. Overall capacity in the litigation and prosecution of RA 6969 cases needs strengthening as a critical element of proper and effective HWM.

3.1.4 International Agreements

The Philippines is a signatory to the Basel Convention on the Transboundary Movement of HW, the Montreal Protocol on Ozone-Depleting Substances, and the Rotterdam Convention on Prior-Informed-Consent (PIC) Procedure for Banned and Severely Restricted Chemicals and the Persistent Organic Pollutants (POPs).

Issued in line with the Basel Convention, DAO 94-28 and 97-28 allow the importation of some recyclable materials containing hazardous substances, namely scrap metals (lead acid batteries and metal-bearing sludge), solid plastic materials, electronic assemblies and scraps, and spent or used oil that contains no polychlorinated biphenyls (PCBs).

3.2 Regulatory Framework

Title III of DAO 92-29 specifically provides a general regulatory framework (see Figure 3.2.1 below) for implementation by government and compliance by industry in order to properly manage and control hazardous wastes.

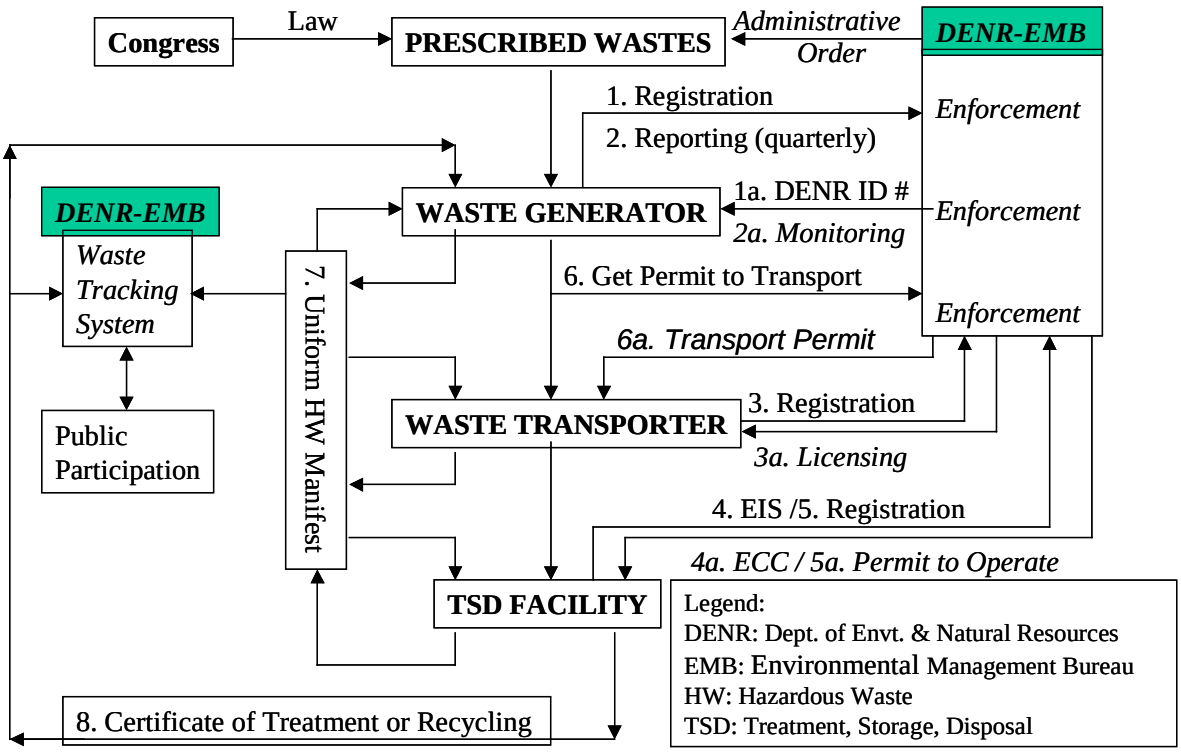


Figure 3.2.1 Regulatory Framework of HWM in the Philippines

The HWM regulatory framework consists of: a) Policy (DAO 92-29, Section 24) – sets preference for waste minimization and recycling; describes general performance standards, including protection of public health and natural resources; b) Classification of HW (DAO 92-29, Section 25) – names broad classes and subcategories of HW streams and exemptions; c) Waste Generators (DAO 92-29, Section 26) – requires notifying, reporting, planning and training by HW generators; d) Waste Transporters (DAO 92-29, Section 27); e) Waste Transport Record or Tracking System (DAO 92-29, Section 28); f) HW Storage and Labeling (DAO 92-29, Section 29); g) Waste Treatment, Storage and Disposal Premises (DAO 92-29, Section 30); and h) Import and Export (92-29 Sec. 31, also DAO 92-28 and 94-28).

As defined by RA6969 and DAO92-29, the corresponding key regulatory and administrative tasks include:

1) Notification, registration and reporting of HW generators,
2) Accreditation of HW transporters and issuance of HW transport permit,

3) Permitting of TSD facilities, including recyclers
4) Monitoring of HW using the Waste Tracking System
5) Database Management for the Waste Tracking System
6) Permitting of HW Importation and Exportation
7) Advocacy for effective HWM, including IEC and training
8) Surveillance, Compliance Monitoring and Enforcement
9) Policy research and formulation
10) HWM technology research
11) Establishment and administration of a Special Fund for projects and research.

Salient aspects of the existing administrative systems and procedures are discussed in the following sections and analyzed further in Section 3.5.

3.3 Administrative Mechanism

3.3.1 Notification, Registration and Reporting of HW Generators

Section 26 of DAO 92-29 requires generators of prescribed wastes, as defined in Section 25, to notify and register with the DENR (now EMB) and submit quarterly reports.

The HW generators are required to submit information about the type, quantity and fate of wastes they are generating, treating and disposing. First, HW generators information fill out the registration form. Subsequently, they regularly provide the above information in the form of the quarterly reports.

Inspection of the registered premises is done in order to validate the submitted data on the reported type, quantity and fate of waste generated, transported, treated and disposed as well as compliance to specific requirements and standards. The reportorial requirement also includes a contingency plan and data on personnel training, while the standards to be complied with application to on-site storage and labeling as well as pre-transport of waste, must also be checked.

The inspection and compliance monitoring of generators' facility in terms of DAO 92-29 requirements and standards are done at the field level by the regional monitoring teams. These frontline teams regularly visit the industrial establishments within their jurisdiction also as part of the PD 984 (air and water quality management) and PD 1586 (EIA/ECC) compliance monitoring.

3.3.2 Permitting of HW Transport and the Waste Manifest System

Sections 27 and 28 of DAO 92-29 mandate that HW must be managed from "cradle to grave".

This is to be attained through an action-linked hazardous waste tracking system (HWTS). The HWTS is based on the HW database and a manifest system that provides receiving and shipping documentation as well as certification of proper treatment, storage and/or disposal as shown in Figure 3.3.1 below.

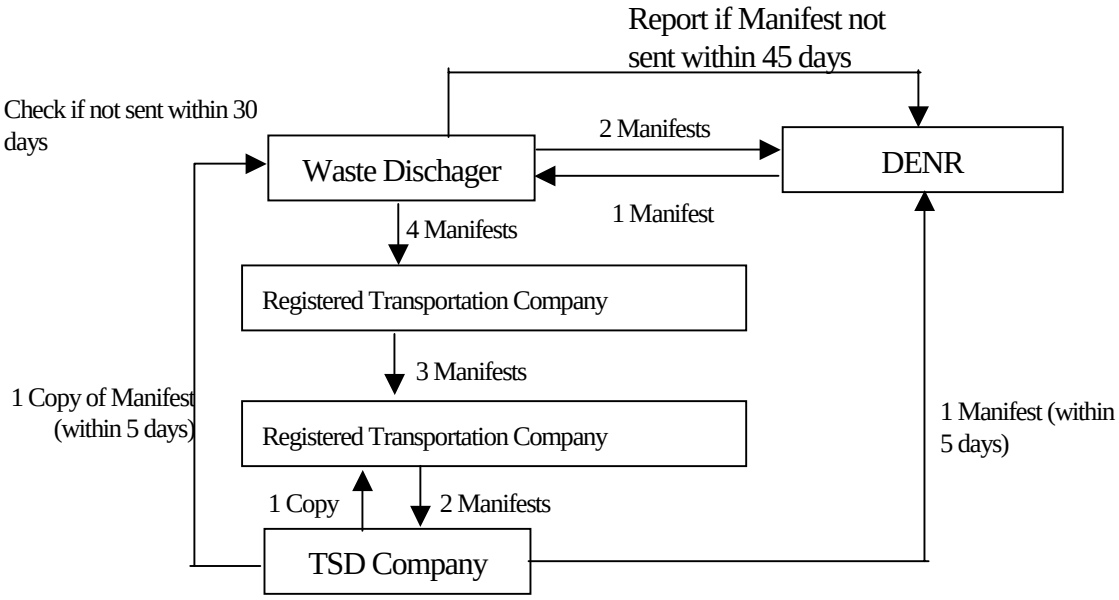


Figure 3.3.1 Flow Chart of HW Manifest System

The transport of HW from the premise of a generator to a TSD facility is subject to a permit from EMB and other requirements such as air, sea and land transport requirements of the Department of Transportation and Communications (DOTC). The Permit to Transport HW is issued, upon application and satisfaction of various requirements, to transporters registered with the EMB.

As shown in Figure 3.3.1, the Manifest must be signed and dated by the generator, then by each of the transporters / handlers along the way and then by the final recipient. The TSD premise owner or operator must send a completed and signed manifest to the generator and the EMB. This completes the manifest cycle and also ends the liability of the HW generator.

Registered HW transporters have the following obligations under RA6969:

- To put up warning signs, markings and other DOTC requirements regarding shipment of hazardous goods,
- To deliver the entire amount of waste accepted,
- To inform and receive rerouting instructions from the generator if the waste cannot be delivered,
- To inform EMB, DOTC and PNP if there is a spill or accident,
- To properly train and equip themselves with tools to contain spill,
- To cover the cost of any clean-up,
- To report in detail to EMB any accident, spill and containment or clean-up measures taken.

3.3.3 Permits of HW Treatment, Storage and Disposal Facilities

Sections 29 and 30 of DAO 92-29 prescribe six categories of HW treaters, recyclers and other TSD premises that may be allowed and permitted to accept, store, recycle, reprocess or dispose of HW. The permitting procedure for TSD facilities under RA 6969 and DAO 92-29 is still being developed, but there are interim guidelines for registration requirements.

Under the draft guidelines for registration and permitting of TSD premises under DAO 92-29, the TSD facility proponents/owners shall undergo the following procedure:

1) Submit an Environmental Impact Statement (EIS) to secure an Environmental Compliance Certificate (ECC),
2) Secure an Authority to Construct (A/C) Wastewater Treatment Facility (WTF) and Air Pollution Control Device (APCD) from the EMB Regional Office under the Pollution Control Law (PD 984), if WTF and APCD are part of the TSD premise,
3) Secure a Permit to Construct the TSD facility from the HWMS-EQD, EMB,
4) Secure Permits to Operate (P/O) WTF and APCD from EMB Regional Office,
5) Secure P/O TSD facility from HWMS-EQD, EMB,
6) Renew annually the P/O TSD facility with HWMS-EQD, EMB.

3.3.4 Permits of HW Import and Export

As a signatory to the Basel Convention and as required by RA 6969 and DAO 92-29, the import and export of HW have to be cleared by EMB. Two administrative issuances, namely DAO 94-28 and 97-28, allow the importation of certain recyclable materials containing hazardous substances but subject to notification and clearance of EMB. Some of the recyclers and treaters import HW and materials such as solder dross, solvents, used oil, used lead acid batteries, and selected plastic materials, among others, mainly from the OECD countries who are Basel Convention contracting parties or other non-contracting parties that have bilateral agreement with the Philippines.

The HW source can also be industries located and registered within export processing or economic zones, which are controlled by the Philippine Economic Zone Authority. The exportation of HW is usually done by local subsidiaries of multinational firms who recycle their by-products. The Bureau of Customs officers have been trained in appraising shipment of toxic chemicals and hazardous wastes and enforcing regulations relevant to RA 6969, the related DAOs and the Basel Convention.

3.3.5 Financial Administration

(1) Financing Schemes

The successful implementation of plans, programs and priorities of EMB on HWM will certainly depend on the funding made available. Based on EMB's Budget Briefing Folio for Fiscal Year (FY) 2001, RA 6969 is one of the "unfunded laws" that it is mandated to implement. Thus, RA 6969 implementation has not been given separate budget nor plantilla items for staff. This may be one reason why the 10-year old law (passed in 1990) has been hardly implemented so far.

The EMB and DENR have consistently sought innovative means of raising revenues from external sources to fund environmental measures and regulatory activities. Itg seems that there exist some good opportunities to augment the logistical support to DAO 92-29 implementation, namely: 1) Special Fund under RA 6969, 2) Environmental Revolving Fund under PD 1586, and 3) the creation of an Environmental Management Services Fund similar to the EIA Review Support Fund. For purposes of effecting proper and sustainable HWM through functional regulatory system and self-liquidating TSD facilities, various financial management schemes for HWM deserve further attention in this Study (see more discussions in Section 3.5 and Annex 6, Section 6.6).

(2) Administrative Fees

DAO 92-29 provides the fees for transactions on hazardous wastes. The schedule of fees, published recently as Memorandum Circular No. 2000-12, is as follows:

1) Registration of a HW Generator = PHP 600
2) Annual registration of a HW Transporter = PHP 500
3) Issuance of a HW Transport Permit = PHP 410/hazardous material
4) Permit to Construct a TSD Facility = PHP 5,000
5) Annual Permit to Operate a TSD Facility = PHP 5,000
6) Issuance of an Exportation or Importation Clearance for HW = PHP 2,000.

These fees appear relatively low and would not recover the actual cost of processing and evaluating the various documents and the follow-through requirements of each above-listed transaction. A discussion of a proposal to set up a special fund under RA6969 and an expanded version in terms of an environmental fund following the polluter pays principle is discussed in Annex 12.

3.4 Monitoring and Law Enforcement Mechanism

3.4.1 Hazardous Waste Tracking System

The HWM regulatory system is a key driving force in attaining the objectives of RA6969 and DAO 92-29. The Hazardous Waste Tracking System (HWTS) is the core of the HWM regulatory system.

3.4.2 Compliance Monitoring, Inspection and Enforcement

It is the specialized HWMS staff of the Central Office of EMB who usually conducts field-level compliance monitoring and inspection for RA 6969 requirements. Due to the limited HWMS staff and logistics, practical assistance from the Regional (and later the Provincial) Offices is necessary. Usually, the regional monitoring units (RMUs) organized for PD 984 implementation is tapped to do the RA6969 compliance monitoring through a checklist of DAO92-29 requirements. This is the first-level monitoring.

If any violation of RA 6969 is suspected or detected, specialized HWM staff from the Regional Office or the Central Office will be alerted to do follow-up or confirmatory inspection (second-level monitoring). If sampling and laboratory analysis is required, the HWM specialist can call on the regional or central laboratory for technical support (third-level monitoring).

Sampling and analytical laboratory services, analyst training and laboratory accreditation are to be provided by the EMB Central Laboratory. Analytical laboratory services may also be availed from some of the well-equipped EMB Regional Laboratories and about 20 EMB-accredited laboratories from the private and academic sector though most of them mainly deal with water quality analysis. The main issue here is upgrade of the EMB Central Laboratory for HW analysis, which is discussed in further detail in Annex 7.

3.4.3 Violations, Fines and Penalties

DAO 92-29 authorizes the DENR Secretary or his representative to monitor and inspect premises and, if there are any administrative violation established after due process, to impose a fine of not less than Ten Thousand Pesos (PHP 10,000) but not more than Fifty Thousand Pesos (PHP 50,000) for administrative violations. Any decision of the DENR Secretary on administrative cases can be appealed, or brought to higher authority, or after exhausting administrative remedies, questioned in a proper court of justice.

Administrative violations in relation to HWM (Section 41, DAO 92-29) include the following:

1. Refusing, obstructing or hampering legitimate inspection of premises
2. Failure or refusal to notify or register with the DENR/EMB about the type and quantity of HW generated and to provide quarterly report of waste generation
3. Failure or refusal to secure a permit or an authorization from DENR/EMB prior to transport, storage, or disposal of HW
4. Failure or refusal to secure approval from DENR/EMB prior to conduct of any importation or exportation of hazardous materials
5. Failure or refusal to comply with subpoena or subpoena duces tecum issued by the DENR Secretary or his duly authorized representative (i.e., EMB).

Criminal offenses and penalties in relation to HWM are mentioned under Section 42, DAO 92-29 and include the following:

1. Failure or refusal to submit reports, notices or other information, access to records or permit inspection of establishment where chemicals are manufactured, processed or otherwise held.

   The penalties are:
   1) Imprisonment of six months and one day to six years and one day and fine ranging from PHP 600 to PHP 4,000,
   2) For alien offender, deportation and re-entry ban,
   3) For offending partnership, corporation or association, consenting official is held co-principal,
   4) For offending government official or employee, dismissal from office and disqualification for any elective or appointive position.

2. Cause, aid or facilitate, directly or indirectly in the storage, importation or bringing into Philippine territory by any means of land, air or sea transportation or otherwise keeping in storage any amount of prohibited hazardous wastes in any part of the Philippines.

   The penalties are:
   1) Imprisonment of twelve years and one day to twenty years,
   2) For alien offender, also deportation and banned re-entry,
   3) For offending partnership, corporation or association, above penalty to be imposed on the managing partner, president or chief executive in addition to an exemplary damage of at least PHP 500,000,
   4) For offending government official or employee, also dismissal from office and disqualification for any elective or appointive position,
   5) Confiscation and forfeiture of proceeds of the unlawful act and instruments, tools or other implements,
   6) Obligation to transport or send back said prohibited wastes at own expense.

3.4.4 Litigation and Prosecution

Violations of the Pollution Control Decree of 1976 (PD 984) involving hazardous wastes and substances prescribed by DAO 92-29 are handled by the Pollution Adjudication Board (PAB). The PAB is a quasi-judicial body supervised by DENR and whose secretariat is based at EMB. The PAB cases are based on preparation of charges and evidence by DENR-EMB done through technical conferences with the alleged violator, evidence gathering and technical-legal evaluation. The PAB cases involving hazardous wastes or substances are usually those where effluent, emissions or ambient standards for air or water have been established for such hazardous substance(s). The PAB can impose administrative fines and penalties. The PAB can also issue a cease-and-desist order that will effectively close the operations of a polluting firm. However, PAB does not handle criminal offenses arising out of the pollution act under PD 984 nor RA 6969 as these are within the jurisdiction of the regular courts.

In contrast to PD 984, RA 6969 and DAO 92-29 have gone beyond defining administrative offenses by criminalizing certain violations. However, this provision has not been tested to any noteworthy level and the overall track record of litigation and prosecution in this regard is weak and ineffective for deterring further violations.

Litigation and prosecution of gross violations is rare but starting to take off with a few celebrated and well-publicized incidents. The recent cases involve the alleged illegal dumping of food flavoring waste by a well-known septage excavator into a Laguna de Bay tributary causing fish kill and the importation of hospital wastes from Japan to Manila. In the case of the illegal dumping, prosecution is hampered by weak technical protocols and expertise in preparing evidence and inexperience with prosecuting RA6969 violations.

3.4.5 Multipartite ECC Compliance Monitoring

As already stated, industrial facilities or premises that use toxic chemicals and/or generate hazardous wastes are required to undergo the EIA process and acquire an ECC under PD 1586 (see (3) of Section 3.1.2). To properly conduct environmental compliance monitoring, they are also required to establish an Environmental Monitoring Fund and a Multipartite Monitoring Team. The concept and procedure of multipartite monitoring in the EIA system may be explored for application to the case of hazardous waste generators. This can be advantageous in effective HWM with the limited human resources and logistical supports available.

3.4.6 Environmental Protection Officers

Based on DAO 92-29, the DENR Secretary can appoint Environmental Protection Officers (EPO) to assist him in the proper discharge of his functions under DAO 92-29. The functions of EPOs

are to investigate, inspect, obtain and examine documents and personal information, stop and detain transport vehicle, enter premises and confiscate toxic chemicals and hazardous wastes, and take other administrative actions deemed necessary to enforce the provisions of the Act.

So far, no DENR Secretary has ever appointed EPOs; neither the EMB Director nor the DENR REDs have ever been given official appointments as EPO although these officials have been performing RA6969 tasks as representatives of the Secretary.

3.5 Organizational Analysis of EMB as the HWM-Mandated Agency

Recognizing the importance of an effective regulatory system to proper HWM in the country, the JICA Study Team conducted an overall organizational audit of EMB as the HWM-Mandated. The main parameters for evaluation are the functions, structure, budget, key result areas and accomplishment of EMB in the performance of its mandate as required by RA6969 and DAO92-29. Due to the time constraint, rapid appraisal techniques were used, such as review of secondary literature (study reports, files and records), key informant interviews and mini-survey of the HWM-related tasks and capability of the Central Office and the Regional Offices.

3.5.1 EMB-DENR as the Mandated Agency

The Department of Environment and Natural Resources (DENR) is mandated by RA6969 to implement the provisions of the law. DENR carries out its mandate through the Environmental Management Bureau (EMB). The EMB is a new line agency that has a Central Office based at the DENR headquarters and 15 Regional Offices based at the various regional capitals. The EMB was initially a staff bureau and supervised by the DENR Undersecretary for Environment and Programs. As a line bureau, EMB has been reporting directly to the DENR Secretary. As an emerging line bureau, the EMB is in a favorable position to develop its institutional capacity for effective hazardous waste management through organizational development measures.

3.5.2 Inter-Agency Coordination and Stakeholder Participation

The assistance of other agencies and the other stakeholders can greatly boost the proper implementation of HWM policies, laws and regulations.

DAO92-29 of RA696 provided establishment of the high-level Inter-Agency Technical Advisory Council (IATAC) with duties to assist DENR in formulating rules and regulations for the effective implementation of RA 6969, among other things. The IATAC is composed of the following officials or their authorized representatives:

- Secretary of the Department of Environment and Natural Resources (Chairman),
- The respective Secretaries of the Departments of Health, Trade and Industry, Science and Technology, National Defense, Foreign Affairs, Labor and Employment, Finance, and Agriculture,
- The Director of Philippine Nuclear Research Institute,
- Representative from non-governmental organizations on health and safety (to be appointed by the President for a term of 3 years).

A Technical Working Group (TWG) on HWM was established by EMB to provide technical support to the Council. The TWG-HWM consists of representatives of the IATAC member-agencies and other sectors concerned as well. The Council is rarely convened (for 2 or 3 times only in the past), but the TWG-HWM has recently held meetings to establish the draft permitting procedure for TSD facilities.

Stakeholder participation in HWM is being pursued in line with the Constitutional policy on due process and people participation. DENR and EMB are among the leading government agencies that consult the public on policy-making and implementation.

3.5.3 EMB Central Office

(1) Functions

The major functions of EMB as a staff bureau are mandated in EO 192 as follows:

1. Formulation of possible legislations, policies and guidelines related to pollution control, environmental impact assessment, toxic chemicals and solid and hazardous wastes management;
2. Formulation of environmental standards on air and water quality, noise, and odor;
3. Technical and laboratory services to support formulation of environmental standards
4. Legal services to support formulation of environmental legislations, policies and guidelines, and adjudication of pollution cases;
5. Environmental information and awareness campaign;
6. Technical assistance to DENR Regional Offices (now transformed to EMB Regional Offices) on the implementation of laws on pollution control, environmental impact assessment and toxic chemicals and solid and hazardous wastes management.

In connection with the last function of providing technical assistance to DENR Regional Offices, EMB as a line bureau can directly enforce environmental laws. The coordination by EMB Regional Directors with DENR Regional Executive Director (RED) on environmental matters remains a key function. The authority to sign and issue Environmental Compliance Certificate (ECC) pursuant to the EIS Decree (PD1586) still rests with the DENR REDs since this function is

a delegated authority from the President of the Philippines to the REDs.

(2) Structure

With the enforcement of the Clean Air Act, the EMB became a line agency and gained the additional function of implementing the Act. Thus, organizationally, EMB is in a flux of transformation from a staff bureau to a line bureau with increased functions, expanded geographical reach, and hopefully also, improved staffing pattern and higher budgetary appropriation.

The existing structure of the EMB Central Office is shown in Figure 3.5.1. The existing structure is still a carryover from its staff agency structure and shall be transformed into a new one befitting a full-fledged line agency. The latest proposed structure as a line agency, as of November 2000, is shown in Figure 3.5.2. However, this new organizational transformation has not yet been officially determined in March 2001.

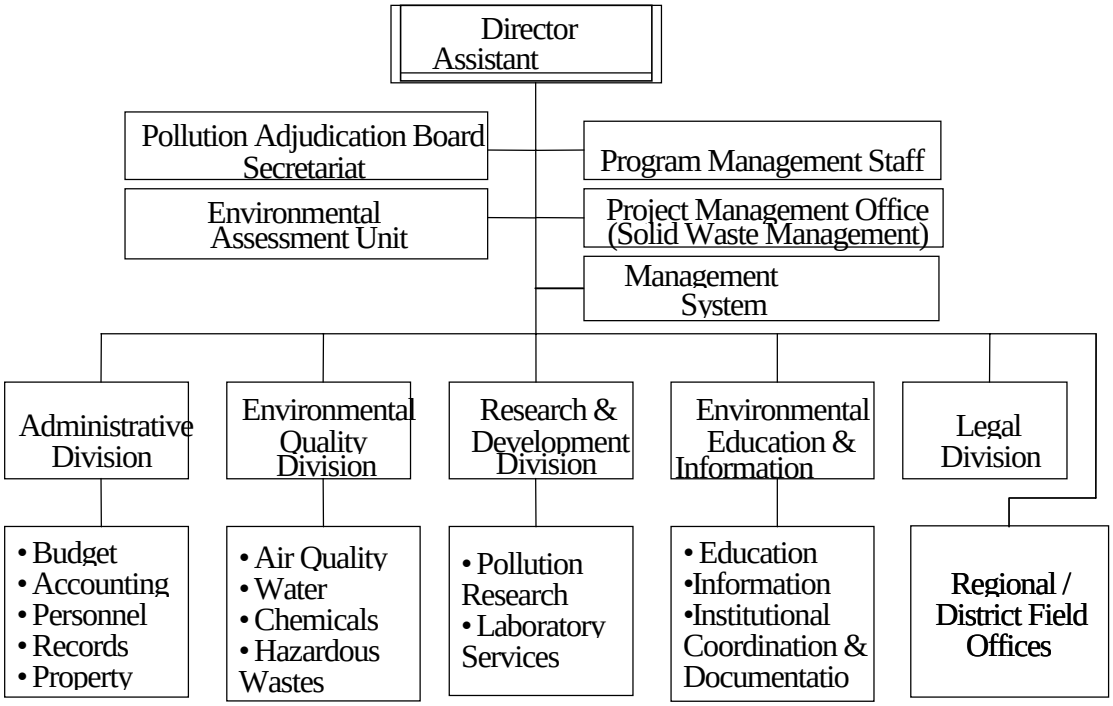


Figure3.5.1 The Existing Structure of the EMB Central Office

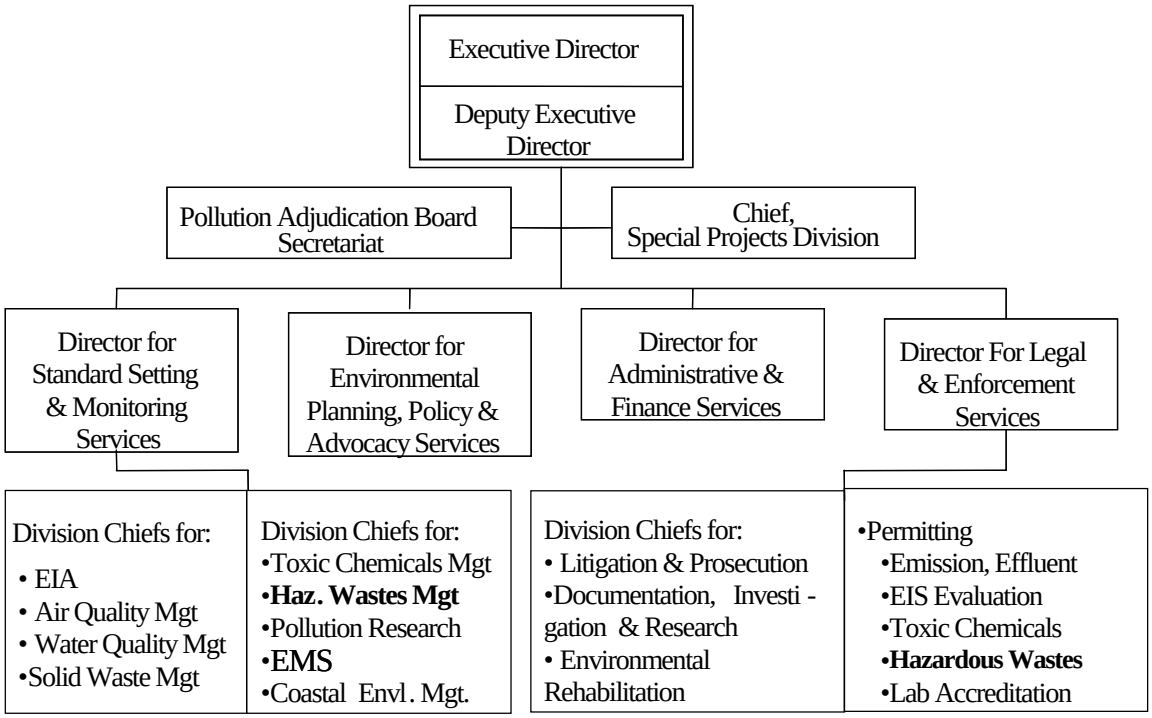


Figure 3.5.2 The Proposed Structure of the EMB Central Office (as of November 2000)

The existing structure of EMB Central Office (Figure 3.5.1) consists of five divisions, listed as follows:

1. Administrative Division
2. Environmental Quality Division – includes the Hazardous Wastes Management Section
3. Research and Development Division
4. Environmental Education and Information Division
5. Legal Division

The Offices of the Director and Assistant Director have five staff and *ad hoc* units attached, listed as follows with their respective functions:

1. Program Management Staff
2. Management Information Unit
3. Environmental Impact Assessment Unit
4. Pollution Adjudication Board Secretariat
5. Program Management Office (Solid Waste Management) – abolished by RA9003 of January 2001 and to be transferred to National Solid Waste Commission

It is worth noting that the two units in charge of implementing RA 6969, which are the Toxic Chemicals and Hazardous Waste Management Sections under the Environmental Quality Division, have no regular staff. The staff (and up to 1999 also the budget) of these units are

merely "shared" by the other regular units and are much limited compared to the mandated tasks at hand.

(3) Hazardous Waste Management Capability

The capability of EMB to administer the requirements of effective hazardous waste management can be analyzed in terms of the quantity and quality of the resources deployed, such as number of staff and its qualifications, logistical support and legal instruments available, among others.

1) Staffing

The HWM function is presently assigned to a specialized section under the Environmental Quality Division (EQD). This section was created out of the Chemicals and Hazardous Waste Management Section only a few years ago.

Table 3.5.1 compares the staff number (and the educational background) of the Hazardous Waste Management Section (HWMS) in the Central Office with other units of EQD as well as the staff numbers of the regional offices based on the recent survey by the JICA Study Team. (For detailed survey data, please refer to Annex Table 7.2.).

Table 3.5.1
Comparison of Staff Numbers and Qualifications in HWM Sections
Between Central and Regional Offices

	Number of Staff					
	Total	Technical Staff	Chemist and Chemical Eng.	Support Staff	EQD Section	HWM Section
EMB Central	**181**	**121**	**21**	**60**	**21**	**6**
EMB Regional						
1. Ilocos	34	25	4	9	17	8
2. Cagayan Valley	11	10	1	1	5	N/S
3. Central Luzon	43	27	8	16	23	5
4a.Southern Tagalog	40	18	3	22	25	N/S
4b.Southern Tagalog Islands	54	36	1	18	8	-
5. Bicol	58	25	6	33	21	6
6. Western Visayas	23	18	10	5	16	1
7. Central Visayas	47	25	19	22	16	N/S
8. Eastern Visayas	20	19	6	1	0	2
9. Western Mindanao	26	20	8	6	15	2
10.Northern Mindanao	19	17	4	2	10	N/S
11.Southern Mindanao	18	14	7	4	16	2
12.Central Mindanao	13	10	3	3	9	N/S
13.Caraga	30	15	4	15	8	2
14.ARMM	8	4	0	4	0	11
15.CAR	35	19	3	16	18	0
16.NCR	104	57	23	47	68	2
Regional total	**583**	**359**	**110**	**224**	**275**	**41**
Country total	**763**	**480**	**131**	**283**	**296**	**47**

N/S: not specified

Source: EESISS, ADB 1998.

The HWMS at the central EMB has presently a total staff of seven persons, a big improvement over the staff number of only two people some three years ago. Four of the staff members are either a chemist or a chemical engineer, one of whom serves as Section Chief. The fifth one is a public administration graduate trained as a HW Materials Handling technician, while the sixth and seventh ones are support staffs. Three other staff members, including the HWM Section Chief, have had various trainings in hazardous materials identification and handling.

There are 17 chemists or chemical engineers working in the other divisions of the Central Office (and 110 more from the regional offices) who can be the pool of expert staff available for HWM works. In fact, some of them have had training in HWM and occasionally performed HWM tasks, which has been also the usual case in the regional offices. EMB Central Office has a total of around 181 official positions (that means, the salaries and wages are chargeable to the regular budgetary appropriation).

Among the critical training needs of the staff are on the following topics: HW identification, characterization and labeling; standard sampling and laboratory analysis for HW materials; HW treatment technologies; contingency planning and emergency response procedures; inspection protocol for HW generators and TSD facilities; permit writing for HW transport and TSD operations; best practices in providing technical support to litigation and prosecution, and so forth.

In conclusion, a crucial constraint in effectively implementing RA6969 and DAO 92-29 is the dire lack of qualified personnel trained and experienced in HWM works. The current staffing of HWMS-EQD is a far cry from the optimal staffing required by the mandated tasks and the size of the regulated community.

2) Budget

The budget of the EMB compared to DENR and the other line agencies attached to the DENR is shown in Table 3.5.2. Before its transformation as a line agency in 1999, EMB's share in the total DENR budget was below 2%. With the transfer of operations of DENR field environmental offices to EMB Regional Offices, the EMB share almost doubled in Fiscal Year (FY) 2000. However, and it is still around 4% of the total DENR budget in FY2001.

This small share of EMB in the total DENR budget (only less than 5%) have started to be questioned by some lawmakers and environmental advocates.

The situation of the budgetary allocation for hazardous waste management is even more unfavorable. Since the passage of RA6969 in 1990 until 1999, the HWMS received no budget allocation of its own and was merely subsidized by the EMB's budget for operations. In FY 2000, the operations budget for the Project Management Office on solid waste management was shared

with the HWMS and Chemicals Management Section under the budgetary item "III. Operations, b. Toxic Substances and Waste Management".

Table 3.5.2
Comparative Analysis of Appropriations for EMB vs. DENR and other Line Bureau (FY 1998-2001)

OFFICE / BUDGET ITEM	1998		1999		2000		2001 (NEP)		2001 (GAB)	
	PHP x 1000	%	PHP x 1000	%	PHP x 1000	%	PHP x 1000	%	PHP x 1000	%
TOTAL DENR	5,649,804	100.0%	5,610,868	100.0%	5,683,132	100.0%	6,694,114	100.0%	6,241,271	100.0%
PS	3,166,645	56.0%	3,395,867	60.5%	3,288,983	57.9%	3,670,656	54.8%	3,670,656	58.8%
MOOE	1,485,149	26.3%	1,562,052	27.8%	1,976,685	34.8%	2,328,178	34.8%	1,885,535	30.2%
CO	998,010	17.7%	652,949	11.6%	417,464	7.3%	695,280	10.4%	685,080	11.0%
DENR	4,597,478	81.4%	4,738,626	84.5%	4,857,980	85.5%	5,792,327	86.5%	5,352,978	85.8%
PS	2,791,147	49.4%	2,854,925	50.9%	2,821,349	49.6%	3,105,910	46.4%	3,105,910	49.8%
MOOE	1,264,110	22.4%	1,302,789	23.2%	1,633,053	28.7%	2,030,283	30.3%	1,600,134	25.6%
CO	542,221	9.6%	580,912	10.4%	403,578	7.1%	656,134	9.8%	646,934	10.4%
EMB	**110,356**	**2.0%**	**218,152**	**3.9%**	**261,953**	**4.6%**	**276,498**	**4.1%**	**271,030**	**4.3%**
PS	34,152	0.6%	129,551	2.3%	131,402	2.3%	118,260	1.8%	118,260	1.9%
MOOE	66,204	1.2%	85,917	1.5%	127,281	2.2%	121,092	1.8%	115,624	1.9%
CO	10,000	0.2%	2,684	0.0%	3,270	0.1%	37,146	0.6%	37,146	0.6%
MGB	364,210	6.4%	394,906	7.0%	333,795	5.9%	386,732	5.8%	379,760	6.1%
PS	207,544	3.7%	276,529	4.9%	205,460	3.6%	288,759	4.3%	288,759	4.6%
MOOE	92,044	1.6%	87,986	1.6%	118,507	2.1%	96,473	1.4%	90,251	1.4%
CO	64,622	1.1%	30,391	0.5%	9,828	0.2%	1,500	0.0%	750	0.0%
NAMRIA	577,760	10.2%	259,184	4.6%	229,404	4.0%	238,557	3.6%	237,503	3.8%
PS	133,802	2.4%	134,862	2.4%	130,772	2.3%	157,727	2.4%	157,727	2.5%
MOOE	62,791	1.1%	85,360	1.5%	97,844	1.7%	80,330	1.2%	79,526	1.3%
CO	381,167	6.7%	38,962	0.7%	788	0.0%	500	0.0%	250	0.0%

DENR: Department of Environment and Natural Resources

EMB: Environmental Management Bureau

MGB: Mines and Geosciences Bureau

NAMRIA: National Mapping and Resource Inventory Authority

PS: Personnel Service Expenses

MOOE: Maintenance and Other Operating Expenses

Note: The total amounts for EMB do not jibe exactly with the figures provided by EMB.

Source: Finance & Management Services, DENR, December 2000.

Out of the total EMB budget of PHP127,281 thousand on MOOE basis in 2000, PHP33,446 thousand is allocated for HWM administration.

Meanwhile, there is hardly any budget allocated for Capital Outlay in HWM. It means that, no fund is available for purchasing field equipment, laboratory space and instruments for HW sampling and analysis.

3) Equipment and Technical Support

The HWMS has serious handicaps in terms of equipment. Only one working computer and one shared telefax line are available for its technical staff of five. This poses a serious bottleneck in their work and transactions with their clients. For transport, the unit has no vehicle for its own administrative tasks and can only make use of other units' pooled vehicles.

The HWM staff's office space is cramped up and there is much limited space for the secured storage of the largely confidential files. Thus, some important files (e.g., HW generator registration documents, waste manifest and transport permit applications, complaints file, etc.) are placed as bundles in an exposed part of the building.

Laboratory and research support to HWMS is provided by the Laboratory Services and Pollution Research Sections of the Research and Development Division (RDD). The in-house laboratory is one of the better equipped public laboratories for chemical and bacteriological analysis of environmental samples and undertakes the accreditation of other laboratories.

The EMB central lab is being proposed as a reference lab for the characterization of hazardous materials (see detailed discussion in Annex 7). However, RDD also has limited staff expertise, laboratory facilities and equipment for sampling and analyzing hazardous wastes. Only one staff has a training on hazardous waste characterization and handling.

EMB has accredited some 20 external laboratories to work on environmental samples, but the array of analytical parameters are also limited in terms of HW characterization. An assessment of the laboratory capability to support HWM is given in Annex 6 while some data are summarized in Table 3.5.2.

(4) HWM Activities, Accomplishments and Targets

EMB's HWMS is the nerve center and hub of the HWM regulatory system mandated by RA6969. The performance of HWMS is therefore critical in shaping HWM effectiveness in the country.

The programs, activities, key result areas and accomplishments of the HWMS-EMB for FY2000 are shown in Table 3.5.3, along with the indicative targets for FY2001 to FY2005. Each of the "Key Result Areas" identified by EMB represents a regulatory task or support activities under RA6969 or DAO92-29.

Table 3.5.3 EMB HWM Accomplishments for the Year 2000 and Targets for Fiscal Years 2001 to 2005 (1)

Key Result Area	Performance Indicator	2000 Target	2000 Accom-plishment	2001 Target	2002 Target	2003 Target	2004 Target	2005 Target
1. Formulation & Finalization of Guidelines	Guideline formulated / finalized							
1.1 Schedule of Fees	Guideline finalized / disseminated	1	1					
1.2 Registration Procedure for TSD Facilities	Guideline formulated / finalized	1	1 formulated					
1.3 Compliance Monitoring Checklist	Guideline formulated / finalized	1	0					
1.4 Updating & Revision of Table 1 of DAO 92-29 on Prescribed HW	Guideline formulated / finalized	1						
1.5 Special Funds	Guideline formulated / finalized	0		1				
1.6 Licensing/Accreditation of HW Transporters	Guideline formulated / finalized	0		1				
1.7 Re-injection of HW into Abandoned Geothermal	Guideline formulated / finalized	0		1				
1.8 Other DAO, MC or guidelines	DAO, MC or Guideline formulated / finalized / disseminated		10	5	5	5	5	5
2. Inspection & Monitoring of HWG & TSD	No. of HWG inspected / monitored	20	25	60				
2.1 Inspection of HWG registrants	No. of HWG facilities inspected			300	450	600	600	600
2.2 Monitoring of registered HWG	No. of HWG facilities monitored			324	594	999	1539	2079
2.3 Inspection of TSD registrants	No. of TSD facilities inspected			25	30	35	40	40
2.4 Monitoring of registered TSD	No. of TSD facilities monitored							
3. Updating of List of HW Generators								
3.1 Processing of HWG registration	No. of registrations processed	1000	442	1,000				
	No. of DENR ID no. issued		442	900				
3.2 Encoding of HWG registrations	No. of new registries encoded in DB	1000	1079	900				
3.3 Evaluation of HWG quarterly reports	No. of quarterly reports reviewed			2158				
3.4 Updating DB with quarterly report data	No. of registries updated in DB	0	0	2158				
3.5 Investigation of possible violations	No. of investigations completed			108				
4. Updating of List of HW Transporters	No. of list set up	1						
	No. of registered transporters	15	56	175	250	300	350	400
5. Updating of List of Treaters & Recyclers	No. of list set up	1						
	No. of registered treaters & recyclers	15		25	30	35	40	40
6. Convening of IATAC-TWG	No. of meetings convened	4		4	4	4	4	4

Table 3.5.3 EMB HWM Accomplishments for the Year 2000 and Targets for Fiscal Years 2001 to 2005 (2)

Key Result Area	Performance Indicator	2000 Target	2000 Accom-plishment	2001 Target	2002 Target	2003 Target	2004 Target	2005 Target
7. Issuance of Permits / Clearances								
7.1 Transport Permit	No. of permits processed / issued	55	204	175	250	300	350	400
7.2 Importation Clearance	No. of clearances processed / issued	12	13	12	12	12	12	12
7.3 Export Clearance	No. of clearances processed / issued	12	13	12	12	12	12	12
7.4 Permit to Construct and Operate TSD Facility	No. of permits processed / issued	0	0	25	30	35	40	40
7.4.1 Treatment Facility only	No. of permits processed / issued							
7.4.2 Storage Facility only	No. of permits processed / issued							
7.4.3 Disposal Facility only	No. of permits processed / issued							
8. Capacity-Building for Regional Offices	No. of trainings conducted	2		10	10	10	10	10
9. Updating / Improvement of HW Database								1
9.1 Redesign of HW Database	Redesigned database	1	1	1	1	1	1	
9.2 Updating of HWG Registration Database	Updated HWG Registration DB	1000	1079	1079	1979	3929	5129	6929
9.3 Setting-Up & Mgt. of Waste Tracking System	WTS set up			1				
9.3.1 Transport Permits Database	Transport Permit DB operational			1	1	1	1	1
9.3.2 Treatment Premises Database	Treatment Premises DB operational			1	1	1	1	1
9.3.3 Storage Facilities Database	Storage Facilities DB operational			1	1	1	1	1
9.3.4 Disposal Facilities Database	Disposal Facilties DB operational			1	1	1	1	1
9.3.5 HW Manifest Databse	HW Manifest DB operational			1	1	1	1	1
9.4 Inspection & Monitoring Reports	Insp'n. & Monitoring DB operational				1	1	1	1
9.5 Sanctions (Notice of Violations, Fines)	Sanctions DB operational				1	1	1	1
9.6 Litigation & Prosecution	Litig'n. & Prosecution DB operational				1	1	1	1
9.7 General Corrspondence and Others	Gen. Correspondence DB operational				1	1	1	1

Table 3.5.3 EMB HWM Accomplishments for the Year 2000 and Targets for Fiscal Years 2001 to 2005 (3)

Key Result Area	Performance Indicator	2000 Target	2000 Accom-plishment	2001 Target	2002 Target	2003 Target	2004 Target	2005 Target
10. Implementation of JICA project on formulation of a National Framework Plan for	Framework Plan prepared	1	ongoing	1				
11. Intervening Activities								
11.1 Written response to inquiries prepared	No. of letters/memoranda prepared		318	500	550	600	650	700
11.2 Public assistance / Help desk	Inquiries addressed		156	125	100	113	125	138
11.3 Aid to legislation	Hearings attended, review prepared		3	10	15	20	25	30
11.4 Resource speaker to seminars/trainings	Lectures delivered		25	25	25	25	25	25
11.5 Participation in HWM seminars	Person-days attended			25	25	25	25	25
11.6 Inter-Agency coordination, meetings	Meetings held		14	15	20	25	25	25
11.7 Aid to litigation & prosecution	Meetings held, Hearings attended			10	15	20	25	30

1) Policy-Making and Guidelines Preparation

The EMB Central Office is responsible for preparing guidelines to implement the provisions of DAO92-29 and for formulating new policy as needed. This function is important in clarifying implementation and enforcement of provisions of RA6969 and DAO 92-29.

In terms of formulation and finalization of guidelines, HWMS accomplished one guideline (Schedule of Fees) in FY2000. For FY2001, the target is set at 5 guidelines formulated, issued and disseminated. This is a very important function that needs to be further accelerated. The ability of HWMS to tap the field support of the Regional Offices in HWM implementation depends to large extent on availability of clear, easy-to-follow and applicable guidelines.

Apart from formulating guidelines and monitoring the performance of these policy instruments in the field, the Central Office staff must also disseminate the guidelines to the stakeholders. This can be done through preparation and dissemination information materials, holding of awareness seminars and multi-media campaign among the regulated community and other stakeholders. Finally, the level of implementation and effectiveness of the policy tools in attaining the purpose at the field level must be tracked, evaluated and fed back to the policy review and adjustment process. So far, there is little organized effort in this regard.

2) Registration of HW Generators

The registration activities started in CY 1992 after the promulgation of the IRR (DAO 92-29). The compliance with the registration requirement was however so low, reaching only around 400 registrations by CY 1998. With the increase of the staff from 2 to 5 persons and the renewed campaign in CY 1998, the registration within CY 1999 and 2000 almost tripled the accomplishments over the previous six years (an addition of around 800).

The current registry of HW generators encoded by the JICA-HWM Study Team stands at 1,079. However, of this number, only 719 registered firms have reasonably complete data useful for effective waste tracking. As the registration data are in need of updating, a new round of re-registration by the 1,079 registered firms is needed.
Additionally, using the initial findings of the JICA HWM Study, EMB is launching a plan for an intensified nation-wide inventory of HW generators that will increase the size of the registry by 1,735 firms in this calendar year (CY) 2001 (see Table 3.5.3). The target is the total number of manufacturing firms that are considered within the priority industrial sectors of EMB, namely: 1) semiconductor and electronics industries, 2) power generating plants, 3) electroplating firms, 4) paint manufacturing companies, 5) chemical industries, and 6) hospitals.

3) Issuance of Permits

EMB currently issues the following permits relative to DAO92-29: transport permit, importation clearance for recyclable hazardous wastes, export permit and, in very few instances, storage permit. The HWMS issued 204 transport permits in Year 2000 compared to its target of only 55. This figure is expected to increase proportionate to the number of HW generator registrations. The issuance of importation and export clearances is leveled off at 13 and is expected to stay in this range for the next few years as long as agreements under the Basel Convention and government policies on importing recyclable hazardous wastes will not change much.

With the approval of new guidelines for permitting of TSD facilities targeted for this year, it is anticipated that this HWMS task will take a major attention and priority input from the staff. There are 28 recyclers/treaters who will be the first TSD facility permit applicants once the guidelines are officially issued. With the intensified campaign for HW registration of generators, the market for HW TSD services will also increase and thus also the demand for EMB staff time for performing the key tasks of permitting, inspection, monitoring and law enforcement.

4) Facility Inspection, Monitoring and Enforcement

The facility of a HW generator or TSD operator applying for registration and DENR ID number is a candidate for "must"-inspection so that the submitted data can be verified and any deficiency or misrepresentation in the filled-up registration form can be uncovered. Facility monitoring is done for those already registered HW generators mainly to check the veracity of the quarterly report and compliance to DAO92-29 provisions on a selective as well as random basis. Inspection and monitoring are also done when there is an indication that a serious violation may exist or a threat to environment and public health may be imminent.

The targets for the inspection and monitoring of HW generators (HWG) and Treatment, Storage and Disposal (TSD) facilities were over-accomplished for the FY2000 (25 facilities accomplished compared to 20 facilities targeted). For FY 2001, the target is being increased to 60 facilities inspected or monitored. This target appears large considering the limited staff of the HWMS and the supporting Regional Offices. However, the target is still very small compared to the number of facilities that should be regularly inspected and monitored. This issue will be discussed again in a later section.

One crucial technical constraint in HWM is the lack of a written protocol for inspection and monitoring of facilities. The current practice is the preparation of a facility- and case-specific plan by the assigned inspection / monitoring team. Due to limited staffing and equipment, the inspections tend to be mere ocular surveys and interviews. As cited already, HW sampling and analysis is hardly done, although a member of the laboratory group is usually involved in the

inspection / monitoring team.

Another gap is the inadequate expertise in the inspection of contaminated sites due to accidental spills or leakages of toxic and hazardous materials or illegal and improper disposal of HW. An essential skill in such situations is the ability to provide timely and adequate emergency response (e.g., containment, rescue, evacuation, clean-up, liability investigation) as well as the remediation, rehabilitation and restoration measures. Moreover, HWMS staff will require skills and knowledge for adequate and proper gathering and preparation of evidence necessary for the possible litigation and prosecution efforts and future contingency planning.

5) Waste Tracking System and Database Management

The Hazardous Waste Tracking System is currently built around the HW Generators' Database and their Quarterly and Manifest Reports, the Transport Permits issued, TSD facilities inspection reports, reports from the regional monitoring units, and walk-in complaints from the public. The HW Generators' database is the only one that is computerized, while the other information sets mentioned are manually searched, retrieved and analyzed.

The manual filing systems for these information sets are physically difficult to maintain due to the lack of space, staff and systematic procedure. The various information sets are consolidated according to the name of the company issued with a distinct DENR Identification Number. Certain issuances, such as the permits and notices of violation, are also archived in separate folders or ring binders. Much of the thicker documents submitted by the generators, including the quarterly reports are mostly filed in bundles and stored in a nearby space. It appears that encoding these information sets in the electronic database will help in better storage, retrieval, analysis and handling and allow for better database management. The electronic database is in a poor condition, but it was recently upgraded and expanded under this JICA study.

Once the unregistered companies start joining the official regulated community of EMB, it is crucial that the HWM electronic database system is adequately designed, equipped and staffed to meet the gargantuan challenge and deliver the expected results. A good computer-aided HW management information system offers of course a great advantage in terms of enhancing staff productivity and alleviating the chronic lack of personnel dedicated to HWM and the error-prone, strenuous and time-consuming manual filing system.

The expectation and need of the HWMS is to have a management information system that can accommodate the large volume of data and allow manipulation of such data sets to provide the necessary decision support for various aspects of HWM tasks.

6) Capacity Building for HWM in Regional Offices

The EMB Regional Offices are the field implementers of environmental laws, rules and regulations. However, their expertise, staffing and logistics for implementing RA6969 are severely constrained. The role of the regional offices so far is limited to survey of registrant-generators and monitoring of registered HW generators and the transmittal of the results to EMB Central for proper action. Some regional offices such as NCR and Region IV also conduct the registration and inspection of HW generators.

Thus, the Central Office must be undertaking everything possible to build capacities of its regional staff for RA6969 implementation. In Year 2000, the HWMS managed to conduct only 2 trainings for regional staff that provided general orientation on Title III of DAO92-29.

Given the higher target for the registration of HW generators, there is a need to prepare the regional staff to undertake their tasks under the project on the national inventory of HW generators. These tasks include the following:

1) Conduct information, education and communication (IEC) campaign among the potential HW generators within the regional jurisdiction;
2) Receive, record and evaluate registration forms
3) Verify registration data through secondary information and interview survey
4) Conduct facility survey of registration applicants, including HW sampling and analysis, and prepare and submit facility survey report
5) Assign temporary DENR I.D. number and endorse registration application to the Central Office
6) Conduct additional information gathering for the Central Office
7) Follow-up status of registration-applications at the Central Office
8) Receive processed registration applications and the permanent DENR I.D. number, if issued by the Central Office
9) Encode new registration data or update regional database, if available
10) Transmit DENR I.D. number and other IEC materials on proper HWM to registered firms
11) Monitor registered firms and prepare and submit monitoring reports to Central Office.

Table3.5.4 presents the possible roles of the regional offices in the national inventory of HW generators and the staff requirement to effectively attain the key result areas, using NCR as the example. The key result areas will be the same for all the regional offices but the target number of events (e.g., registrations) differ among them. Regions 4, 3, 7, 11 and 1 are also crucial in HWM as most generators are under their jurisdictions.

7) Project Implementation

There is one ongoing project that the HWMS implemented in Year 2000, and that is this ongoing JICA-funded HWM Master Plan Study. As mentioned already, HWMS plans to implement this Year 2001 a related project on the National Inventory of Hazardous Waste Generators. This project is an offshoot of the JICA Master Planning Study's survey results and forecasting activities that reveal that the potential size of the regulated community is at least ten bigger than the registered generators. EMB is thus barely scratching the surface, so to say.

The national Inventory will focus on six selected industrial sectors, as a starter, but eventually will have to address the rest of the potential HW generating firms in the entire country.

8) Intervening Activities, including Networking and IEC Campaign

The HWMS staff reported varied intervening activities in CY 2000. Intervening activities refer to tasks that are not planned but expected to occur on a walk-in basis. These include dealings with the various stakeholders, such as answering queries from the regulated community, maintaining some kind of a helpdesk or assistance to public requests and complaints, technical assistance to law- and policy-making functions of the DENR Secretary or Congress or the President, giving and attending seminars, coordinating with other agencies and industry groups, and assisting prosecutors and attending hearings on violations of RA6969 and DAO92-29, and the like. These tasks may be better categorized the networking and information, education and communications functions of HWMS. Networking with various stakeholders and enhancing their awareness for effective HWM is a key result area of the HWMS and its regional counterparts.

Table 3.5.4 Key Result Areas and Level of Effort for Implementing Hazardous Waste Management Regulatory System by Regional Offices (1)

Table 3.4. Key Result Areas and Level of Effort for Implementing Hazardous Waste Management Regulatory System by Regional Offices (1)

Office: NATIONAL CAPITAL REGION (NCR)			**NATIONAL CAPITAL REGION (NCR)**										
Key Result Areas	**unit LOE**	**Target**	**2000 Baseline**	**2001 Target**		**2002 Target**		**2003 Target**		**2004 Target**		**2005 Target**	
	pd/g	**%**	**# events**	**# events**	**person-day**	**# events**	**person-day**	**# events**	**person-day**	**# events**	**person-day**	**# events**	**person-day**
Regional Target for Registration (NSO data)			**2,034**	**365**		**316**		**328**		**325**		**326**	
HW Generators													
Existing registered HW Generators			**200**										
IEC Campaign for Registration	0.25	125%		456	114	395	99	410	102	406	102	407	102
Receive & Evaluate Registration Form	1	80%		365	365	316	316	328	328	325	325	326	326
Inspect premises & prepare Inspection Report	3	60%		219	657	189	568	197	590	195	585	195	586
Take HW sample(s) and submit to laboratory	1	30%		66	66	57	57	59	59	58	58	59	59
Do laboratory analysis and prepare analytical report	15	30%		66	985	57	852	59	885	58	877	59	879
Endorse to CO for DENR ID no. Issuance	0.2	80%		**365**	73	**316**	63	**328**	66	**325**	65	**326**	65
Receive & Evaluate Quarterly Reports	0.5	50%		912	456	789	395	820	410	812	406	814	407
Monitor premises	2	30%		197	394	169	339	264	528	362	725	460	920
Update HWG Database	0.2	100%	200	**200**	40	**565**	113	**880**	176	**1,208**	242	**1,533**	307
Investigate complaints & prepare report	5	7%		40	198	62	308	85	423	107	537	130	651
Conduct Technical Conference with Potential Violators	1	3%		17	17	26	26	36	36	46	46	56	56
Prepare Notice of Violation	2	2%		11	23	18	35	24	48	31	61	37	74
Impose Administrative Sanction against Violators	2	1%		6	11	9	18	12	24	15	31	19	37
Assist in litigation and prosecution	5	1%		3	14	4	22	6	30	8	38	9	46
Total person-days	38.15				3,411		3,210		3,707		4,097		4,514
Total person-years					16.2		15		18		20		21
TSD Premises													
Existing HW TSD premises			10	10		10		12		15		17	
IEC Campaign for Registration	0.25	125%		13	3	3	1	3	1	3	1	3	1
Receive & Evaluate Registration Form	1	80%		10	10	2	2	2	2	2	2	2	2
Inspect premises & prepare Inspection Report	3	100%		10	30	2	7	2	7	2	7	2	7
Take HW sample(s) and submit to laboratory	3	100%		10	30	2	7	2	7	2	7	2	7
Do laboratory analysis and prepare analytical report	25	100%		10	250	2	60	2	60	2	60	2	60
Endorse to CO for DENR ID no. Issuance	0.2	100%		10	2	2	0	2	0	2	0	2	0
Receive & Evaluate Application for Permit to Construct	1	100%		10	10	2	2	2	2	2	2	2	2
Inspect premises & prepare Inspection Report	3	100%		10	30	2	7	2	7	2	7	2	7

Table 3.5.4 Key Result Areas and Level of Effort for Implementing Hazardous Waste Management Regulatory System by Regional Offices (2)

Office: NATIONAL CAPITAL REGION (NCR)			NATIONAL CAPITAL REGION (NCR)										
Key Result Areas	**unit LOE**	**Target**	**2000 Baseline**	**2001 Target**		**2002 Target**		**2003 Target**		**2004 Target**		**2005 Target**	
	pd/g	**%**	**# events**	**# events**	**person-day**	**# events**	**person-day**	**# events**	**person-day**	**# events**	**person-day**	**# events**	**person-day**
Inspect premises & prepare Inspection Report	3	100%		10	30	2	7	2	7	2	7	2	7
Endorse to CO for Issuance of Permit to Construct	0.2	100%		10	2	2	0	2	0	2	0	2	0
Receive & Evaluate Application for Permit to Operate	1	100%		10	10	2	2	2	2	2	2	2	2
Inspect premises & prepare Inspection Report	1	100%		10	10	2	2	2	2	2	2	2	2
Endorse to CO for Issuance of Permit to Operate	0.2	100%		**10**	2	**2**	0	**2**	0	**2**	0	**2**	0
Monitor and prepare monitoring report	2	100%		0	0	10	20	12	25	15	30	17	34
Investigate complaints & prepare report	2	20%		2	4	0	1	0	1	0	1	0	1
Conduct Technical Conference with Potential Violators	2	20%		2	4	0	1	0	1	0	1	0	1
Prepare Notice of Violation	3	15%		2	5	0	1	0	1	0	1	0	1
Impose Administrative Sanction against Violators	1	5%		1	1	0	0	0	0	0	0	0	0
Assist in litigation and prosecution	5	3%		0	2	0	0	0	0	0	0	0	0
Total person-days	44.85			0	329	0	99	0	104	0	109	0	113
Total person-years					1.6		0.5		0.5		0.5		0.5
Transport Permit													
Transport permits issued in previous year			200										
Receive & Evaluate Application for Transport Permit	1	100%		200	200	565	565	880	880	1,208	1,208	1,533	1,533
Inspect premises & prepare Inspection Report	2	20%		40	80	113	226	176	352	242	483	307	613
Endorse to CO for Issuance of Transport Permit	0.2	100%		**200**	40	**565**	113	**880**	176	**1,208**	242	**1,533**	307
Monitor transporter premises and vehicle	1	20%		40	40	113	113	176	176	242	242	307	307
Investigate complaints & prepare report	2	10%		20	40	56	113	88	176	121	242	153	307
Do sampling & laboratory analysis & report	16	5%		10	160	28	452	44	704	60	967	77	1,227
Conduct Technical Conference with Potential Violators	1	8%		15	15	42	42	66	66	91	91	115	115
Prepare Notice of Violation	1	5%		10	10	28	28	44	44	60	60	77	77
Impose Administrative Sanction against Violators	1	1%		2	2	6	6	9	9	12	12	15	15
Assist in litigation and prosecution	5	1%		1	5	3	14	4	22	6	30	8	38
Total person-days	25.2				587		1,658		2,584		3,546		4,500
Total person-years					2.8		7.9		12.3		16.9		21.4
Planning, Implementation, Monitoring & Evaluation													
Do Annual Work & Financial Planning & Reprogramming	10	100%	1	1	10	1	10	1	10	1	10	1	10
Do Quarterly Accomplishment Reports & Work Plans	10	100%	4	4	40	4	40	4	40	4	40	4	40
Do project monitoring & evaluation & adjustment	30	100%	2	2	60	2	60	2	60	2	60	2	60
Total person-days	50				110		110		110		110		110
Total person-years					0.5		0.5		0.5		0.5		0.5
Capacity-Building Activities	3	100%		6	18	6	18	6	18	6	18	6	18
GRAND TOTAL PERSON-DAYS					**4,437**		**5,077**		**6,504**		**7,862**		**9,237**
GRAND TOTAL PERSON-YEARS					**20.2**		**23.1**		**29.6**		**35.7**		**42.0**

The key stakeholders are:

- IATAC and its TWG members
- The regulated community: HW generators, transporters, operators of treatment, storage and disposal (including landfill) facilities
- Neighboring communities and local government units of generators, TSD facility operators and transport routes
- Local government units participating in the Memorandum of Agreement between DILG and DENR on monitoring of HW in their respective jurisdictions
- Media and environmental NGOs and POs
- Suppliers of environmental goods and services dealing with HWM, including technical consultants and legal practitioners
- Other national government agencies involved in HWM and law enforcement, such as the Bureau of Customs, Philippine National Police, Philippine Coast Guard, Department of Justice, Regional Trial Courts, Court of Appeals and Supreme Court, Department of Science and Technology, Department of Trade and Industry, Board of Investments, Philippine Economic Zone Authority, etc.

3.5.4 EMB Regional Offices

The EMB Regional Offices were set-up only last year in pursuit of the provisions of the Clean Air Act that mandated the conversion of EMB into a line agency as the lead implementer of this Act. The EMB Regional Offices were organized out of the environmental management sector of the DENR Regional Offices' Environmental Management and Protected Areas Services (EMPAS). The transfer of staff, budget and equipment from the DENR Regional Offices to EMB Regional Offices is still being completed and formalized at various degrees.

(1) Function and Structure

The EMB Regional Offices, headed by Regional Directors who report to the EMB Director at the Central Office, discharge the mandate of the Bureau at the regional level. The EMB Regional Offices are the frontline implementers of environmental laws, rules and regulations that EMB is mandated to enforce. The existing structure of the EMB Regional Offices (Figure 3.5.3) derives from what was handed down by the respective mother DENR Regional Offices and modified by the nature and extent of merging with EMB as a line agency.

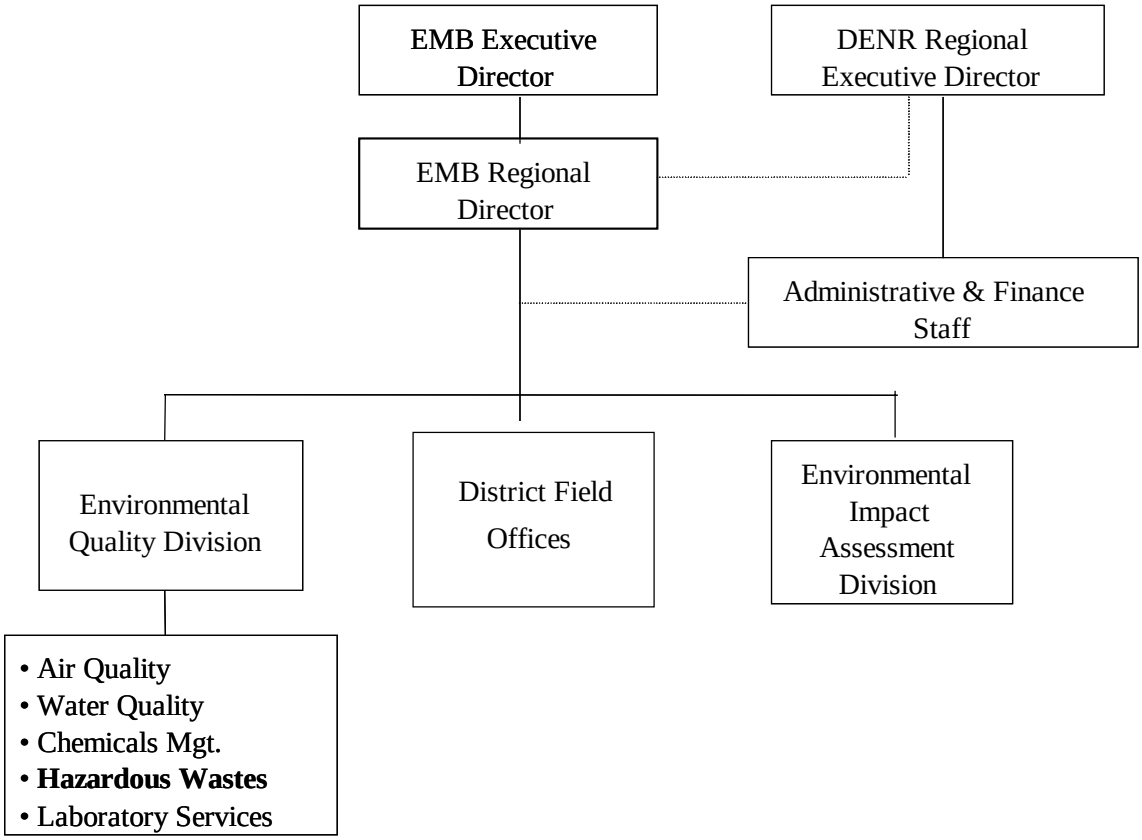


Figure 3.5.3 Organizational Chart of EMB Regional Office

The most common feature is the inclusion of two technical divisions, namely the ad hoc EIA division and the EQD division, and an administrative and finance unit. HWM is handled by the EQD. Usually, HWM tasks are assigned on a part-time basis to one or several staff. Some Regional Offices have formed a separate section to handle RA6969 matters, that is, toxic chemicals management and hazardous wastes management.

The budget and staff of the EMB Regional Offices are still in the process of being segregated from those of the respective DENR Regional Office. This budget-cleaning and re-staffing exercise is to be completed by FY2001. Based on the JICA-HWM Study Team Survey, selected data were consolidated about the staffing, budget and other information related to HWM capability of the current regional operations of EMB, as shown in Table 3.5.2. It appears that, among the regional offices, those with the most number of potential HW generators also have the highest staff and budget.

The organizational structure of the Regional Offices will have to be adjusted again once the proposed changes at the Central Office take shape. The latest proposed organizational chart coincides with the proposed function-based concept of the Central Office structure (Figure 3.5.4).

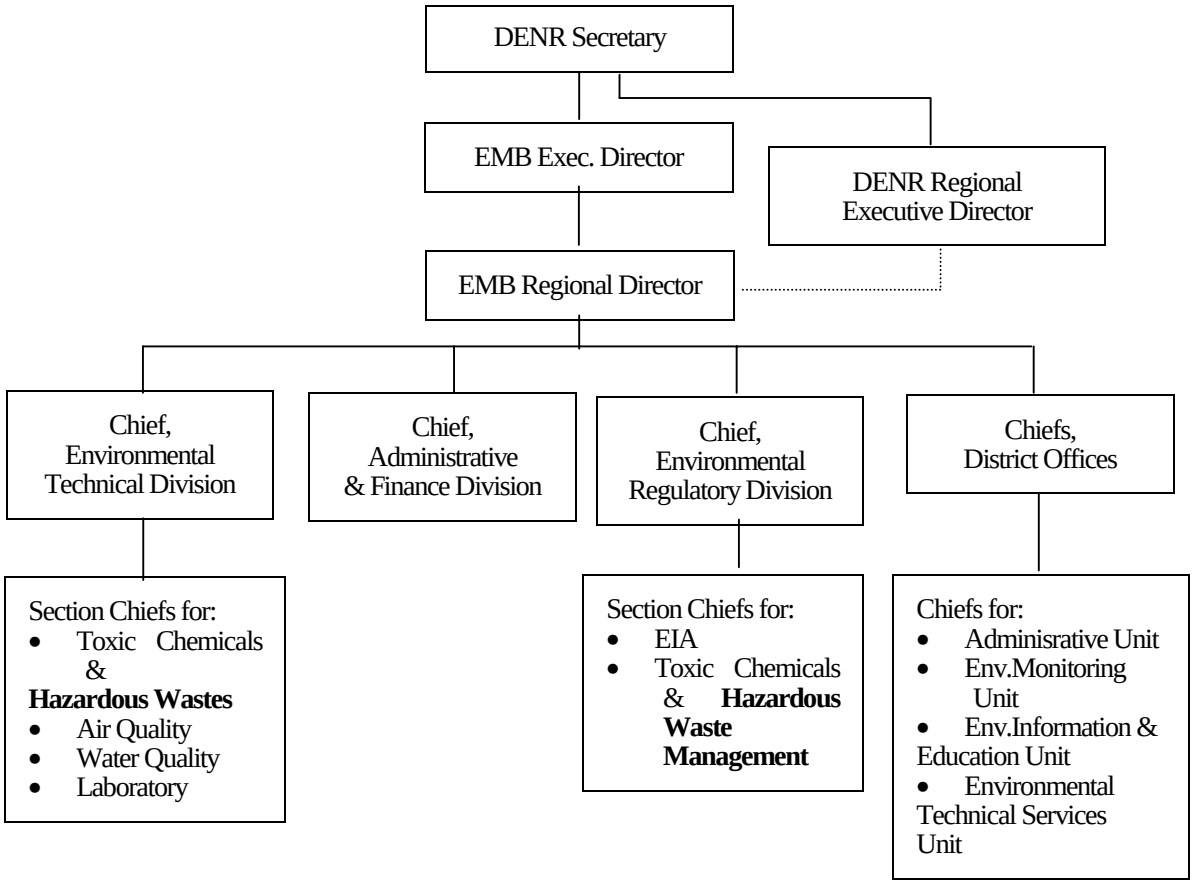


Figure 3.5.4 Proposed Organizational Chart of EMB Regional Office (November 2000 Version)

(2) HWM Capability of Regional Offices

Based on a brief survey done by the JICA Study Team, the various Regional Offices demonstrate similar management practices with regards to HWM. The KRA is limited to surveying and monitoring of HW generators as well as responding to public complaints or reports of violation.

Half of the regional offices have no permanent staff assigned exclusively to HWM, but the tasks are shared among one or two persons and in some cases among the whole staff of the EQD. Thus, training on HWM is also open to any staff member. The same is true for the budget and equipment, which are shared with the other units of the Regional Office.

The HWM tasks assigned by the Central Office have been limited to:

- Accepting, reviewing and forwarding generator registrations, applications for transport permit and TSD permit to operate
- Receiving complaints and conducting inspections, as needed, and
- Collecting additional data and doing other filed tasks as required by the Central Office
- Sampling of HW and laboratory analysis when regional laboratory is existing and capable.

However, the role of the regional offices in HWM and implementation of RA6969 and DA92-29 will become much more significant as more and more responsibilities will have to be devolved by the Central Office.

3.6 Overall Assessment of EMB As The Organization Mandated For HWM

The results of the overall assessment of the organizational capability of EMB to undertake its mandated tasks under RA6969 and DAO92-29 are summarized in an organizational audit matrix presented in Annex Table 6.9. Each mandated task and key result area defined by the HWMS staff, the regional staff and those recommended by the JICA-HWM Study Team have been included as items for assessment. Each of the assessment items was rated according to a simple scale of three levels, namely either 'adequate', or 'average', or 'needs improvement'. The results are.

All of the audited items have already been discussed in the foregoing sections. It can be concluded that EMB meets its self-determined targets. However, it is currently not adequately equipped to meet fully its mandates and commitments under RA6969 and DAO 92-29. In fact, EMB has barely implemented the various essential tasks activities identified in its Orientation Manual and Action Plan that were prepared in 1995. Taking into context the magnitude of the job (perhaps less than 5% of the potential HW generators are captured by the regulatory system) and the critical situation posed by ineffective HWM in the country, as highlighted by the results of the organization audits here, EMB will require bold innovations and stronger resolve to match the challenges of HWM.

The best option of EMB is to maximize the potential benefits it can gain from being transformed to a line agency, such as greater mandate with the addition of the Clean Air Act and the Ecological Solid Waste Management Act including:

- Independent Vision-Mission-Goal-Objective and core values setting,
- Expanded national and regional coverage with direct control and supervision over regional and district offices
- Legal basis for requesting increased budgetary appropriations as line agency
- Legal basis for requesting increased staffing complement as line agency

CHAPTER 4

PRESENT CONDITIONS ON

AND

ISSUES IN PRIVATE SECTOR PARTICIPATION IN

HWM

4. PRESENT CONDITIONS ON AND ISSUES IN PRIVATE SECTOR PARTICIPATION IN HWM

4.1 Characteristics of the HWM Sector

The HWM sector is quite complex, compared to municipal waste management. Its main characteristics are:

a) Production and Service. It involves a wide range of firms in their normal production processes as well as firms which are providing a public environmental service by recycling and disposing of wastes,

b) Linkages. It depends on a chain of actors. These are Generators (the firms which produce wastes as part of their production processes), Recyclers (firms which re-process wastes for re-sale: they obtain their income mainly from sales, with a smaller portion coming from charges to generators for relieving them of their wastes), and Treaters (firms which treat and dispose of wastes which are not recyclable: they obtain their income from charges to generators and recyclers for relieving them of their wastes). In addition, Transporters form another category of companies that transport wastes between generators and recyclers, and also from generators and recyclers to treaters. These categories are recognized and regulated by EMB. In practice, there is some overlap in these categories as firms may undertake more than one activity.

c) Leakages. Due to weak monitoring and enforcement and low awareness, both among the firms and the public, many wastes are disposed illegally, especially those originating from SME (small and medium enterprise) generators who can escape detection and both the costs of paying for treatment and the fines for violation. This problem is aided by the existence of unregistered transporters, who offer cut-price rates and then dump the HW in open land or water or in municipal waste dumps. Severe impacts on the environment and public health are the result, together with significant reductions in the volumes available for recycling and treatment,

d) Insecurity. Due partly to weaknesses in regulation and enforcement, and also to the precarious economic position of many generators in the SME sector, the flow of wastes to recyclers and treaters is often sporadic and uncertain. This has the effect of inhibiting growth and development in these businesses. It also means that much of their business is confined to a few large firms, most of which are multi-nationals, who can afford the service and are keen to legally dispose of their wastes to avoid a poor public image and to conform to the requirements of ISO 14001.

e) Poor Incentives. Apart from weak enforcement, the HW sector suffers from the lack of incentives to improve the market and the performance of recyclers and treaters.

Existing incentives are outlined elsewhere in this Annex, and Annex 12 proposes improvements.

In summary, the sector's key characteristics that require attention of policy-makers are:

a) A small and insecure current market for recycling and treating HW, but a potentially large one,
b) The need for enforcement and incentives to realize the potential market,
c) Policy measures crafted to focus on reduction as well as treatment of HW, and to address SMEs as well as large scale generators,
d) Measures to improve technologies of recyclers and treaters, and
e) Measures to address the phasing and timing of increasing supply of HW with capacity for recycling, storage and treatment

4.2 Analysis of Stakeholders

In preparing for improvements in policy and business conditions in the sector, a key issue is the recognition of the stakeholder interests and measures to incorporate them into the planning and development process. The selection of sites for HW storage and treatment is, perhaps, the best known issue due to the "not in my back yard" (NIMBY) syndrome, but stakeholder management goes far beyond this, to form a supportive environment and incentives for better overall HWM. The following table identifies the stakeholders, their main objectives, and the tools and actions they use to achieve those objectives:

Table 4.2.1 Objectives, Tools and Actions by Stakeholders in HWM

STAKEHOLDERS	OBJECTIVES	TOOLS/ACTIONS
HW GENERATORS		
Large Industries	- Support HWM. - Increasing concern over limited HW disposal facilities	- Adopting ISO 14,000, EMS,CP. - Undertaking on-site treatment, storing HW, exporting HW
Small & Medium Industries	- Generally un-aware of HW problems, dangers, legislation (esp. small industries). - Wish to avoid detection by EMB, BIR	- Sell HW to Traders, Recyclers. - Dump/throw residues
HW TRANSPORTERS		
Registered Transporters	- Increase business. - Simplify regulatory Procedures. - Acquire treatment capability	- Contracts with generators
Unregistered Transporters	- Increase business. - Reduce costs	- Avoid registration. - Contact generators, reduce prices.
TREATERS/ RECYCLERS	- Expand business. - Seek monopoly or regulatory protection, tax breaks on recycled products. - Integrate with transporters	- Lobby Regulators, Politicians. - Contact generators

STAKEHOLDERS	OBJECTIVES	TOOLS/ACTIONS
INDUSTRY ASSOCIATIONS	- Gradual support for env. and HW mgt.,especially since ISO 14,000, BA 21, establishment of PBE, PCAPI, PAEAP.	- Information, promotion to membership, training, set up waste & CP exchanges.
ENVIRONMENTAL NGOs	- Promote better environmental quality	- Lobby for better HW mgt., but maybe critical of HW disposal facility, especially if community objects.
LOCAL COMMUNITIES	- Protect local environmental quality and property values	- NIMBY syndrome will probably give rise to resistance when specific sites identified.
POLITICIANS	- Re-election. - Support constituents' concerns. - Deliver public services. - Attitude to HWM ambivalent. - Support as national principle, but may oppose facility	- Legislation. - Campaign in communications media.
CONSULTANTS, LABORATORIES	- Obtain more HW business	- Lobby agencies, improve capabilities.
PUBLIC AGENCIES		
DENR/EMB	- Env. Quality. - Promote regulation. - MBIs - HWM principles *Integrated media approach *Polluter pays *Waste mgt. hierarchy *Cradle to grave responsibility	- Regulations, EIA, ECC, notification, monitoring, enforcement, outsourcing functions, env. funds.
LLDA	- Improve water quality of Laguna Bay. - Reduce pollution in Bay watersheds. - Undertake appropriate development	- Water quality regulations. - Wastewater charges, env. fund. - Enforcement and penalties. - Sponsor dev. projects.
DoH	- Protect public health. - Control hospital wastes.	- Env. health education. - Regulate hospitals and clinics. - Health impact assessment
DPWH	- Develop national infrastructure	- Construct solid waste transfer stations and landfills, access roads, clean waterways.
DoTC	- Control road transport.	- License haulers.
DoST	- Improve industries' technical and management systems.	- Establish industrial standards. - Promote ISO14,000, EMS, CP.
HLURB	- Guide efficient land use. - Promote Housing and building health and safety	- Zoning regs, devt. permits. - Construction permits.
NEDA	- Promote economic development. - Minimize health and env. costs. - Minimize public finance exposure.	- Establish econ. sector priorities. - Project evaluation and approval through ICC process
MoF	- Fiscal discipline. - Revenue generation.	- Fiscal and monetary policy. - Income and capital gains taxes. - Financial controls of LGUs. - Financial guarantees, subsidies.
DTI/BOI/PEZA	- Promote private sector and inward investment.	- Tax incentives. - Advice to industries. - Customs duties.
CCPSP	- Evaluates/guides BOT process	- BOT law, project evaluation. - Contract approval.
LOCAL BANKS (DBP, LBP, MDF)	- Development lending, equity	- Environment lending windows

STAKEHOLDERS	OBJECTIVES	TOOLS/ACTIONS
DBM	- Govt. budgets and expenditures. - Minimize govt. admin. costs	- Budgetary allocations and controls on govt. depts. - Control staff plantillas.
LOCAL GOVTS. and MMDA	- Economic and social development. - Environmental quality - Local services	- Municipal waste management business permits. - Property and business taxes. - Enforce env. regulations. - Municipal waste management.
INTERNATIONAL AID AGENCIES AND BANKS	- Economic and social development. - Environmental protection.	- Grants, loans, guarantees. - Technical assistance, training.
HW – NEW TSD FACILITY		
GOP AGENCIES	- Policy and regulatory guidance.	- Permitting, monitoring
PROJECT SPONSOR	- Achieve efficient TSD dev. & operation.	- Contracts, monitors Proponent. - Assists in coordination w. govt.
PROJECT PROPONENT	- Project Development	- Proposal, raises financing contracting, supervision, closure, decommissioning.
SITE OWNER	- Provision of site	- Purchase/transfer.
PLANT CONTRACTOR	- Provision of HW plant under Proponent	- Design, construction, commissioning, training.
PLANT OPERATOR	- Operation & mgt. under Proponent	- Develop procedures, provide and train staff, operate and monitor facility, decommission.

The above information can be used as a checklist for the steps and timing required to implement a HW management-strengthening program.

4.3 Present Policies of GOP

GOP's overall objectives are to reduce, and eventually eliminate HW from the environment. RA 6969 and its subsequent regulations and procedures provide the initial legal basis to begin implementation of this policy. The strategy to support the policy is contained in the aphorism "reduce, reuse, recycle, dispose". This establishes a hierarchy for the production and consumption process, namely:

a) Reduce the volume and toxicity of inputs to industrial production. These include water, power, and materials. With regards to materials, substitution of less toxic and recycled materials for virgin materials is encouraged. This approach also includes improvements in the efficiency of the industrial process through waste minimization and use of cleaner technology,

b) Reuse parts and materials that are often discarded, but, with minimal attention (such as cleaning and refilling) can be brought back into the production process. Examples include bottles and other containers,

c) Recycle and Recover materials that have been changed, or mixed in the industrial process, into new materials and for inputs to other industries. Examples include paper, plastics, putrescibles, used oils, solvents, precious metals, batteries, and

d) Dispose only those materials that cannot be further recycled. Disposal may include processing to reduce toxicity, solidification and landfilling to render hazardous materials inert, or heat decomposition, which could also produce heat or energy as a byproduct.

The policy tools to achieve these objectives include i) regulation, ii) financial and economic incentives, including market-based instruments (MBIs), iii) institutional changes to improve economic efficiency, iv) financial resources, and v) knowledge promotion, including awareness-raising, training, and technical advice

4.4 Current Incentives and Disincentives for HWM

There are a wide range of incentives and disincentives that affect the behavior of the private sector in HWM. Many of these are not intentional, but are the by-product of other policies and also of the lack of policies and their implementation. The major forces affecting the HW sector are i) macro-economic conditions and the growth rate of the industrial sector, ii) public awareness and pressure, iii) information and knowledge, iv) market-based policy instruments, v) financial resources, vi) public infrastructure and land-use management, and vii) regulatory system. This section discusses the current incentives and disincentives for HWM according to these forces.

4.4.1 Incentives

(1) Public Awareness and Pressure

The communications media is very active and frequently reports environmental problems. Community groups and NGOs are also active. However, the health and environmental effects of HW are not well understood, not only among the public, but also among most of the management and workforce of SMEs. Consequently, concern tends to be diffused, and only rarely results in concerted action. Large industries are aware and are lobbying for treatment facilities.

(2) Information and Knowledge

GOP has recognized the above problem and established a number of initiatives to address it. These have mainly focussed on collaboration with industry associations (through PBE and the PRIME and IISE programs) and PMS for individual industries, as well as assisting EMB to improve its monitoring capability, and strengthening waste exchange and information

exchange programs. Initial results look promising, and deserve continuing support. (see Annex 4)

(3) Market-based Instruments (MBIs)

These are hardly used in the Philippines, despite recommendations from a number of studies. With regards to HWM these could include fines for non-compliance, taxes on virgin input materials, tax relief on recycled products, environmental charges on utilities (water and power), charges for HW production and disposal, deposit-refund schemes, permit trading, and risk/liability insurance. At present, despite recommendations from a number of studies, few of these measures have yet been implemented in the Philippines, except for the LLDA (see below) and three cases of fines for egregious non-compliance. The issues concerning MBIs are therefore also addressed below in the section on "Disincentives". In fact, with the exception of the tax on mining wastes (which is intended to rehabilitate affected communities) the only environmental tax on industrial pollution is the charge on BOD loading imposed by LLDA on industries discharging into the Laguna lake watershed. LLDA could introduce this tax due to its effective monitoring ability, which is mainly due to its ability to retain earnings that are re-invested in staff and equipment. The program so far has been a qualified success. BOD levels have decreased by 8%/year since the initiation of the program in 1997 (although much less than the projected 50% in the first year). Out of the revenues to LLDA, 60% are allocated to its administration, 20% go to fund wastewater collection and treatment projects, and 20% are put into a trust fund to assist municipalities and industries improve their environmental management.

(4) Financial Resources

Due to the high cost of debt and the small size and volatility of the stock and securities market in the Philippines, much of the financial resources for environmental investments by industry are from internally generated funds. Most of the investments have been made for wastewater treatment and air pollution control. This has had the effect of reducing the gross arisings of HW, but producing a considerable amount of concentrated liquids and sludges, which most industries cannot treat on-site, but need the services of recyclers and treaters. More detail on the structure of financial resources is discussed below (see section 4.5). Resources are available for environmental investments, but, due to the high cost of capital requirements on collateral and rates of return, and cumbersome application procedures, much of the available resources have not been used, and availability of loan capital has not been much of an incentive.

4.4.2 Disincentives

(1) Economic Level and Growth

Perhaps the most important disincentive for the private sector to invest in HWM is the level of economic development and the negative or slow growth being experienced over the past few years and possibly also in the near future. Especially for SMEs, which often operate on a batch and/or intermittent basis, with low capital investment and slim profit margins, flat, or negative economic growth leaves no space for environmental costs. The most that might be achieved are very low cost "housekeeping" activities for waste minimization. This implies that careful attention needs to be paid to the willingness and ability to pay for HW treatment, especially by SME generators, for which special regulatory, tax and subsidy programs may be needed.

(2) Lack of MBIs

Some of the inaction on MBIs may be attributed to lack of political will, but the major immediate impediment is the weak monitoring by EMB. Monitoring HW is essential for implementing fines, disposal charges, permit trading and liability insurance, and must be implemented before a comprehensive charging system for HW can be introduced. In some respects, the situation is worse than some years ago. Fines for non-compliance were established at PHP 5,000 per day in 1976 under PD984, but have not been increased since, and have thus been eroded to one tenth of the value through inflation. The 13% tax exemption for importation of pollution control equipment was recently eliminated, although it was being used as a loophole, and would require more careful definition if re-instated. And water charges are reduced in the PEZA zones, thus encouraging more profligate use with consequent pollution effects. However, most of the other MBIs noted earlier (taxes on virgin materials, tax relief on re-cycled products, deposit-refund schemes, and environmental charges on utilities) do not require monitoring, or could be implemented through product registration. This is an area that could be addressed while monitoring is being improved. Studies should now be undertaken to assess their feasibility. However, complex instruments such as tradable permits should be avoided at this stage.

(3) Lack of Attractive Financing

The mechanisms for financing environmental investments need review, especially for SMEs. Mechanisms that could involve SME associations show promise.

(4) Regulatory Regime

The problems of regulation and enforcement are discussed extensively elsewhere (see Annex 6). It is sufficient here to note again that lack of clarity in the legal definitions of HW, inadequate registration of generators, transporters and treaters, ineffective monitoring, unclear priorities for enforcement and weak enforcement itself, are major causes of the lack of progress in the HW sector. Part of the reason for slow action, is the lack of temporary storage and a TSD facility which could process the residual HW. Improvements in the regulatory system therefore need to be timed to match with the implementation of these facilities.

4.5 Financing of HWM

Financing HWM can be divided into two main objectives:

a) Financing the regulation of HW, and
b) Financing the reduction, re-cycling, treatment and disposal of HW.

The following sections briefly describe the various financial mechanisms available.

4.5.1 Financing the Regulation of HW

The regulation of HW is the responsibility of DENR/EMB. As a government department, this has been traditionally financed through the government's budget. The amount which has been available through the budget is grossly insufficient for the regulation, monitoring and enforcement of HW, and the amounts released by DBM are even less than those budgeted. Given the competition for scarce government funds, this unlikely to improve in the foreseeable future. Moreover, the levels of fines and charges are very low, and rarely imposed; and even if imposed, they cannot be retained, but must revert to the General Fund. It is therefore essential that alternative sources of financing EMB's functions be explored.

4.5.2 Financing the Reduction, Recycling, Treatment, and Disposal of HW

Mechanisms and sources for financing the businesses, which are involved in the production, recycling, treatment and disposal of HW, are part of the financing for industry in general. The PRIME project, module 4 prepared a useful policy study, which outlined finance for industrial environmental projects. In summary, financial institutions (FIs) in the Philippines have been promoting sustainable development as part of their public relations campaigns. Some have also established environmental units to improve their advice and appraisal

functions. However, the core values of FIs remain very conservative, and they perceive environmental factors as adding additional costs and risks to their lending. Apart from a few multinational banks (e.g. Bank of America), very few banks have clear credit programs which support environmental lending. Only government financing institutions (GFIs), notably DBP and the Land Bank (LBP) have developed environmental credit facilities, which are re-lent either retail of wholesale. Funds for these facilities come from multilateral financial institutions such as World Bank, ADB and JBIC. While these funds are lent to GOP at very favorable interest rates compared to commercial loans (especially JBIC environmental loans which are available at 2%) and offer long-term finance with grace periods, they are less attractive by the time the Dept of finance takes a spread for administration and Forex risk, and the GFIs take their spread for credit risk and administration. Nevertheless, the coverage of Forex risk in the present situation where the value of the peso has been declining, is a valuable means to reduce risk.

Despite the existence of environmental credit facilities, actual borrowings have been few, although the GFIs are willing to lend. Some reasons for this are i) the inflexibility of the system to smaller loan sizes which are needed when only environmental improvements are required, ii) inflexibility in meeting rates of return requirements when environmental investments do not yield any immediate income, iii) creditworthiness of smaller companies, and iv) application procedures and the general difficulty of complying with regulatory requirements (including ECCs).

For larger projects such as a TSD for HW, other sources of finance could also be considered. These include multilateral finance through the IFC (World Bank Group), and a similar institution in ADB. These funds are not guaranteed against Forex risk and do not require a government guarantee, and so can lend directly to industries without going through the intermediation of GFIs. As example, the IFC has expressed interest to the Study Team to assist in financing a TSD. IFC could finance both equity and debt. Its exposure is limited to 25% of the project cost, but it could help arrange syndication through its “B” loan approach to obtain additional financing. Its interest rate is Libor plus 3% to 4%. At present, this yields an annual rate of 9.5% to 10.5%. IFC lends for periods up to 12 to 14 years for conventional projects, but may want to limit its exposure in this new type of project to 7 years. This could include a grace period during construction. 7 years may be a rather short loan period in light of the long term and essentially public service nature of a TSD project and its expected low profitability in view of the need to keep charges low enough to attract supply of HW from industries, particularly the SMEs. However, this aspect may be open to negotiation. The principal might also be back-loaded to match the cash flow.

CHAPTER 5

ESTIMATION

OF

HW GENERATION AND TREATMENT

IN

THE PHILIPPINES

5. ESTIMATION OF HW GENERATION AND TREATMENT IN THE PHILIPPINES

5.1. Present Situation of HW Generation

5.1.1 Methodology of Estimation of the HW Generation

HW generation amount was estimated based on a summation of the verified registration data.

(1) Procedure of Summation of the Registered HW Generation Amount

Sum of the registered HW generation amount was estimated through the following steps.

- Deletion of Duplicated ID
- Reconsideration of the Industrial Category
- Reconsideration of HW Code
- Conversion of the Generation Amount (Standardized to the Tonnage Base)
- Deletion of the Registered Generators without PSIC and Number of Employees

After the above steps, the HW generation amount by region and the type of HW were estimated.

(2) Problems for the Estimation

1. Inaccuracy of the data entry on the type of HW
   - The lack of sufficient information about HW.
2. Unclear parameters of HW
   - Vagueness about the standards remained in the orientation

The over-estimation of HW

Organic sludge and wastewater generated from the food industries, and the organic wastewater treated biologically etc. are classified as HW.

3. No concrete regulation for the classification of the Acid and Alkali wastes in DAO 92-29.

↓

Large amount of the wastewater of Acid and Alkali were registered.

The orientation manual has defined acid waste with pH less than 2 and alkali waste with pH more than 12.5, however most of the pH value of wastewater registered are between 2 and 12.5, so that the Study Team deleted the wastewater treated by lagoon, neutralization amounting to a volume of more than 1,000 tons/year from the HW.

The amounts of these wastes deleted are shown in the Table 5.1.1.

Table 5.1.1 Registered Waste Re-Classified as a Non-hazardous Waste

Type of Waste	Generation Amount (tons/year)	
X1	24,995,520	44.0%
X2	1,826,235	3.2%
X3	10,863	0.0%
X4	247,409	0.4%
X5	18,684,151	32.9%
X6	11,037,600	19.4%
X Total	56,801,778	100.0%

X100: Waste water
X400: Waste gases
X200: Non-hazardous Industrial waste
X500: Mining slug/tailing
X300: Municipal waste
X600: Geothermal gases

Other examples of wrong coding or assigning of category for hazardous wastes are as follows:

Exhaust gas and the heated water generated at the geothermal power plant were registered. For other typical mistakes, organic sludge, textile waste, vegetable residue. Many of the organic sludge and textile waste were easy to be classified as a "G999: Putrescible/Organic wastes". On the other hand, many textile wastes were classified as H999 because the description of the "H999: Other textiles wastes" is not enough. And some plastic wastes were classified as "K: immobilized wastes".

EMB will be requested to check if the HW code is suitable or not when receiving registration form and/or quarterly report submitted by the generators.

5.1.2 Results of Summation of the Registration Data

(1) Generators Registered

The number of registered generators is 1,079 and of these, 719 registration data have both PSIC and number of employees.

Table 5.1.2 Generators, Employees by Industrial Category

Industrial Code	No. of Generators		No. of Employees		Employees / Generator
1 Agricultural Industries	6	0.8%	232	0.1%	39
2 Mining	12	1.7%	6,671	2.4%	556
3 Manufacturing	464	64.5%	226,670	80.7%	489
4 Electricity, Gas & Water	124	17.2%	18,778	6.7%	151
5 Construction	3	0.4%	193	0.1%	64
6 Wholesale Trade	42	5.8%	2,459	0.8%	59
7 Transportation Services	3	0.4%	969	0.3%	323
8 Financial Services	2	0.3%	2,015	0.7%	1,008
9 Public Administration & Defense	63	8.8%	22,906	8.2%	364
Total	**719**	**100.0%**	**280,893**	**100.0%**	**391**

The industry with biggest number of generators is the manufacturing industry (464) and it accounts for 64.5 percent of all generators registered and 80.7 % of total number of employees. The second is the Public administration and defense with 8.8 % and 8.2% respectively. In terms of scale of facility, the mean number of employees per registered generators of 391 is comparatively high.

(2) HW generation amount registered

The adjusted sum of the HW generation amount registered is 278,393 tons/year. Table 5.1.3 shows generation amount by the type of HW.

Table 5.1.3 HW Generation Amount by Type of HW

HW Code	Generation Amount (ton/year)	Rate (%)
A Plating wastes	11,233	4.0
B Acid wastes	26,900	9.7
C Alkali wastes	56,099	20.2
D Inorganic chemical wastes	68,103	24.5
E Reactive organic wastes	14,769	5.3
F Organic solvents	2,216	0.8
G Putrescible /organic wastes	30,588	11.0
H Textile	81	0.0
I Oil	22,549	8.1
J Containers	3,499	1.3
K Immobilized wastes	516	0.2
L Organic chemicals	16,226	5.8
M Miscellaneous wastes	25,614	9.2
Total	278,393	100.0

The generation amount of “D: Inorganic chemical wastes” of 68 thousand tons/year is the largest. Lead compound has the largest volume and estimated to be about 29 thousand tons and the second largest volume is the salts and complexes estimated to be about 27 thousand tons/year.

The second largest one is “C: Alkali wastes” of 56 thousand tons/year. Most of the alkali wastes are sludge containing metals generated through neutralization by using calcium oxide. There is some possibility that the amount of this sludge being stored is declared as the generation amount of alkali wastes.

The third largest is “G: Putrescible / Organic Wastes” of 31 thousand tons/year. G801: Animal/abattoir wastes considered as washing water at the meat processors is 7.5 thousand tons/year. 23 thousand tons/year of “G899: Other putrescible waste” is also a big amount, but it seems to be an organic sludge classifies as non-hazardous wastes.

The fourth is “B: Acid wastes” of 29 thousand tons/year. 88% of this waste is being treated within the facilities and it seems the waste is discharged as salts after neutralization.
The fifth is 25 thousand tons/year of “Miscellaneous waste” in which “M503: Pharmaceutical waste and drugs” is 11 thousand tons/year and “M650: all emission control dust/sludge” is 10 thousand tons/year.

The sixth is 22 thousand tons/year of waste oil. Almost half of waste oil is

recycled and/or consumed as a fuel.

(3) The Present Situation of HW Treatment

The registration data without description of the treatment method were counted as an unclassified treatment. Also waste water treatment and incineration are regarded as on-site treatment.

The Table5.1.4 shows a procedure for the estimation of treatment demand and the Table 5.1.5 shows HW amount estimated.

Table 5.1.4 Estimation Procedure of HW Treatment Demand

Category	Descriptions
Generation amount (A)	Sum of HW generation amount registered
Recycle amount (B)	Recycled and/or reused HW waste on/off site of the facilities
Treatment demand (C)	(A)-(B): HW needed treatment for disposal
On-site treatment amount (D)	HW amount registered as treated by incineration, lagoon, biological one, chemical one and oil separation is considered as the on-site treatment amount.
Off-site treatment	(A) – (B) – (D) : On-site Storage, Disposal, HW carried out, HE Exported and HW unclassified are included

Table 5.1.5 HW Amount to be Treated

(tons/year)

HW Code	HW Generation amount (A)	Recycle Amount (B)	Treatment Needed (C)	On-Site Treatment (D)	Off-Site Treatment (E)
A Plating wastes	11,233	0	11,233	9,572	1,661
B Acid wastes	26,900	1,087	25,813	24,667	1,146
C Alkali wastes	56,099	1,523	54,576	11,107	43,470
D Inorganic chemical wastes	68,103	33,392	34,711	2,015	32,696
E Reactive organic wastes	14,769	297	14,473	1,871	12,602
F Organic solvents	2,216	850	1,366	161	1,204
G Putrescible /organic wastes	30,588	8,217	22,371	9,942	12,429
H Textile	81	0	81	9	71
I Oil	22,549	12,540	10,009	1,377	8,632
J Containers	3,499	1,249	2,250	154	2,097
K Immobilized wastes	516	61	455	64	391
L Organic chemicals	16,226	8,649	7,577	6,151	1,426
M Miscellaneous wastes	25,614	1,690	23,923	1,412	22,511
Total	278,393	69,555	208,837	68,501	140,336

a) Recycle Amount (B)

Recycled HW amount registered is estimated as 69.6 thousand tons/year. 33.3 tons/year of "Inorganic waste" is biggest and 12.5 thousand tons/year of solvent and waste oil, 8.6 of organic chemicals, 8.2 of putrescible/organic waste follow.

b) Treatment Needed (C)

Demand of HW treatment is 209 thousand tons/year which is the difference between generation amount and recycled one. Largest amount of the HW to be treated is Alkali waste, 54.6 thousand tons/year, and the second is 34.7 tons/year of inorganic chemical wastes.

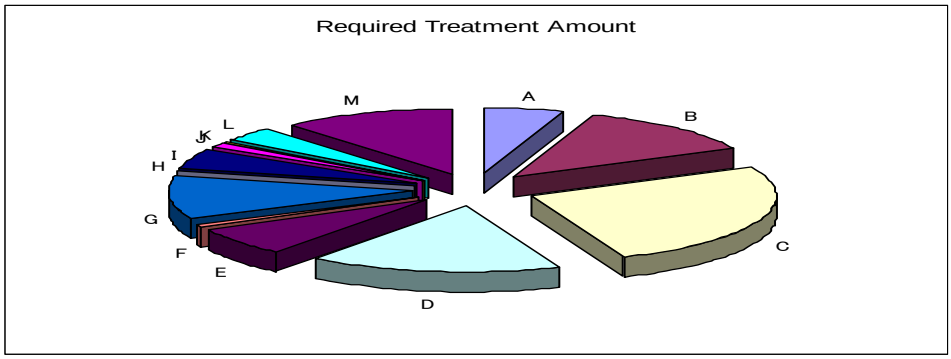


Figure 5.1.1 Required Treatment Amount

Table 5.1.6 Required Treatment Amount

HW Code	Required Treatment Amount (tons/year)		HW Code	Required Treatment Amount (tons/year)	
A Plating wastes	11,233	5.4%	H Textile	81	0.0%
B Acid wastes	25,813	12.4%	I Oil	10,009	4.8%
C Alkali wastes	54,576	26.1%	J Containers	2,250	1.1%
D Inorganic chemical wastes	34,711	16.6%	K Immobilized waste	455	0.2%
E Reactive organic wastes	14,473	6.9%	L Organic chemicals	7,577	3.6%
F Organic solvents	1,366	0.7%	M Miscellaneous was	23,923	11.5%
G Putrescible /organic wastes	22,371	10.7%	Total	208,837	100.0%

c) On-Site Treatment Amount

Sum of on-site treatment is estimated as 68.5 thousand tons/year. Breakdown of the on-site treatment is 3.5 thousand tons/year by incineration, 24.9 thousand ton by lagoon.

As far as the type of HW, the amount of acid waste and alkali waste has accounted for the half of all.

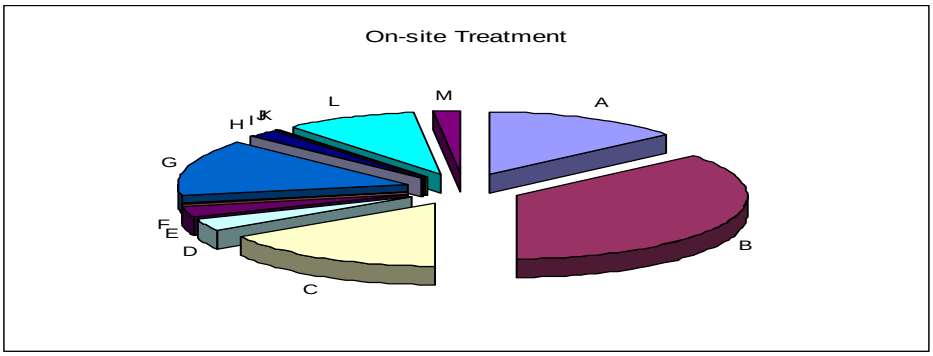


Figure 5.1.2 On-site Treatment

Table 5.1.7 On-site Treatment

HW Code	On-Site Treatment (tons/year)		HW Code	On-Site Treatment (tons/year)	
A Plating wastes	9,572	14.0%	H Textile	9	0.0%
B Acid wastes	24,667	36.0%	I Oil	1,377	2.0%
C Alkali wastes	11,107	16.2%	J Containers	154	0.2%
D Inorganic chemical wastes	2,015	2.9%	K Immobilized wastes	64	0.1%
E Reactive organic wastes	1,871	2.7%	L Organic chemicals	6,151	9.0%
F Organic solvents	161	0.2%	M Miscellaneous wast	1,412	2.1%
G Putrescible /organic wastes	9,942	14.5%	Total	68,501	100.0%

d) Demand of Off-Site Treatment Amount

Sum of the amount of off-site treatment is 140 thousand tons/year. The biggest amount is 43.5 tons/year of Alkali wastes and the next is 32.7 thousand of inorganic waste (23.3%), the third is 22.5 thousand ton of miscellaneous wastes(16.0%).

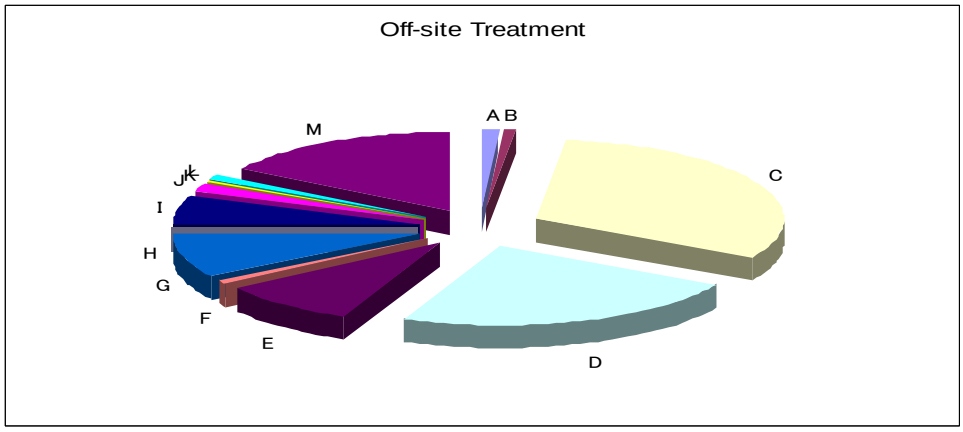


Figure 5.1.3 Off-site Treatment

Table 5.1.8 Off-site Treatment

HW Code	Off-Site Treatment (tons/year)		HW Code	Off-Site Treatment (tons/year)	
A Plating wastes	1,661	1.2%	H Textile	71	0.1%
B Acid wastes	1,146	0.8%	I Oil	8,632	6.2%
C Alkali wastes	43,470	31.0%	J Containers	2,097	1.5%
D Inorganic chemical wastes	32,696	23.3%	K Immobilized wastes	391	0.3%
E Reactive organic wastes	12,602	9.0%	L Organic chemicals	1,426	1.0%
F Organic solvents	1,204	0.9%	M Miscellaneous waste	22,511	16.0%
G Putrescible /organic wastes	12,429	8.9%	Total	140,336	100.0%

(4) HW by Region

HW amount registered from NCR accounts for almost half of the whole country. And the HW amount from CALABARZON consists of NCR, and Region 4 takes 70%. Waste amount from the remaining region is less than 20,000 tons/year.

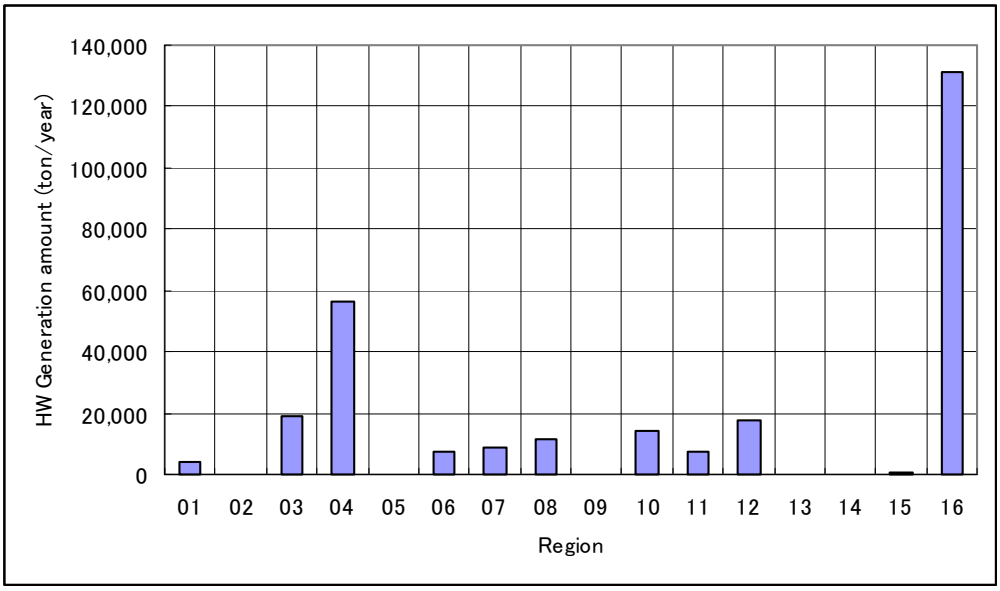


Figure 5.1.4 HW Generation Amount by Region

Table 5.1.9 HW Generation Amount by Region

Region	Generation Amount (tons/year)	Rate
01: Ilocos	3,937	1.4%
02: Cagayan Valley	1	0.0%
03: Central Luzon	18,939	6.8%
04: Southern Tagalog	56,613	20.3%
05: Bicol	97	0.0%
06: Western Visayas	7,210	2.6%
07: Central Visayas	8,912	3.2%
08: Eastern Visayas	11,323	4.1%
09: Western Mindanao	60	0.0%
10: Northern Mindanao	14,178	5.1%
11: Southern Mindanao	7,771	2.8%
12: Central Mindanao	17,383	6.2%
13: CARAGA	42	0.0%
14: ARMM	10	0.0%
15: CAR	622	0.2%
16: NCR	131,295	47.2%
Total	278,393	100.0%

5.2 Methodology of Extended Estimation

5.2.1 Extended Estimation of HW Generation Amount

The amount of industrial HW is generally estimated by the multiplication of the generation unit per index of activities and number of index. Production amount is not included in the registration data although it is the most suitable index to estimate the industrial waste generation. Therefore the number of employees, which does not show the industrial activities, can be used as an index and there is no other choice to use this index for the extended estimation.

Accordingly, the extended estimation is given by the following formula.

$$\text{HW Generation amount} = \sum_{i=1}^{n} (Mi \cdot Gij)$$

i = Industrial category
j = Type of waste
M = Number of employees (person)
G = HW generation unit (tons/year/person)

However, this method has the following disadvantages.

- Generation unit is estimated based on the data given only by HW generators.
- Number of employees as an index has included not only the HW generators but facilities not generating HW.

Therefore the above formula inevitably overestimates the generation amount since the registration data indicates that all facilities categorized in industry generates HW. The results become obviously larger than the actual amount since generation units do not consider the facilities that do not generate HW.

Table 5.2.1 compares the registration data and the extracted data by the scale of employees.

Table 5.2.1 Comparison between Registration Data and NSO Data

Scale of Industries (No. of Employees)	< 10	10 - 49	50 - 199	200 - 999	1000 <	Total
No. of Generators registered	76	169	209	197	68	719
No. of Industries screened from NOS data	131,505	15,837	3,440	1,262	158	152,202
Coverage ratio	0.1%	1.1%	6.1%	15.6%	43.0%	0.5%
Targeted coverage ratio considering priority	1.0%	10.0%	60.0%	100.0%	100.0%	-
Number of Potential Generators	1,315	1,584	2,064	1,262	158	6,383

However the extracted facilities from NSO data include that of non-HW generators. If the HW generation amount is estimated based on 152,202 facilities, it will be obviously higher than actual one. JICA study team set the target rate of the registration coverage considering priority of the scale of facilities to be paid attention as HW generators. Therefore, 4,845 facilities were estimated as potential generators according to the targeted coverage rate shown in the lowest two columns in the table.

The extended estimation proceeded based on this number of potential generators. HW generation amount of the extended estimation by treatment methods is calculated in portion to the ratio obtained through analysis of the registration data.

5.2.2 Results of Extended Estimation

Total HW generation amount of extended estimation is 2.41 million tons per year. HW generation amount by regions and also by industrial category are shown below.

(1) Generation amount by regions

579 thousand tons/year of HW generation amount in NCR takes for 35.5% of whole country. The next is Region 4 of 464 tons/year and 28.2%. Compared with registration data, waste generation ratio in CALABARZON against whole country reduces from 58% to 49%. The areas where its ratio increased are Central Luzon and Central Visayas.

Table 5.2.2 HW Generation Amount of Extended Estimation

Region	Expanded Estimation		Sum of Registrated Generation	
01: Ilocos	50,959	2.1%	3,937	1.4%
02: Cagayan Valley	31,282	1.3%	1	0.0%
03: Central Luzon	195,014	8.1%	18,939	6.8%
04: Southern Tagalog	642,985	26.7%	56,613	20.3%
05: Bicol	57,656	2.4%	97	0.0%
06: Western Visayas	97,393	4.0%	7,210	2.6%
07: Central Visayas	210,789	8.7%	8,912	3.2%
08: Eastern Visayas	25,556	1.1%	11,323	4.1%
09: Western Mindanao	30,142	1.3%	60	0.0%
10: Northern Mindanao	43,653	1.8%	14,178	5.1%
11: Southern Mindanao	71,994	3.0%	7,771	2.8%
12: Central Mindanao	52,288	2.2%	17,383	6.2%
13: CARAGA	29,405	1.2%	42	0.0%
14: ARMM	4,231	0.2%	10	0.0%
15: CAR	38,051	1.6%	622	0.2%
16: NCR	828,883	34.4%	131,295	47.2%
Total	2,410,281	100.0%	278,393	100.0%

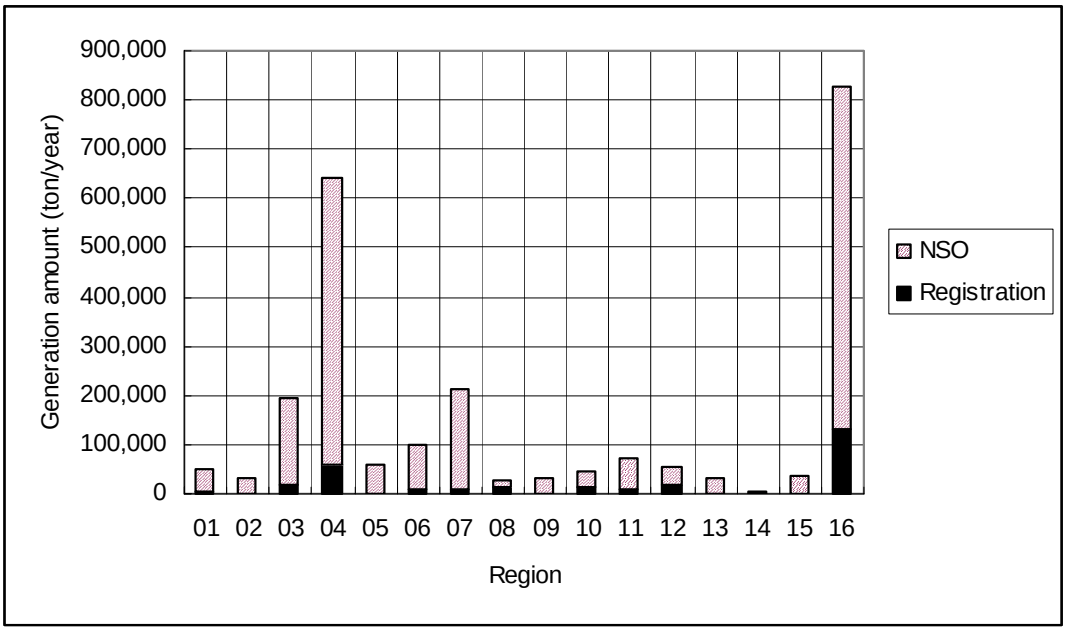


Figure 5.2.1 Generation amount by Region

(2) HW Generation Amount by Industrial Category

941 thousand tons/year, which is almost half of the total generation, is generated from the manufacturing industry. The second is 433 thousand tons/year of Electricity, Gas and water supply accounts for 26.3%. The summation of these two amount to 83.5% of that of whole country.

On the other hand, from the type of HW point of view, amount of C: Alkali waste of 351 thousand tons/year is largest (21.3%), and the next if 326 thousand tons/year (19.8%) of I: waste oil. 232 thousand tons/year (14.1%) of D: Inorganic chemical waste, 127 thousand tons/year (7.7%) of B: Acid waste.

Table 5.2.3
Extended Estimated Generation Amount by Industrial Category and Type of HW

	1	2	3	4	5	6	7	8	9	Total
A	2,470	1,929	98,454	49,696	575	10,064	45	116	11,596	174,945
B	2,501	1,953	99,682	50,316	582	10,189	45	117	11,741	177,127
C	7,703	6,018	307,065	154,995	1,794	31,388	140	362	36,167	545,631
D	4,730	3,695	188,536	95,166	1,102	19,272	86	222	22,206	335,014
E	2,396	1,872	95,514	48,212	558	9,763	44	112	11,250	169,721
F	696	543	27,725	13,994	162	2,834	13	33	3,266	49,265
G	1,983	1,549	79,063	39,908	462	8,082	36	93	9,312	140,489
H	12	9	479	242	3	49	0	1	56	851
I	6,941	5,422	276,671	139,653	1,616	28,281	126	326	32,587	491,623
J	523	408	20,843	10,521	122	2,131	9	25	2,455	37,036
K	761	594	30,316	15,302	177	3,099	14	36	3,571	53,869
L	2,191	1,712	87,343	44,087	510	8,928	40	103	10,287	155,201
M	1,122	877	44,745	22,586	261	4,574	20	53	5,270	79,509
Total	34,028	26,582	1,356,435	684,678	7,925	138,653	618	1,597	159,765	2,410,281

PSIC
1 Agricultural industries
2 Mining
3 Manufacturing
4 Electricity, Gas and Water Supply
5 Construction
6 Wholesale trade
7 Transportation services
8 Financial services
9 Public administration and defense

(3) Generation amount by treatment method

Treatment amounts of the extended estimation were calculated by using the ratio from the registration data. Table 5.2.4 shows the generation amount by treatment method.

Table 5.2.4 Extended Estimated HW amount by Treatment Method

HW Code	Recycle	Incineration	Lagoon	Biological treatment	Chemical treatment	Oil separater	Storage	Disposal	Off-site treatment	Export	Effluent	Unclassified treatment	Total
A Plating wastes	0	0	146,085	40	2,946	0	333	80	934	2,648	0	21,877	174,945
B Acid wastes	7,157	4	429	1,867	160,122	0	4	18	109	0	10	7,405	177,127
C Alkali wastes	14,810	63	36,661	1,716	69,585	0	356,468	27,538	4,085	340	0	34,362	545,631
D Inorganic chemical waste	164,264	3,796	277	90	5,748	0	2,135	89,186	5,040	35,371	0	29,106	335,014
E Reactive chemical wastes	3,409	1,706	8,140	87	12,401	0	576	121,359	265	0	35	21,743	169,721
F Organic wastes	18,902	3,237	2	93	257	0	876	14,339	342	56	0	11,160	49,265
G Putrescible/Organic wastes	37,742	469	24,460	12,465	8,268	0	0	35,476	0	0	0	21,608	140,489
H Textile	2	0	4	95	0	0	15	698	0	0	0	38	851
I Waste oil	273,399	3,207	5,702	5,840	3,031	12,247	10,701	3,508	25,717	87	0	148,184	491,623
J Containers	13,218	1,622	0	2	2	0	954	1,225	3,294	0	0	16,720	37,036
K Immobilized waste	6,321	137	6,583	0	0	0	1,254	11,422	26,159	0	0	1,993	53,869
L Organic chemical	82,731	12,879	45,551	27	277	96	447	36	1	0	0	13,157	155,201
M Miscellaneous	5,247	2,201	1,553	9	621	0	210	36,032	1,077	0	0	32,560	79,509
Total	627,203	29,321	275,447	22,331	263,258	12,343	373,973	340,918	67,025	38,502	45	359,914	2,410,281

VOLUME 2:
MASTER PLAN

CHAPTER 6

PRESENT ISSUES

IN

HAZARDOUS WASTE MANAGEMENT

IN

THE PHILIPPINES

6. PRESENT ISSUES IN HWM IN THE PHILIPPINES

This chapter identifies the current issues in HWM in the Philippines based on the current situation analyzed in Volume 1 so as to incorporate them into the master plan.

6.1 Assessment of Present HWM in the Philippines

This Section assesses the present HWM in the Philippines whether hazardous wastes are managed properly in compliance with the relevant laws in the following categories:

- Whether HWM at sources
- HWM by haulers (transporters)
- HWM by TSD operators
- Overall mechanism of HWM

The present legal and institutional mechanisms of HWM are included in the assessment of the overall mechanism of HWM.

(1) Current Status and Issues of HWM at Sources

The results of the HW generator survey and analysis identify the following issues in HWM at sources:

- Insufficient compliance with the registration duty of HW generators,
- Inaccuracy and no renewal of the registered data and information by HW generators,
- Limited compliance with the participation in WTS (Waste Tracking System),
- Limited knowledge of proper HWM among HW generators,
- Lack of on-site HW storage facilities, and
- Accumulated on-site storage of HW due to no or limited availability of proper treatment facilities.

Meanwhile, some of HWs are properly recycled or reused on-site by generators.

(2) Current Status and Issues of HW Haulers

The results of the questionnaire and interview surveys on HW haulers identify the following issues in HW transport:

- Limited implementation of WTS by HW haulers,
- No regular reporting to DENR of HW transport records by HW haulers due to non existence of such obligation provided by law,
- Difficulty in identifying the interrelationship among HW generators, haulers, and treaters resulting from the above insufficient control of HW haulers,
- Difficulty in controlling the safety of HW transport due to use of improper transport vehicles by HW haulers, who sometimes do not even have their own vehicles.

(3) Current Status and Issues of TSD Operators

HW recyclers in the Philippines mainly deal with easily recyclable HWs of high quality and market value such as waste oil, solvents, and sludge containing high value metals. Available recycling facilities are also mostly small scale with comparatively simple recycling technologies applied.

On the other hand, there is very few treatment and landfill facility dealing with the HWs that are difficult to recycle or have no choice but to be landfilled after proper treatment. Especially, proper thermal destruction, solidification, and landfill facilities are not available in the Philippines. This is mainly because these facilities require a large investment.

Consequently, a large amount of HWs is presently stored on-site by generators because of no available proper treaters. Sometimes it may be illegally treated and dumped due to no space to pile up the HWs on site by generators.

The current issues of TSD operators in the Philippines are identified as follows:

- Lack of space for storing HWs by generators, as well as TSD operators,
- Acceptance of HWs beyond the capacity of TSD operators due to lack of proper treatment and disposal facilities for HWs in response to increasing demands,
- Insufficient installation of effluent treatment facilities at the existing HW treatment facilities, and
- Improper handling of residues generated by HW treatment.

(4) Overall Assessment of the Present HWM in the Philippines

The main issues of present HWM in the Philippines are outlined as follows:

- There are only 1,079 HW generators officially registered at EMB as of the year 2000, which is much smaller than the potential number of HW generators.
- The amount of HWs generated by the registered generators is approximately 280 thousand tons per year. About 140 thousand tons (50%) are recycled or treated on site while 36 thousand tons are handled by off-site treaters. The remaining around 100 thousand tons are estimated to be stored on- or off-site waiting for proper treatment and disposal, otherwise they may be improperly dumped somewhere. Although the above figures are based on the available data from the registered HW generators upon their first registration, the actual treatment demand at present may be much larger than the estimate. Accordingly, an enormous amount of HWs is estimated to be stored at sources due to limited availability of proper TSD facilities.
- The regulating authority cannot properly identify and control the flow of HWs from generation to final disposal due to insufficient enforcement of present laws and regulations. It is also difficult for the authority to identify the conditions of compliance with the laws and regulations by HW generators and TSD operators.
- There are no serious environmental impacts of HWs revealed in the Philippines; they may exist but cannot be identified by the government due to its limited capacity of monitoring and inspection.

6.2 Key Factors Contributing to Insufficient HWM

Key factors contributing to insufficient HWM in the Philippines include:

- Lack of awareness and management system of HWM at sources (generators),
- Limited technical and financial capacity of private TSD operators, and
- Lack of and insufficient enforcement of laws and regulation on HWM.

HWM business requires special expertise and knowledge, which are not yet fully obtained by TSD operators in the Philippines. Moreover, it is a very risky business in terms of environmental liabilities, market, and large capital requirement, which makes investors hesitate to participate in it.

Concerning the enforcement of the laws and regulations on HWM, the following issues need to be addressed for realizing proper HWM:

- Laws and regulations

- ✧ Unclear definition of HWs,
- ✧ Insufficiency in regulating the licensing of HW haulers,
- ✧ No regulation on technical requirement for TSD facilities of HWs,
- ✧ No regulation on acceptance criteria for HW landfill,
- ✧ No regulation on reporting requirements of operation records by TSD operators,

- Enforcement of laws and regulations
  - ✧ Limited institutional capacity of the regulating authority (EMB), which is going to be strengthened in response to its reorganization as a line bureau,
  - ✧ Insufficient management and operation of WTS,
  - ✧ Insufficient information and data management system,
  - ✧ Limited skills and knowledge of monitoring and inspection on HWM, and
  - ✧ Limited human and financial resources.

6.3 Issues to be Addressed in the Master Plan

Considering the issues identified above, the master plan will focus on the followings for realization of proper HWM in the Philippines:

- Promotion of 3R (reduction, reuse, and recycling) of HWs by generators, and establishment of proper HWM at sources based on PPP,
- Promoting the development of TSD facilities for proper treatment and disposal of HWs, and
- Strengthening laws, regulations, and enforcement capacity of the regulating authority on HWM.

CHAPTER 7

BASIC POLICY FRAMEWORK OF HW RECYCLING AND TREATMENT

7. BASIC POLICY FRAMEWORK OF HW RECYCLING AND TREATMENT

This chapter clarifies the basic principle and policies, goals, and targets of HWM in the Philippines by the year 2010. It also discusses the basic policy framework of HW recycling and treatment to be built by EMB/DENR for proper HWM.

7.1 Basic Principle of HWM

There is no clearly identifiable case of serious health or environmental damages due to improper HWM in the Philippines. However, HW is presumed to be discharged through various media into the environment. Although no such incident has not yet officially been reported due to limited capacity of relevant scientific investigation, it is speculated that hazardous substances may have already been eluted into watercourse or groundwater and exposed to humans and other organisms.

Since the Philippines is now in the initial stage of full-scale industrialization, environmental pollution induced by HW generation does not yet outbreak at a large scale. Nevertheless, considering recent rapid growth of hi-tech industry may increase HW generation, proper HW management needs to be implemented at the earliest possible. Possible environmental pollution caused by HW should be eliminated or minimized and not be left unsolved for future generation.

It is a timely situation now in the process of large-scale industrialization in the Philippines to take preventive measures against HW induced pollutions.

7.1.1 Basic Policies on HWM

'Preventing possible damages on human health and environment, contributing to the development of sustainable society, and no environmental liabilities for the future generation', are the universally known and agreed policy objectives of HWM. The basic policies to achieve these objectives are given by '3Rs and 1P' policies, namely:

- Reduce (Waste minimization and detoxification at sources)
- Reuse
- Recycle
- Proper treatment (Intermediate treatment to reduce environment load at final disposal)

Reduction (Waste Minimization) means to minimize HW generation at sources by the generators' efforts of lowering the use of hazardous substances and saving input to production process by proper process management. **Reuse** includes the efforts of returning the generated waste to the same or other production processes as raw materials. After the above efforts by generators, the remaining waste should be further processed to be usable as raw materials (material recycling) or as energy resources (thermal recycling), that is defined here as **'Recycling'**. **Proper treatment** is the last option of HWM that only deal with the remaining HW after the above 3 processes (Reduce, Reuse and Recycle). In this last stage, remaining HW is detoxified at its maximum before going to final disposal sites (landfills). This is the priority of HWM, which is sometimes called as HWM hierarchy.

7.1.2 Priority on Reuse and Recycling

Reuse and recycling of HW should be given higher priority than treatment and disposal even after TSD facilities are sufficiently provided in the Philippines. Reuse of HW inside the premises of generators is first pursued. Next, reuse and recycling in other premises will be examined.

These reuse and recycling of HW should be promoted under the market mechanism. Some of HW needs to be reprocessed to remove impurities before selling them at the market. In this case, HW generators will pay the reprocessing cost to recyclers and recyclers have to properly reprocess the HW before its transaction in the market.

7.1.3 Proper Treatment and Disposal for Protecting Human Health and the Environment

It is one of the primary concern in HWM that how the HW should be finally returned to the environment. It is the issue of HW landfill policies. The Study Team recommends adopting the basic HW landfill policy as follows:

HW is to be detoxified at its maximum before finally disposing of at landfills in order that no environmental risk or liabilities may be left remained to the future generation.

There are mainly two different types of policies on final disposal of HW. One is to completely detoxify and stabilize HW before its final disposal. This policy is based on the view to minimizing the present and future environmental risks in consideration of the difficulty in supervising and monitoring the landfills eternally after their closure. It also considers maximizing the use of the closed landfill in the future. The EU

nations such as Germany and Netherlands adopt this policy. The EC Landfill Directive issued in 1999 also supports it. Recently, Japan is also going to follow it. In general, the countries facing serious difficulty in obtaining the land for landfill are likely to espouse this policy.

Meanwhile, there is another policy of HW landfill in which HW is allowed to be brought into landfill with its hazardousness remained while final disposal facilities (landfills) are strictly designed to block the possible leakage of hazardous substances to the environment. This second policy is applied in the U.S.A, where a lot of land is available for landfill.

The cost of HW treatment is higher in the former policy than the latter is. On the other hand, potential environmental risks remains permanently at the landfills in the latter policy while they are minimized in the former policy.

In the case of the Philippines, the waste landfill issue draws a great deal of public attention now. It is also very difficult to acquire the land for waste landfill because of such strong attention by the public. Furthermore, it is one of the most important policy objectives in HWM in the Philippines to eliminate or minimize the environmental risks now and not to carry them over to the future generations.

It will require higher cost to detoxify and stabilize HW before its final disposal than treating it at landfill. However, considering the potential threat of HW to human health and environment, the Philippines should take the former policy.

7.2 Establishment of Targets for Hazardous Waste Management

7.2.1 Policy Priority in Proper HWM System

The basic principle in HWM is to put the priority, firstly on reduce (waste minimization), secondly on reuse and lastly on recycle. However, even after the maximization of these efforts, there still remains HWs to be properly treated and disposed. The Philippines is still not well prepared to properly deal with these remaining HWs.

The efforts of 3R (Reduce, Reuse, and Recycle) can reduce the amount of HWs, but not completely eliminate them and their danger to human health and environment. Moreover, 3R of HW depend much on the individual efforts of HW generators, haulers, recyclers, and so forth. It will also take much time to raise and disseminate their

awareness of 3R.

Therefore, in terms of protecting human health and environment, development of the proper HW treatment and disposal system should be given the first policy priority of the Philippines Government in HWM sector.

Based on the above recognition, the master plan defines the development of proper HW treatment and disposal system as the top policy priority in HWM sector in the Philippines. 3R of HW are mainly discussed as the next policy issues in which HW generators are the main actors while the government takes the supporting roles to promote them.

7.2.2 Goals and Targets

(1) Goals

The ultimate goal of HWM is to eliminate the threat of HW to human health and environment by the complete control of HW flow. Figure 7.2.1 (see next page) shows the conceptual image of the ideal HWM to be finally achieved.

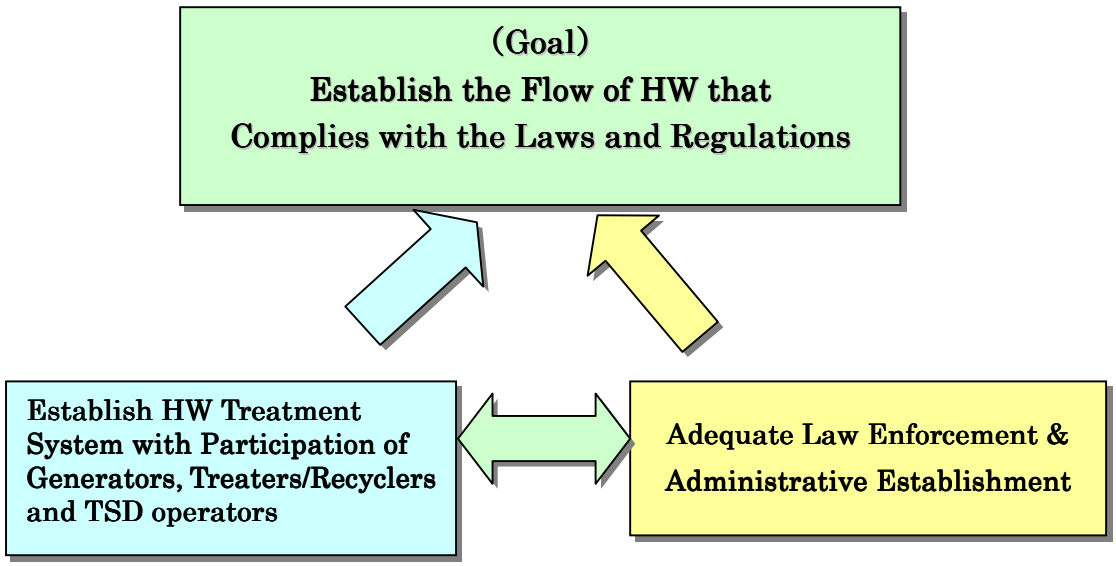


Figure 7.2.1 Conceptual Image of the Ideal HWM

There are two main issues to be addressed to achieve the complete control of HW flow. One is to establish proper HWM mechanism by HW generators and TSD operators (also including recyclers and haulers), and the other is to establish full scale HWM

administration and law enforcement mechanism. These two issues are closely connected with each other. Strict law enforcement on HWM will not be possible without any sufficient HW treatment facilities. Likewise, without any law enforcement on HWM, proper TSD facilities will never be developed. Therefore, both issues have to be simultaneously addressed to reach the ultimate goal of HWM.

(2) Targets

The Study Team establishes the following 3 policy targets to achieve the above goal by the year 2010.

- Development of TSD facilities needed for proper treatment and disposal of HW,
- Establishment of proper management of HW at sources and promotion of 3R, and
- Complete law enforcement and full-fledged establishment of HWM administration by the Government

A Development of TSD facilities needed for proper treatment and disposal of HW

1. All the HWs from the registered generators will be properly managed by the TSD facilities to be developed by 2010.

Some of the HWs need special treatment or disposal for their detoxification and safe management, which goes beyond the capacity of individual HW generators. HW treatment and disposal facilities have to be built to receive and collectively deal with these HWs. Since this type of facility requires a large amount of investment, governmental support will be needed to promote its development.

B Establishment of proper management of HW at sources and promotion of 3R

1. Complete registration of 6,500 HW generators compliance with the reporting duties.
2. Proper HWM at sources and promotion of 3R (Reduce, Reuse, and Recycle)
3. Establishment of the in-house HWM system at sources

The primary targets of HWM are the official registration of HW generators and efforts of 3R with the conventional technologies by individual generators. The master plan sets the target of registered HW generators at 6,500 by the year 2010.

To realize proper HWM at sources and promote 3R by generators, accurate understanding of HWM has to be disseminated to generators as well as other stakeholders. The HWM practices at sources need to be inspected through the regular reporting by generators. The Philippines government also has to promote proper

on-site recycling, storage, and treatment of HW.

It is also necessary for each HW generator to establish its internal HWM system. The Philippines government needs to support HW generators through preparation of guidelines and manuals for this internal HWM system.

C Complete law enforcement and full-fledged establishment of HWM administration by the Government

1. Establishment of legal, regulatory, and administration system to control HWM by generators, haulers, recyclers, and treaters (TSD operators)

To realize complete enforcement of DAO92-29 and RA6969, the Philippines government has to formulate and enact supporting laws, regulations, and standards at the earliest possible. The governmental HWM administration has also to be further enhanced through human resource development, capacity building, and necessary organizational reforms.

7.2.3 Phased Targets and Their Compliance Scenarios

The Study Team established the phased targets of HWM by the year 2010. The coming 10 years up until 2010 are divided into three phases as follows:

1st Phase: 2001 to 2004
2nd Phase: 2005 to 2007
3rd Phase: 2008 to 2010

(1) Development of TSD Facilities for HW

To properly treat and dispose of the HWs that are difficult to be handled by individual HW generators and existing TSD facilities, the master plan set up the phased targets of TSD facilities development as given in Table 7.2.1.

Table 7.2.1 Phased Targets of TSD facilities Development and Operation

Items	1st Period 2001-2004	2nd Period 2005-2007	3rd Period 2008-2010
Development of a Model Integrated HW Treatment Facility (MIF)	・Preparation and construction of the facility.	・Begin operation in 2005	・Continued operation
Facility Development by Private Sector	・Prepare a national plan for promoting TSD facility development by private sector participation.	・Implementation of the promotion plan through control of TSD facility development by the Government. ・Development and/or operation of the private TSD facility by 2007	・Facility expansion
Development of HW Recycling Facilities by Private Recyclers	・Designation of priority HWs for recycling ・Formulation of the national recycling promotion plan	・Promoting development of HW recycling facilities in response to the growth of recycling market	・Promoting development of HW recycling facilities in response to the growth of recycling market

It will take at least 4 to 5 years to operate new HW treatment and landfill facilities, taking into account the preparation works to be done before their construction (planning, feasibility study, basic and detail design, EIA, fund raising, consensus building, etc.).

Therefore, a model HW treatment facility will be developed under the government initiative as the fist step to encourage TSD facilities development and operation by private sector proponents.
The 1st model facility will start its operation in 2005 at the earliest possible. Full-scale development of proper HW treatment and disposal involving private sector proponents will also start in 2005.

In addition, the master plan targeted that the government would formulate the national HW recycling plan to promote development of HW recycling facilities by private sector.

(2) Establishment of HWM at Sources (Generators) and Promotion of 3R

The master plan set the phased targets for the following policy issues:

- **Compliance with the Registration and Regular Reporting Duties by HW Generators**
- **Promotion of Waste Minimization, Recycling, and Proper Treatment**

- **Establishment of Proper HWM System at Sources (Generators)**

Table 7.2.2 showed the phased targets of the above policy issues.

Table 7.2.2
Phased Targets on Establishment of HWM at Sources and Promotion of 3R

Items	1st Period	2nd Period	3rd Period
	2001-2004	2005-2007	2008-2010
Compliance with the registration and regular reporting duties	No. of registered generators 3,200	No. of registered generators 5,000	No. of registered generators 6,500
	・Complete compliance with reporting duties by generators.	・Complete compliance with reporting duties by generators.	・Complete compliance with reporting duties by generators.
Promotion of Waste Minimization, Recycling, and Proper Treatment	・Determine the priority HWs and its generators, and promote waste minimization and recycling.	・Further expand recycling through disseminating the achievement	・Further expansion of the efforts.
	・Full-scale implementation of proper HWM at sources.	・Full-scale implementation of proper HWM at sources.	・Full-scale implementation of proper HWM at sources.
Establishment of Proper HWM System at Sources (Generators)	・Promote establishment of HWM system (guidelines, manuals)	・Start establishment	・Further expansion

A. Compliance with the Registration and Regular Reporting Duties by HW Generators

The master plan set the target of the number of registered HW generators at 6,500 by 2010. As shown in Table 7.2.3, the target covers will cover all the industries of over 200 employees, 60% of 50 to 199 employees, and 10% of 10 to 49 employees. Although, it is difficult now to accurately identify the number of potential HW generators, the JICA Study Team estimated that there would be at least around 6,000 HW generators in the Philippines. So far, many of registered generators are large industries and the number of small and medium industries is very limited. Encouraging registration of small and medium size HW generators is the key of increasing the number to achieve the target.

Table 7.2.3 Targeted Number of HW Generators

	< 10	10 - 49	50 - 199	200 - 999	1000 <	Total
No. of Generators registered	76	169	209	197	68	719
No. of Industries screened from NSO data	131,505	15,837	3,440	1,262	158	152,202
Coverage ratio	0.1%	1.1%	6.1%	15.6%	43.0%	0.5%
Targeted coverage ratio considering priority	1.0%	10.0%	60.0%	100.0%	100.0%	-
Number of Potential Generators	1,315	1,584	2,064	1,262	158	6,383

In addition, the regular reporting duty of HW generation and management by generators will be further strengthened to achieve the 100% compliance.

B. Promotion of Waste Minimization, Recycling, and Proper Treatment

Proper treatment here means that all the HW generators properly manage the HWs in compliance with the relevant laws and regulations while the government clearly identify and control the quantity and quality of existing HWs. The master plan targeted this proper treatment of HWs to be completely achieved by 2004.

With the exceptions of recycling waste oil and solvents as well as neutralization treatment of acid and alkali wastes, most of the HWs have no access to proper treatment and disposal facilities in the Philippines now. Therefore, those HWs have to be stored on-site or in other available off-site storage facilities until proper treatment and disposal facilities are developed. It will take at least 4 to 5 years to operate new HW treatment and landfill facilities, taking into account the preparation works to be done before their construction (planning, feasibility study, basic and detail design, EIA, fund raising, etc.).

Therefore, HW generators will be required to take the following measures by the time the proper HW treatment and landfill facilities start their operations.

- On-site treatment and recycling of HWs at its maximum,
- Maximizing the use of available HW recyclers and treaters to reduce the amount of HW
- On-site or off-site temporary storage of non-recyclable/treatable HWs.

This transitional HWM system has to be developed as early as possible. The master plan sets the target of developing the basic facilities by the end of the 1st phase (2004).

After the proper HW treatment and landfill facilities start their operations, the

temporarily stored HWs will be transported to the facilities as far as they are treatable. If there is still no proper facility to treat the HWs, they will be continuously stored by the time the facilities are developed.

Meanwhile, the Philippines Government will also promote waste minimization and recycling by HW generators. The regulating authority will determine the priority of HWs and their generators and formulate the national HW recycling promotion plan to guide and support them in waste minimization and recycling at sources.

C. Establishment of Proper HWM System at Sources (Generators)

Every HW generator should appoint in-house HW managers to organize its own HWM system. The regulating authority has to guide and encourage registered HW generators to achieve this target within the 1st phase. The number of in-house HW managers will subsequently increase with the number of registered HW generators in the next phases. The regulating authority will also encourage every HW generator to apply for ISO 14001, Environment Management System.

(3) Complete law enforcement and full-fledged establishment of HWM administration by the Government

Proper HWM by the regulating authority consists of:

- **Enactment of relevant laws and regulations,**
- **Establishment of strengthened HWM administration, and**
- **Strict law enforcement and implementation of relevant policies and measures.**

The master plan will deal with these policy issues in accordance with the phased targets as mentioned in Table 7.2.4.

Table 7.2.4
Phased Targets of Law Enforcement and
Full-fledged Establishment of HWM Administration

Category	1st Period 2001-2004	2nd Period 2005-2007	3rd Period 2008-2010
Laws and Regulations	・Prepare and enact necessary laws and regulation by 2003	・Continuous efforts	・Continuous efforts
Establishment of Strengthened HWM Administration	・Capacity increase of current staffs.	・Establish full-fledged administration system.	・Continuous efforts
Law Enforcement and Related Policy Measures			
・Monitoring & Inspection	・Formulation of the implementation plan and starting implementation. ・Establishment of waste tracking system.	・Continuous efforts.	・Continuous efforts.
・Economic Instruments	・Examine the feasibility and implementability of various instruments.	・Introduction of economic instruments.	・Continuous efforts.
・Awareness Raising	・Program development and implementation.	・Continuous efforts.	・Continuous efforts.

A. Laws and Regulations

To supplement RA6969 and its Implementing Rules and Regulations of DAO92-29, all necessary standards, criteria, and guidelines have to be formulated within the 1st Phase. Those supporting legal and regulatory instruments include waste acceptance criteria for landfills, HW treatment standards, TSD facilities standards, and so forth.

B. Establishment of Strengthened HWM Administration

Capacity building of the existing human resources will be given the first priority. Further strengthening of HWM administration will be carried out in a step-by-step manner. Information and data management capacity is of great importance among other administrative abilities.

C. Law Enforcement and Related Policy Measures

a. Monitoring and Inspection

Monitoring and inspection of HW generators, haulers, recyclers, and TSD

operators have to be clearly defined as routine works of the regulating authority and be executed according to the plans. All of these have to be implemented within the 1st Phase.

b. Establishment and Operation of the Waste Tracking System

As provided in DAO92-29, the waste tracking system is an important tool to manage proper flow of HW. The master plan requires achieving the full-fledged operation of this system within the 1st phase. The regulating authority has to encourage all the stakeholders to participate in the system.

c. Economic Instruments

Feasibility and implementability of various economic and financial incentives to promote TSD facilities development should be immediately examined for their possible introduction at the early stage.

d. Awareness Raising

Raising awareness of stakeholders in HWM needs to be conducted by the governmental initiative to increase their understanding on the importance of 3R and proper treatment and disposal.

7.3 Overall HWM Policy Mechanism

The overall HWM policy mechanism recommended in this chapter is outlined in Figure 7.3.1.

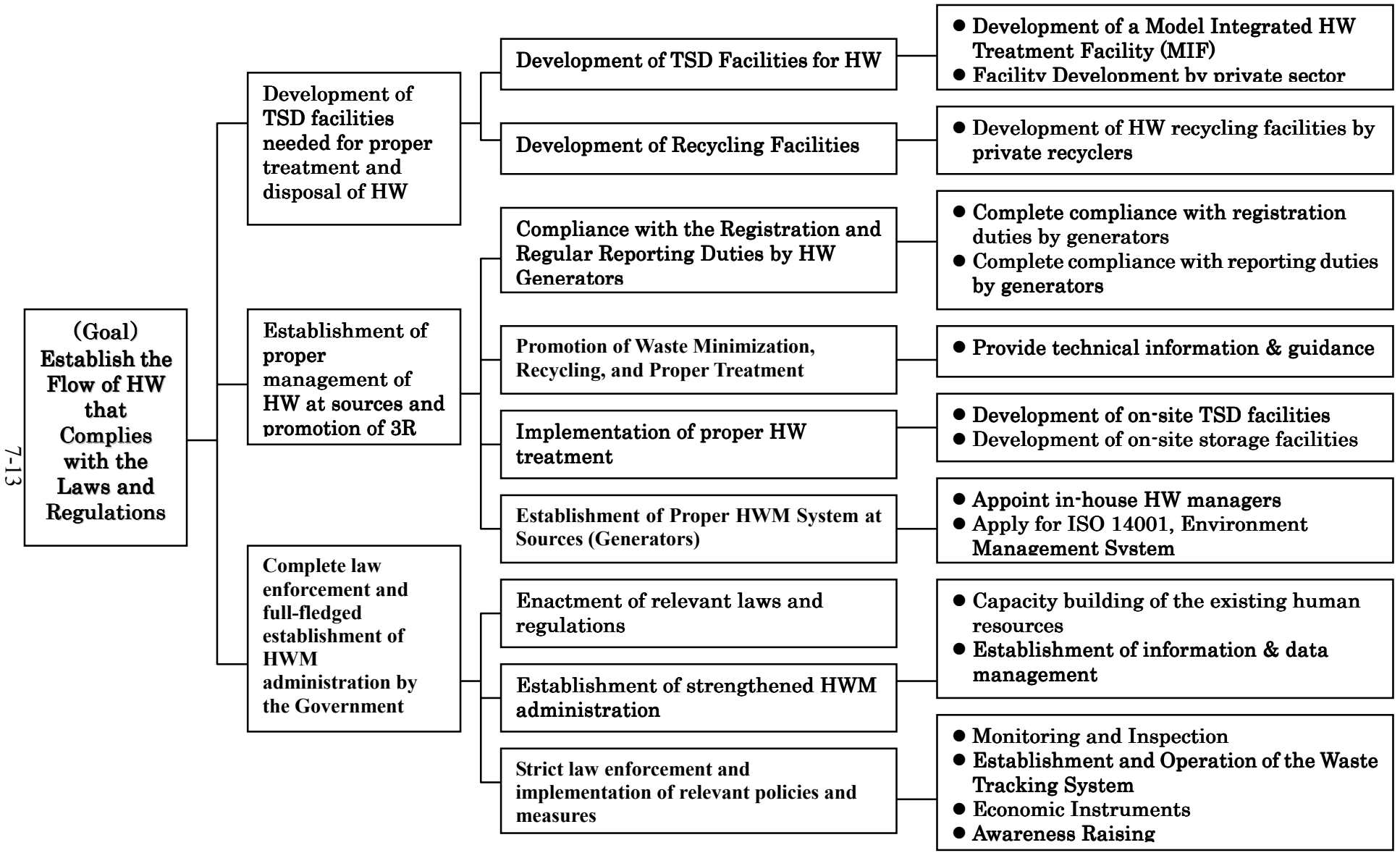


Figure 7.3.1 Recommended Overall HWM Policy Mechanism in the Philippines

CHAPTER 8

BASIC HAZARDOUS WASTE TREATMENT STRATEGY AND PLAN

8. BASIC HAZARDOUS WASTE TREATMENT STRATEGY AND PLAN

This chapter first discusses the basic framework of HW treatment and disposal and detail criteria for treatment and disposal of HW. Subsequently, it formulates the strategy and plan of the TSD facility development with the roles of key stakeholders in HWM.

8.1 Basic Framework of HW Treatment and Disposal

The basic principle of HWM, as given in Chapter 7, consists of 3 R (Reduce, Reuse, Recycle) and proper treatment and disposal of HW. This chapter discusses the proper treatment and disposal of HW.

Proper treatment and disposal are defined as those in compliance with the relevant laws and regulations. In the case of the Philippines, however, there is no available criterion for determining the adequate levels of HW treatment and disposal. Therefore, establishment of such criteria is the first policy issues to be addressed in formulating the master plan on HWM.

It is the waste acceptance criteria for landfill that has to be first determined in formulating the total legal and regulatory system of HWM. Since all the HWs finally go to landfills, how much the environmental load of HWs has to be minimized before landfills determines the levels of HW treatment as well as the landfill measure itself.

The landfill criteria consist of:

- Designation of the HWs not treated in landfills,
- Waste acceptance criteria for landfills,
- Establishment of the landfill facility standards.

Figure 8.1.1 shows the basic framework of selecting HW treatment technology. At first, recyclability of HW is judged in view of its value. Subsequently, acceptability of the HW at landfill is examined according to the waste acceptance criteria. If the HW does not comply with the criteria, it has to be treated to minimize its toxicity. Depending the toxicity characteristics of HW, proper treatment measures such as physicochemical treatment, thermal destruction, solidification, etc. are selected.

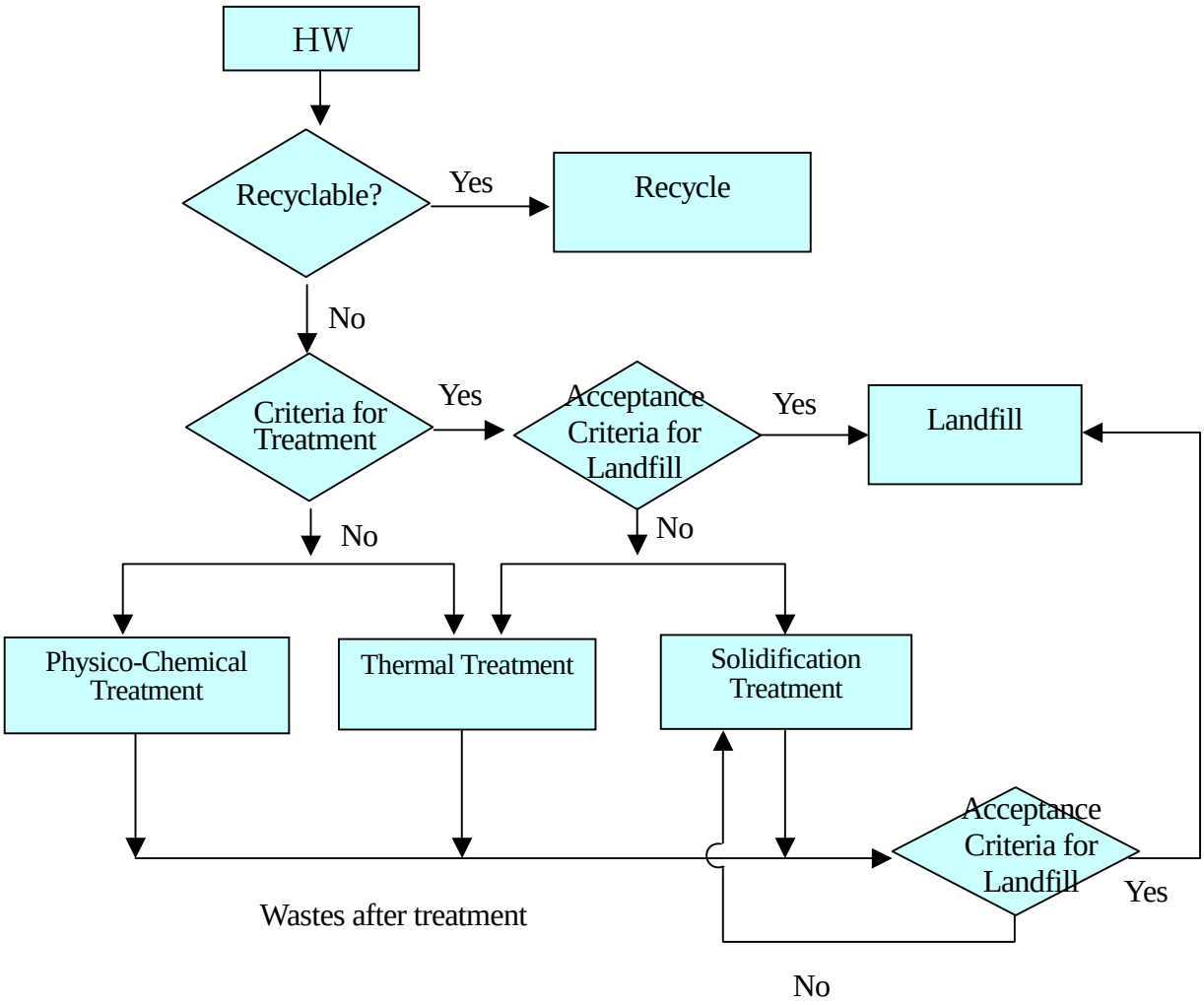


Figure 8.1.1 Flow Chart of Selecting Proper HW Treatment Measures

In order to ensure proper treatment of HW in accordance with the flow above, HW treatment standard and its acceptance criteria for landfill have to be provided in the form of legally binding decisions by the national authority. They will also contribute to strengthened enforcement of DAO92-29.

8.2 HW Treatment Standard

8.2.1 Criteria for HW Treatment and Landfill

Table 8.2.1 shows the recommended treatment measures to be applied by types of HWs before their final disposal at landfills.

As the first step of proper HWM in the Philippines, the regulating authority has to determine what HWs are prohibited to be treated at landfills. The HWs of liquid, ignitable, explosive, and reactive states needed to be banned for direct disposal at landfills.

Table 8.2.1

Recommended Treatment Measures by of HW Categories

HW No.	Class/Sub-category	Criteria for Treatment	Remarks
A101~ 105, A199	Plating wastes Plating waste with cyanide (solution and salts)	- Landfill of waste in liquid state is forbidden. - Landfill after detoxification by physicochemical treatment.	- Highly concentrated liquid cyanide must be decomposed by thermal treatment.
Acid wastes			
B201	Sulfuric acid	- Landfill of waste in liquid state is forbidden. - Liquid wastes must be chemically treated. - Residues generated from the above process may go to landfill in accordance with the acceptance criteria.	
B202	Hydrochloric acid		
B203	Nitric acid		
B204	Phosphoric acid	- To be neutralized and separated by sedimentation. - Residues must be solidified.	
B205	Hydrofluoric acid		
B206	Mixture of sulfuric and hydrochloric acid	- Liquid waste must be chemically treated. - Residues generated from the above process may go to landfill in accordance with the acceptance criteria.	
B207	Other inorganic acid		
B208	Organic acid	- To be neutralized and thermally decomposed.	
Alkali wastes			
C301	Caustic soda	- Landfill of the waste in liquid state is forbidden. - To be neutralized and treated at landfill in the form of neutral salt or metal hydroxide	
C302	Potash		
C303	Alkaline cleaners		
C304	Ammonium hydroxide		
C305	Lime slurries		
C306	Lime-neutralized metal sludge	- To be solidified if the waste does not comply with the waste acceptance criteria for landfill.	
C399	Other alkaline materials	- Landfill of the waste in liquid state is forbidden. - To be neutralized and treated at landfill in the form of neutral salt or metal hydroxide	
Inorganic chemical wastes			
D401	Non-toxic salts	- Landfill of the waste in liquid state is forbidden. - To be solidified to comply	
D402	Arsenic and its compound		
D403	Boron compounds		

HW No.	Class/Sub-category	Criteria for Treatment	Remarks
D404	Cadmium and its compounds	with the acceptance criteria for landfill.	
D405	Chromium compounds		
D406	Lead compounds		
D407	Mercury and mercuric compounds	- Same as above.	
D499	Other salts and complexes		
Reactive chemical wastes			
E501	Oxidizing agents	- Landfill is forbidden. - To be chemically treated by types of materials	
E502	Reducing agents	- Landfill is forbidden. - To be chemically treated by types of materials	
E503	Explosive and unstable chemicals	- Landfill is forbidden. - To be treated at sources.	
E599	Highly reactive chemicals	- Landfill is forbidden. - Chemical treatment for each type.	
Paint/Resins/Lattices/Inks/Dyes/Adhesives/Organic Sludge			
E601	Aqueous-based	- Landfill of the waste in liquid state is forbidden. - The waste in solid state can be treated at landfill if it meets the acceptance criteria. - Solidification or thermal treatment may be needed for non-compliance wastes	
E602	Solvent-based		
E699	Other mixed		
Organic solvent			
F701	Flash points>61℃	- Landfill of the wasre in liquid state is forbidden. - To be thermally treated.	
F702	Flash points<61℃		
F703	Chlorinated solvents and residues	- Landfill of the waste in liquid sate is forbidden. - Thermal or physicochemical treatment is needed.	Organic chlorine materials may be chemically treated.
Putrescible/Organic Wastes			
G801	Animal/abattoir waste	- Landfill is forbidden. - Thermal treatment or biological treatment, including composting is required.	Some of the waste can be biologically treated to composts or animal food.
G802	Grease trap wastes from industrial or commercial premises		
G899	Others		
Textile			
H901	Tannery wastes	- Thermal treatment is required to comply with the acceptance criteria.	
H999	Other textile wastes	- Thermal treatment is required to comply with the acceptance criteria.	
Oil			
I101	Waste oils	- Landfill is forbidden.	

HW No.	Class/Sub-category	Criteria for Treatment	Remarks
I102	Interceptor sludge	- Thermal treatment is required to comply with the acceptance criteria unless the waste is recycled.	
I103	Vegetable oils		
I104	Waste tallow		
I105	Oil/water mixtures		
Containers			
J201	Portable containers previously containing toxic chemical substances	- Landfill is forbidden. - To be recycled after rinsing or thermally treated before landfill.	
Immobilized Waste			
K301	Solidified and polymerized wastes	- To be properly treated before landfill by types of materials.	
K302	Chemically fixed waste	- Landfill is allowed.	
K303	Encapsulated wastes		
Organic Chemicals			
L401	Aliphatics	- Landfill is forbidden. - To be thermally treated.	
L402	Aromatics and phenolics		
L403	Highly odorous		
L404	Surfactants and detergents		
L405	Halogenated solvents	- Landfill of the waste in liquid state is forbidden. - Thermal or physicochemical treatment is required.	Same as F703
L406	Polychlorinated biphenyls and related materials	- Landfill of the waste in liquid state is forbidden. - Thermal or physicochemical treatment is required. - Solid waste can be treated in landfill if it meets the acceptance criteria.	
L499	Other organic chemicals	- Landfill of the waste in liquid state is forbidden. - To be thermally treated.	
Miscellaneous Wastes			
M501	Pathogenic or infectious wastes	- Landfill without treatment is forbidden. - Sterilization is required.	
M502	Asbestos wastes	- Solidification and proper packaging are required before landfill.	
M503	Pharmaceutical wastes and drugs	- Landfill is forbidden. - To be decomposed by thermal treatment	
M504	Pesticides	- Landfill is prohibited. - To be decomposes by thermal treatment.	

The insulated boards, on which printed circuits are drawn by board level packaging technology, may contain Pb (lead). Although the board itself is inert materials, Pb will be easily eluted under acid or alkaline environment. To control this elution of Pb, the boards need to be thermally destructed to separately collect Pb in the ashes. Therefore, insulated boards are usually identified as the HWs to be treated before going to landfills.
Some of the waste oils such as bunker sludge cannot be fully recycled. Thermal destruction is needed to completely detoxify them. Insecticides, medicines, and fluxes are also subject to thermal destruction.

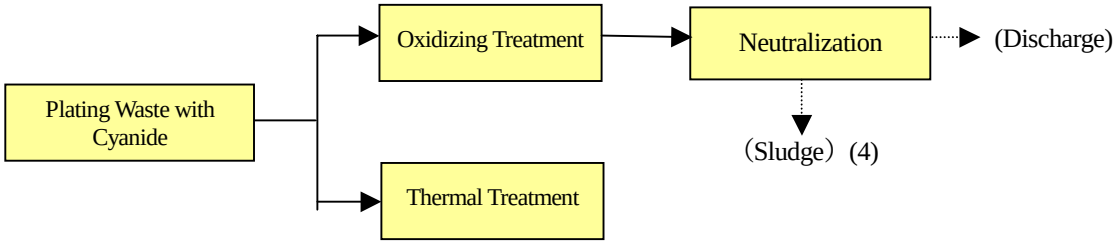
The HWs of explosive should be treated under the generators' responsibility.

8.2.2 Establishment of HW Treatment Flow

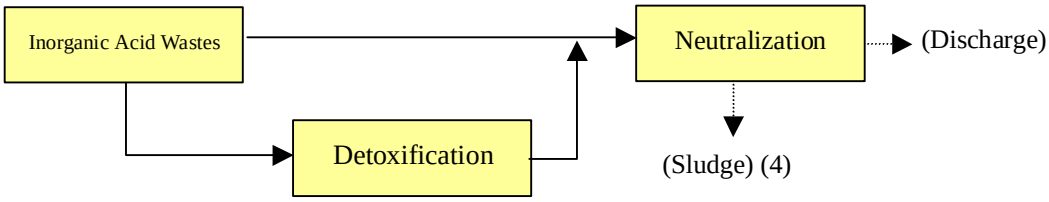
(1) Required Standard HW Treatment Flow by HW Categories

Required standard flow of HW treatment is summarized below by types of HW.

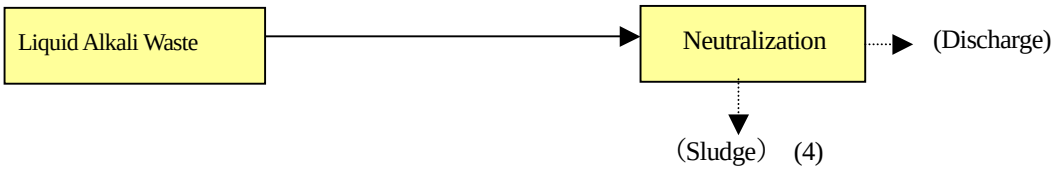
1) Cyanide Plating Waste and the Likes



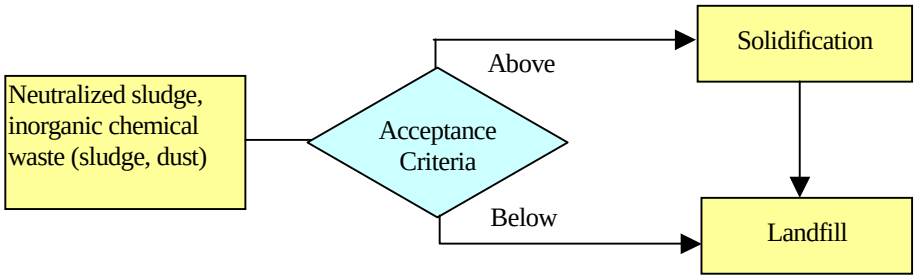
2) Inorganic Acid Wastes



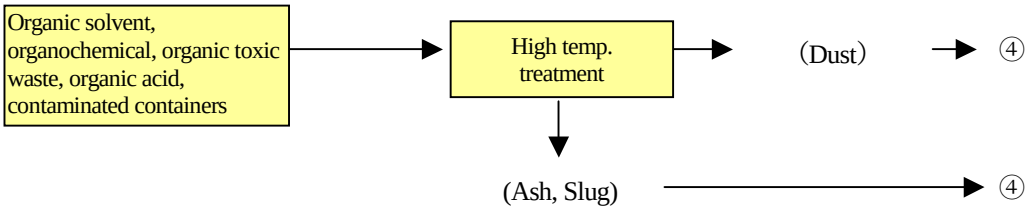
3) Alkaline Liquid Wastes



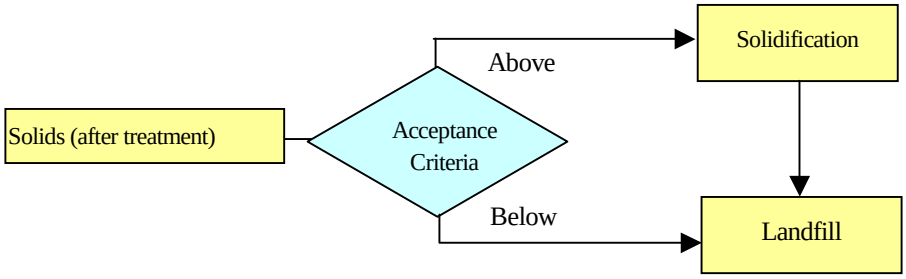
4) Sludge after Neutralization and Inorganic Chemical Wastes (Dust, Ashes, etc.)



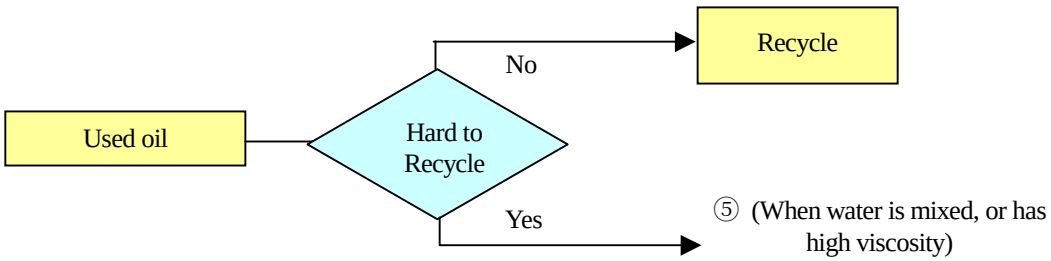
5) Organic Solvents, Chemicals, Acids and Other Hazardous Organic Substances



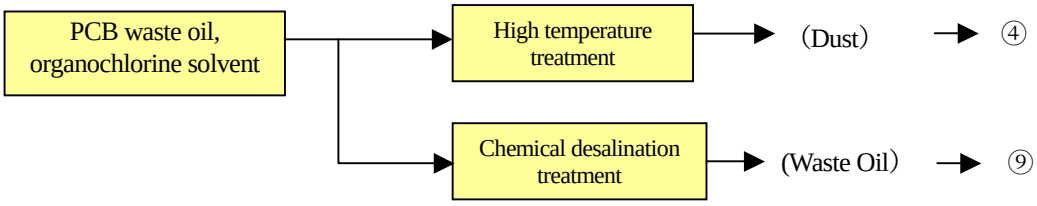
6) Solids (Treatment Residues)



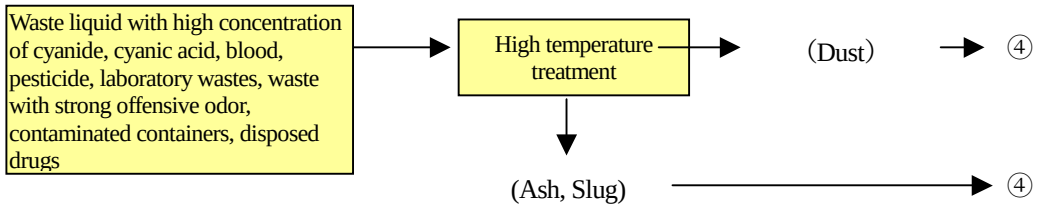
7) Waste Oil



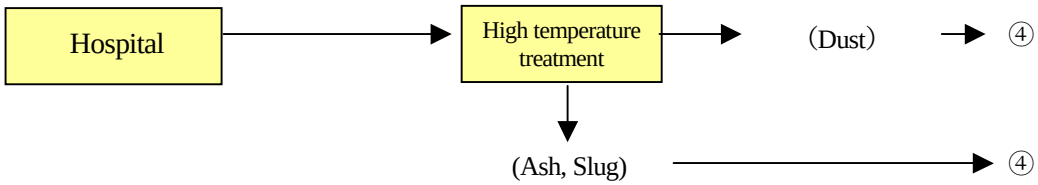
8) Toxic Materials (PCBs, Organic Chlorinated Solvents)P



9) Specially Controlled Wastes (Highly Concentrated Cyanide Liquids, Cyanides, Blood, Insecticides, Laboratory Wastes, Highly Offensive Odorants, HW-Contaminated Containers, waste medicines)

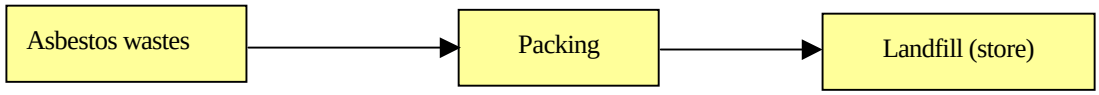


10) Pathogenic or Infectious Wastes



Remark:
There are two types of measures for pathogenic and infectious wastes, namely, autoclave and landfill. However, because landfill of organic HW is completely prohibited in the Master Plan, autoclave is the only way of proper treatment.

11) Waste Asbestos)



Remark:
Waste asbestos cannot be detoxified unless they are melted at the temperature of more than 1400 Celsius. It will take some time to develop such facilities in the Philippines. For this present moment, the Study Team suggests to firmly pack and temporarily stored them at the landfills.

(2) Recycling of Waste Solvent and Oil

1) Waste Solvent

The less contaminated solvents like those used in rinsing process of hi-tech industries can be easily recycled by distillation. Portable distillation device is also disseminated through the market. Recycling and reuse of these less polluted solvents should be promoted. However, heavily contaminated solvents need thermal treatment.

As to the materials contaminated by solvents, such as containers, there are some treatment measures including rinsing by non-hazardous solvents, separating toxic solvents by heat distillation. But, most practical option is thermal treatment.

2) Waste Oil

Recycling of waste oil is well developed in the Philippines, represented in the reuse of lubricant. It is also used as the heat source of industrial furnace such as cement kilns. This current active use of waste oil should be maintained and further expanded.

8.2.3 Standards and Criteria for HW Landfill

(1) Establishment of HW Landfill Standards

1) HW Landfill Options

There are two major options of HW landfill. One is to establish stringent waste acceptance criteria, and the other is to set up comparatively moderate ones. There will be a big difference in HW treatment cost between which options to apply in the Philippines. The required levels of HW treatment and disposal for these two options can be summarized as follows.

Table 8.2.2 Required Levels of HW Treatment and Disposal by Options

Options	Details of the Option
Option A: Set up comparatively moderate waste acceptance criteria for HW landfill	Physicochemical treatment and solidification are required for pre-treatment of HW. For the landfill facility, stringent standard is to be applied so as to ensure the environmental safety.
Option B: Set up stringent waste acceptance criteria for HW landfill	Physicochemical treatment, solidification, and thermal treatment of organic are required for pre-treatment of HW. The standard applied for the facility is less strict than Option A.

The differences between these two options are explained in further detail in Table 8.2.3. Although incremental cost of HW treatment is higher in applying stringent waste acceptance criteria, it does not include the cost of monitoring and inspection of HW landfill that may be carried out permanently unless its environmental safety is completely ensured. If some hazardous materials leak to the watercourse or soil, the contaminated environment has to be completely restored. The precedents in U.S.A. and other countries clearly indicated that an enormous amount of fund had been invested in restoration of contaminated environment. It is very difficult to accurately compare the total lifecycle cost of HW treatment and disposal between the two options.

Table 8.2.3 Comparison Between Two Options of HW Landfill Criteria

	Potential hazardousness	Environmental Load to Landfill	Monitoring Period	Landfill Cost (peso/ton)
Option A	High level hazardousness remains at landfill.	Large amount of waste will come to landfill.	Long-term monitoring will be needed.	8,000
Option B	Potential hazardousness minimized.	Amount of waste will be reduced to one-fourth of Option A.	Monitoring period will be shorter than Option A.	12,000 – 15,000

Taking into account the current difficulties in waste disposal, and not to carry over the possible danger to human health and environment to the future generation, stringent waste acceptance criteria should be applied for HW landfill in the Philippines. This option also complies with the basic policies on HWM given in Chapter 7.

2) Establishment of Differentiated Landfill Categories

The Philippines does not have an overall regulatory mechanism on waste disposal (landfill) yet. Therefore, the Study Team first recommends the overall mechanism of waste landfill, in which HW landfill will be properly put in place.

The Study Team recommends establishing the following 3 categorized landfills.

Table 8.2.4 Recommended Landfill Categories

Landfill Classification	Waste Acceptance Criteria
Class III	Hazardous waste (Toxicity must be minimized in the pre-treatment process.)
Class II	Municipal solid waste and industrial waste excluding hazardous ones
Class I	Inert waste (waste rubber, waste glass and ceramics, etc.)

Besides the 3 types of landfills above, there is another category of landfill called 'Isolated Landfill'. The isolated landfill, which is introduced in Japan and Germany, accepts the HWs in non-compliance with the waste acceptance criteria for any of the above 3 landfills. Accepted wastes are permanently or semi-permanently stored under strict monitoring and control. Radioactive waste is an example of such waste. It will be very difficult for

private sector to build and permanently manage such facility. It should be under the control of national authority if it is built in the Philippines in the future. The overall concept of these categorized landfills is shown in Figure 8.2.1.

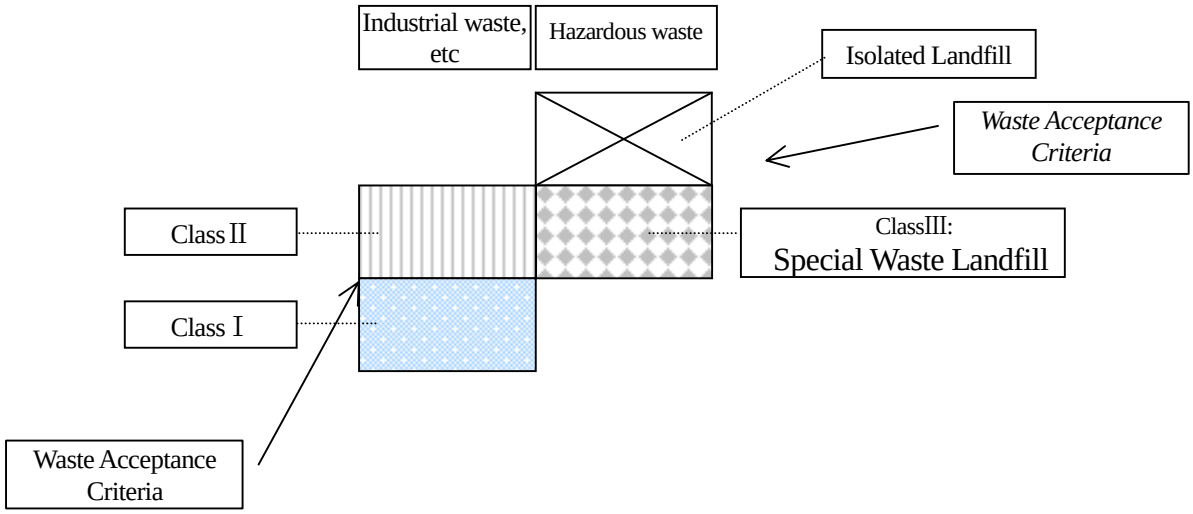


Figure 8.2.1 Conceptual Framework of the Categorized Landfills

i) Theoretical Basis of Establishing Class III landfill

The Class III landfill is designed to accept HW exclusively from other types of waste. It has to be separately built and managed in terms of risk mitigation and proper management of HW.

Even though the HW is detoxified and stabilized at its maximum, hazardous substances such as heavy metals will still remain within the waste. Therefore, it still needs separate control with other types of landfills so as to avoid possible elution of hazardous materials by mixing with other wastes, especially organic substances.

Furthermore, in terms of proper HWM, HW needs to be brought into landfill separately with other wastes. If it is allowed to dispose of HW and other types of wastes in the same landfill, proper HWM will be virtually impossible, especially in the present situation of no overall regulatory mechanism of waste landfill in the Philippines.

Since the Class III landfill accepts HW as far as it is detoxified and stabilized at its maximum, it is not appropriate to call it HW landfill. Instead, the Study Team recommends calling it 'Special Waste Landfill'. In this case, special waste means the detoxified and stabilized HW, not the non-treated HW.

ii) Class I Landfill

The Class I landfill only accepts non-hazardous inert waste. Since there will be no danger of hazardous substances elution, the technical and management requirements for Class I Landfill will be less stringent than other types of landfills.

iii) Class II Landfill

The Class II landfill accepts non-hazardous waste of active state. Its technical and management requirements will be in the level between Class I and Class III landfills. Municipal waste of active state will go to this Class II landfill.

(2) Establishment of Waste Acceptance Criteria for Special Waste Landfill

1) Hazardous Substances to be Controlled in Class III Landfill

In landfill management, prevention of diffusing the pollution to surface and ground water is primary concern. The main route of exposing the pollutants to the human is fresh water drinking. Therefore, the existing drinking water standard for human health should be the basis of waste acceptance criteria for Class III Landfill.

Table 8.2.5 below shows the Philippines drinking water standard for human health.

Table 8.2.5 The Philippines Drinking Water Standard for Human Health

	Constituents	Maximum Level (mg/L)
Inorganic Constituents	Antimony	0.005
	Arsenic	0.01
	Barium	0.7
	Boron	0.3
	Cadmium	0.003
	Chromium	0.05
	Cyanide	0.07
	Fluoride	1.0
	Lead	0.01
	Mercury(total)	0.001
	Nitrate as No_3-	50
	Nitrate as No_2-	3
	Selenium	0.01
Organic Constituents (Pesticides)	Aldrin & Dieldrin	0.03
	Chlordane	0.2
	DDT	2
	Endrin	0.2
Organic Constituents (Pesticides)	Heptachlor and Heptachlor epoxide	0.03
	Lindane	2
	Methoxychlor	20

	Constituents	Maximum Level (mg/L)
	Petroleum oils & grease	nil
	Toxyphane	5
	2,4-D	30
	2,3,5-T	9

Source: Philippine National Standard for Drinking Water

The substances that are listed in the table above as well in DAO92-29 are Nitric Acid, Hydrofluoric Acid, Arsenic and its compounds, Boron compounds, Cadmium and its compounds, Chromium compounds, Lead compounds, and Mercury and mercuric compounds. Another important substances that is not listed in the drinking water standard, but listed in DAO92-29 is PCBs (Polychlorinated biphenyls and related materials). It also has to be controlled in the waste acceptance criteria. These will be the basis of the substances controlled in the waste acceptance criteria.

Regarding the organic hazardous wastes, it is not necessary to include them into the controlled substances in the criteria, as far as they are brought into landfill after making them completely inert. However, highly toxic materials like PCBs and dioxin compounds are necessary to be controlled by the criteria.

2) Other indicators to be Applied

There are some other items to be controlled by the waste acceptance criteria. An important item is to regulate inert levels of the HW. As used in European countries and Japan, the Study Team recommends applying the indicators of ignition loss and TOC (Total of organically bound carbon) to regulate them.

Another item to be considered is the physical state of the HWs. Taking into account smooth and safe use of the heavy machinery at the landfill, proper physical requirement of HW needs to be established.

3) Examples of HW Acceptance Criteria for Landfill

Table 8.2.6 compares the Philippines drinking water standard with Japanese one as well as with 3 countries' (Japan, Germany, USA) waste acceptance criteria for HW landfill. The table indicates that the level of waste acceptance in the U.S. is less strict than others. It seems that the U.S. accepts the HWs of higher pollution potential, although the conditions of elution test to measure the concentrations of controlled substances may be different between countries.

In the case of waste acceptance criteria, its compliance is examined by elution tests of the HWs because contamination of the water by leachate from is of great importance in proper

landfill management.

The acceptance levels at Class III landfill will not be the same as the drinking water standard. The Class III landfill will be equipped with the maximum facilities to prevent and minimize leaks or elution of hazardous materials into the environment.

Table 8.2.6 Examples of HW Acceptance Criteria for Landfill

	Philippine	Japan	Japan	Germany	U.S.A.
	Drinking water criteria (mg/l)	Environmental water quality standard (mg/l)	Acceptance level (mg/l)	Acceptance level (mg/l)	Acceptance level (mg/l)
Arsenic (as A)	0.01	0.01	0.3	0.5	5.0
Lead (as Pb)	0.01	0.01	0.3	1	5.0
Cadmium (as Cd)	0.003	0.01	0.3	0.1	5.0
Chrome, hexavalent (as Cr^{+6})	0.05	0.05	1.5	0.1	5.0
Mercury (as Hg)	0.001	0.0005	0.005	0.02	0.2
Cyanide, easily releasable (as CN)	0.07	ND	1	0.5	-
Barium (as Ba)	0.7	-	-	-	100.0
Selenium (as Se)	0.01	0.01	0.3	-	1.0
PCB	-	ND	0.003	-	
Dioxin	-		3ng/kg	-	

ND: not detected by the specified testing device.

In the case of Japan, it is considered that heavy metals are usually captured in soil and mostly will not elute into surface or ground water. Accordingly, the acceptance levels of heavy metals at the landfill are set up at approximately 30 times as of drinking water standard. Regarding cyanide and mercury, however, the acceptance levels are established at 10 times of drinking water standard, taking into account their comparatively high tendency of elution.

As far as the above acceptance levels are kept, the elution of hazardous substances will be minimized enough to protect safety and quality of surface and ground water.

4) Waste Acceptance Criteria for Class III Landfill (7 hazardous substances)

Table 8.2.7 below recommends the waste acceptance for Class III Landfill. The criteria are established for 7 hazardous substances to be controlled. The acceptance levels given here is almost the same as of Japan and Germany. Acceptance levels of PCBs and dioxin compounds are shown here as the references for the future determination in the Philippines.

Table 8.2.7

Comparison of Recommended Waste Acceptance Criteria with Other Countries'

	Philippine	Philippine	Japan	Germany
	Drinking water criteria (mg/l)	Proposed Acceptance level (mg/l)	Acceptance level (mg/l)	Acceptance level (mg/l)
Arsenic (as A)	0.01	0.3	0.3	0.5
Lead (as Pb)	0.01	0.3	0.3	1
Cadmium (as Cd)	0.003	0.1	0.3	0.1
Chrome, hexavalent (as Cr^{+6})	0.05	1.5	1.5	0.1
Mercury (as Hg)	0.001	0.01	0.005	0.02
Cyanide, easily releasable (as CN)	0.07	0.7	1	0.5
Barium (as Ba)	0.7	2.0	-	-
Selenium (as Se)	0.01	0.3	0.3	-
PCB	-	0.003*	0.003	-
Dioxin	-	3ng/kg*	3ng/kg	-

Arsenic, Lead, Cadmium, Chrome (hexavalent) are 30 times higher than drinking water. However, figures are rounded off from 0.09 to 0.1 for Cadmium, and 2.1 to 2.0 for Barium. For Mercury, Cyanide, and easily releasable substances, the values are set 10 times higher than drinking water's.

5) Other Criteria to be Applied

The Study Team recommended that no criteria would be established for organic hazardous substances with the exception of PCBs and dioxin compounds. Instead, the Study Team recommends prohibiting direct disposal of organic HWs at any of landfill unless they are detoxified and stabilized by intermediate treatment. In addition, the acceptance criteria for organic content of HWs will be established at stricter level by tightening the related indicators such as ignition loss and TOC.

Table 8.2.8 below takes the Germany's case as an example of the similar acceptance criteria for organic HW.

Table 8.2.8 Acceptance Criteria for Organic HW in Germany

	Germany
Landfill type Parameter	Class II
Ignition Loss	5%
Total of organically bound carbon TOC (as C)	≦ 3%
TOC	100mg/L

The ignition loss of 5% is a very strict standard because even the ashes from normal

incinerators still show more than 10%. However, to prevent contamination by dioxin compounds, ignition loss has to be kept at least below 10%. In the case of the Philippines, taking all of these into account, the Study Team recommends setting up the ignition loss of 7 to 8% between 5 and 10% and TOC of 5 to 6% as the initial criteria.

As to the indicator for regulating physical state of HWs, the water content should be controlled below 85% so that landfill operators can drive heavy machinery and equipment on-site.

6) Waste Acceptance Criteria for Class I and Class II Landfills

Class I landfill only accepts non-hazardous inert wastes such as scrapped metals, glass and ceramic wastes, rubbles and the likes. Any organic wastes will not be accepted in Class I landfill. Ignition loss to be applied in Class I will be less than 5%. Class I landfill I also refuses any of HWs to be disposed of. Therefore, no criterion will be established for hazardous substances.

Class II landfill will allow disposal of non-hazardous industrial waste and municipal solid waste. The acceptance criteria for hazardous substances will be the same as Class III landfill with the exception of organic substances. Class II landfill will accept organic wastes as long as they are identified as non-hazardous. However, the HWs that are pre-treated to comply with the criteria for Class III landfill will never go to Class II landfill so as to avoid mixture with organic substances.

7) Recommended Waste Acceptance Criteria by Landfill Classes

Table 8.2.9 below shows the recommended waste acceptance criteria for the 3 classified landfills.

Table 8.2.9 Recommended Waste Acceptance Criteria for 3 Classes of Landfills

Landfill type	Class Ⅲ	Class Ⅱ	Class Ⅰ
Acceptable Wastes	Detoxified HW	MSW, non hazardous ISW	Inert waste
Ignition Loss	≦ 7-8%	-	≦ 5%
Total of organically bound carbon TOC (as C)	≦ 5-6%	-	-
Moisture contents	≦ 85%	≦ 85%	-
Arsenic (as As)	0.3 mg/l	0.3 mg/l	-
Lead (as Pb)	0.3 mg/l	0.3 mg/l	-
Cadmium (as Cd)	0.1 mg/l	0.1 mg/l	-

Landfill type	Class Ⅲ	Class Ⅱ	Class Ⅰ
Chrome, hexavalent (as Cr)	1.5 mg/l	1.5 mg/l	-
Mercury (as Hg)	0.01 mg/l	0.01 mg/l	-
Cyanide, easily releasable	0.7 mg/l	0.7 mg/l	-
Barium (as Ba)	2.0 mg/l	2.0 mg/l	-
Selenium	0.3 mg/l	0.3 mg/l	-

8.2.4 Required Treatment Measures by Types of HWs

Required treatment measures are shown for each category of HWs in Table 8.2.10 below.

Table 8.2.10 Required Treatment Measures by Types of HWs

Treatment Methods	Applicable Waste Types
Physicochemical Treatment Physicochemical Treatment	・Plating waste with cyanide (solution and salts) A101~105, A199 ・Acid, (・B201 Sulfuric acid, ・B202 Hydrochloric acid, ・B203 Nitric acid, ・B204 Phosphoric acid, ・B205 Hydrofluoric acid, ・B206 Mixture of sulfuric and hydrochloric acid, ・B207 Other inorganic acid) ・Alkali (・C301 Caustic soda, ・C302 Potash, ・C304 Ammonium hydroxide, ・C305 Lime slurries, ・C306 Lime-neutralized metal sludge, ・C399 Other alkaline materials) ・Inorganic chemical wastes （・D402 Arsenic and its compound, ・D403 Boron compounds, ・D404 Cadmium and its compounds, ・D405 Chromium compounds, ・D406 Lead compounds, ・D407 Mercury and mercuric compounds, ・D499 Other salts and complexes） ・Reactive chemical waste (・E501 Oxidizing agents, ・E502 Reducing agents, ・E599 Highly reactive chemicals)
Solidification Treatment	・C306 Lime-neutralized metal sludge ・D402 Arsenic and its compound ・D403 Boron compounds ・D404 Cadmium and its compounds ・D405 Chromium compounds ・M502Asbestos wastes
Thermal Treatment	・B208 Organic acid ・C303 Alkaline cleaners ・D401 Non-toxic salts ・Reactive chemical waste (・E501 Oxidizing agents, ・E502 Reducing agents, ・E599 Highly reactive chemicals)

Treatment Methods	Applicable Waste Types
Thermal Treatment	・Paint/Resins/Lattices/Inks/Dyes/Adhesives/Organic Sludge (E601 Aqueous-based E602 Solvent-based E699 Other mixed) ・F701 Organic solvent (Flash points ＞61℃) ・F702 Organic solvent (Flash points ＜61℃) ・F703 Chlorinated solvents and residues ・G801 Animal/abattoir waste ・G802 Grease trap wastes from industrial or commercial premises ・G899 Others ・H901 Tannery wastes, ・H999 Other textile wastes ・I102 Interceptor sludge ・J201 Portable containers previously containing toxic chemical substances ・Organic chemical (L401 Aliphatics, ・L402Aromatics and phenolics, ・L403 Highly odorous, ・L404 Surfactants and detergents, ・L405 Halogenated solvents, ・L499 Other organic chemicals) ・M501 Pathogenic or infectious wastes ・M503 Pharmaceutical wastes and drugs ・M504 Pesticides
Distilled Treatment	・F701 Organic solvent (Flash points ＞61℃) ・F702 Organic solvent (Flash points ＜61℃) ・F703 Chlorinated solvents and residues
Oil separating/ distillation, etc.	・Oil(・I101 Waste oils, ・I103 Vegetable oils, ・I104 Waste tallow, ・I105 Oil/water mixtures)
Treatment at source	・E503 Explosive and unstable chemicals
Landfill	・K301 Solidified and polymerized wastes ・K302 Chemically fixed waste ・K303 Encapsulated wastes
Chemical Treatment	・F703 Chlorinated solvents and residues ・L405 Halogenated solvents ・L406 Polychlorinated biphenyls and related materials
Sterilization	・M501 Pathogenic or infectious wastes

8.3 Technological Requirements for TSD Facilities and Their Operation

There is no technological requirement provided by law to regulate TSD facilities and their operation in the Philippines. It hinders private sector from making proper investment in developing TSD facilities. Therefore, the Study Team here made recommendations

regarding the technological requirements for TSD facilities and their operations.

8.3.1 Technological Requirement for Class III Landfill Facilities and Their Operation

Class III landfill facilities are required to comply with the technological criteria given in Table 8.3.1.

Table 8.3.1 Technological Requirement for Class III Landfills

	Category	Detail
Site selection	Protection of ground water aquifer	- Select a site where its geological feature prevents the groundwater contamination by elution of toxic materials from the landfill.
Facility standards	Fences on the perimeter of the site	- Clarify the boundary between the facility and surrounding area by fence. - Prevent people from coming into the facility.
	Prevent accidental release of waste	- Build retaining walls and/or dams to prevent accidental waste releases to the surrounding environment. Construct the facility in such way to withstand against the weight of waste itself, soil pressure, wave force, and earthquakes.
	Drainage system for rain water	- Construct drainage system to prevent rainwater from running into the facility.
	Liner facilities	- Install the liner on 50cm of stratum with the permeability coefficient of less than 10^{-6} cm/second, or on more than 5cm of asphalt/ concrete layer with the permeability coefficient of less than 10^{-7} cm/second. - Install double liners.
	Leachate collection facility & treatment facility	- Construct leachate collection facility. - Construct a treatment facility for the collected leachate. (Treated effluent must meet the effluent standards of DAO90-35.)
	Monitoring facility	- Monitoring facility for the liner maintenance. - Install more than two monitoring wells.
Operation	Protecting the liner facility	- Take appropriate measures for protecting the liner facilities from breakage.

	Category	Detail
	Verify conditions of the liner	- Periodically conducted.
	Intermediate earth cover	- Conducted as the occasion demands.
	Leachate treatment management	- Periodically conducted.
	Leachate monitoring	- More than twice a year.
	Groundwater monitoring	- Once a year for the standard items. - Once a month for conductivity and pH value.
After operation period	Earth cover after landfill	- Cover with earth for more than 50 cm.
	Monitoring	- Examine groundwater for once a year. - Check for leachate.
	Maintenance and Management	- Conducted in accordance with the guidelines to be formulated.

8.3.2 Technological Requirement for Physicochemical Treatment

Acid and alkaline wastes as well as cyanide plating liquids are subject to oxidizing disintegration and neutralization. Comparatively simple process of neutralization can be made at sources (by HW generators). However, more complicated or highly contaminated HWs must be treated at specialized treatment facilities equipped with sufficient safety measures. Such wastes include fluoric acid (Toxicity cannot be sufficiently removed by simplified neutralization.), nitric acid (Toxic gases may arise in the process of treatment.), heat discharging liquids, and the liquids containing co-existing impurities.

Concentrated liquids of cyanide and hexavalent chromium also need special treatment process, such as thermal destruction of cyanide, oxidizing disintegration of hexavalent chromium, etc.

The above physicochemical treatment processes generates hydroxides. The hydroxides are further filtrated to remove its toxicity. Finally, filtration residues remain in the form of sludge to be disposed of at landfills.

Technological requirement for these physicochemical treatment facilities are given in Table 8.3.2.

Table 8.3.2 Technological Requirements for Physicochemical Treatment Facilities

Items	Requirement
Structure of Facility	- The facility should be build on or with impermeable ground/floor. - Install a facility/system to control supply of waste acid, waste alkali, neutralizers, and oxidizing agents. - Install reaction chamber equipped with stirring mechanism
Operation / Maintenance	- Corresponding to pH value measured in the reaction chamber, adjust supply of waste acid, waste alkali, or other chemicals. - Thoroughly mix the wastes. - Protect the surrounding living environment by taking necessary measures against the gasses that are generated in the process of oxidizing decomposition of cyanide, and treatment of nitric and hydrofluoric acids.

8.3.3 Technological Requirement for Solidification

Solidification is applied to the wastes that are not in compliance with the waste acceptance criteria for the designated landfills. Cement or chelate resin is utilized to solidify HWs. Technical requirement for solidification is given in Table 8.3.3 below. Facilities are equipped with holding and cement tanks. Mixing and molding process are carried out in the calefied water tank. Regarding the mixing and molding processes, more detailed technological requirement is needed to specify combination of cement materials and intensity, size, and configuration of the solids.

Table 8.3.3 Technological Requirement for Solidification Treatment Facilities

Items	Requirement
Structure of Facility	- Facility is to be constructed on and/or with impermeable ground or floor, respectively. - Facility has to be designed to evenly mix sludge, dust, cement, and water.
Operation / maintenance	- Collect elusion from sludge in the wastewater discharging process. - Take enough aging.

8.3.4 Technological Requirement for Thermal Decomposition

Thermal decomposition is the only available way to detoxify organic HWs. To comply with the waste acceptance criteria for Class III landfills, organic HWs need to be thermally destructed. As far as in accordance with the criteria recommended here in the master plan, many kinds of existing HWs will be subject to thermal decomposition.

The Philippines Clean Air Act stipulates in Article 3 of Section 20 that 'Incineration, hereby

defined as the burning of municipal, biomedical and hazardous waste, which process emits poisonous and toxic fumes is hereby prohibited'. Under this article, waste incineration by conventional technology is completely forbidden.

However, the Study Team recognized that the article does not prohibit to pyrolize waste by making use of some heat media in the form of rotary kilns and the likes, as far as no poisonous and toxic fumes are discharged to the environment. It is considered that poisonous and toxic fumes indicate Section 19 of the Act, which provides flue gas emission standard. Therefore, thermal decomposition treatment can still be applied in the Philippines as far as it is advanced enough to comply with the Act including the flue gas emission standard.

Additional technological requirement for thermal decomposition facilities to comply with the Clean Air Act will be as follows:

- To comply with the flue gas emission standards of Section 19,
- Ignition loss of treatment residues must be less than 5%,
- Furnace temperature must be kept at above 1,200 Celsius.

In the above conditions, even the flame resistant HWs can be almost completely destructed by heat. Generated residues are in the glass fibred form and mostly do not contain any organic compounds. These advanced treatment technology has already been introduced in Japan and European countries and technologically feasible to apply in the Philippines. The overall technological requirement for thermal decomposition of HWs is given in Table 8.3.4 below.

Table 8.3.4 Technological Requirement for Thermal Decomposition Facilities

Item	Requirement
Facility Structure	- Constant supply of waste is secured. - Pyrolysis gas can be retained in the chamber for 2 seconds while holding temperature of more than 1,200 ℃. - Furnish auxiliary fuel firing equipment to maintain 1,200℃. - Equip machines to continuously measure and record the temperature of gas in the chamber. - Temperature of gas sent to the dust collector need to be cooled down to less than 200℃. - Equip machines to continuously measure the temperature of gases flown into the dust collector. - Install exhaust gas treatment device to meet the emission standards. - Continuously measure concentration of carbon monoxide in the exhaust gas. - Dust need to be separated from slug.

Item	Requirement
Operation / Maintenance	- The temperature of pyrolysis gas must be kept at more than 1,200℃. - Hold the ignition loss at less than 5 %. - Continuous operation. - Continuously measure and record the gas temperature in the chamber. - Retain the gas temperature at less than 200℃ in the dust collector while constantly measuring and recording it. - Periodically remove dust from the dust collector. - Operate the chamber in such way to keep the concentration of carbon monoxide in the exhaust gas at less than 100ppm. (4 hours average on 12% oxygen equivalent). - Constantly measure and record carbon monoxide concentration. - Periodically measure concentration of exhaust gas.

In addition to the above, the analysis of dioxin compounds is also required.

If the furnace gas temperature is kept at above 1,200 Celsius for more than 2 seconds and carbon monoxide content in the flue gas is maintained at less than 100ppm, PCBs and chlorinated organic compounds can be detoxified at a rate of 99.9999%. Complete sterilization of infectious waste is also possible by applying this technology.

8.3.5 Technological Requirement for Treatment of PCBs, Asbestos and Medical Wastes (Pathogenic/Infectious Wastes)

(1) PCBs

Waste PCBs mainly consist of insulation oil and other PCB-contaminated materials such as PCB-applied papers, wood chips, and fibers. Except insulation oil, PCB-contaminated materials can only be detoxified by high temperature pyrolysis. The above-mentioned thermal decomposition technology can detoxify them into required acceptance level.

PCBs containing insulation oil can also be detoxified by the same technology to reach the decomposition rate of 99.99%. However, because there is no technology available to constantly monitor and measure decomposition rate of PCBs, it is practically impossible to guarantee non-hazardousness of the treated PCBs. Therefore, other PCBs treatment technologies have also been developed, namely dechlorination by metal sodium and hypercritical hydroxide decomposition.

Technological requirement for chemical dechlorination above is given by controlling the PCBs content of treated oils or liquids. In the case of Japan, PCBs content of chemically

treated oils is established at below 0.5mg per litter of oil. In the case of applying hypercritical hydroxide decomposition, PCB content of the liquid after vapor-liquid separation process is 0.03mg per litter.

As to the structure of PCBs treatment facilities, every possible measure has to be taken to prevent leaks even in the case of accidents. It is also necessary to analyze the treated liquids and residues before discharging or bringing out from the facilities.

(2) Asbestos

There are two options regarding the treatment of asbestos. One is high temperature melting and the other is storage by packing into containers. Since high temperature melting needs the temperature of as high as 1,500 Celsius, it is not possible for this moment in the Philippines. Temporary storage by packing into safe containers will be the only possible way for now.

(3) Medical Wastes (Pathogenic/Infectious Wastes)

Incineration of medical waste is presently prohibited in the Philippines. The remaining treatment measures may include:

- Melting,
- Crushing and autoclaving,
- Crushing and sterilizing by drying sterilization device,
- Crushing and pasteurizing

In accordance with the recommendations made by the Study Team, organic HWs are not allowed at any of the proposed landfills. Therefore, pyrolysis is the only way of properly treating the medical wastes; otherwise we have to look for other high temperature thermal treatment technologies that comply with the technological requirement given in Table 8.3.4.

8.3.6 Technological Requirement for HW Haulage

There is no legally authorized requirement for storage and haulage of HWs in the Philippines. At least, the following rules and regulations should be provided so as to eliminate possible risks of HWs during their storage and transportation.

- Prohibition of mixed loading of HWs,
- Obligation to segregate HWs by defined categories in the different containers,
- Obligation to clearly mark the specification of HWs stored or hauled (on containers or transportation vehicles)

- Obligation to attach manifest sheets for each of transported HWs.

Table 8.3.5 specifies the required quality of containers for each type of HWs, which is also necessary to be controlled by the relevant regulations. Specific requirement are also needed for HW hauling vehicles. The Study Team suggests that HW hauling vehicles should be designed and exclusively used to transport HWs.

Table 8.3.5 Required Quality of Containers by Types of HWs

	Open drum	Closed can	Chemical can	Plastic containers	Oil can	Flexible container	Bulky refuse container	Infectious wastes container
Waste acid, Waste alkali			+	+				
Waste oil	+	+			+			
Sludge	+						+	
Dust	+						+	
Solvent	+	+		+	+			
Solids	+					+	+	
Infectious waste								+

8.4 Promotion of TSD Facilities for HWs

Development of off-site TSD facilities is the most urgent issue to be addressed in the Philippines. This section discusses the measures to promote TSD facilities development and its scenario.

8.4.1 Present Conditions and Issues of HW Treatment

(1) Present Conditions of HW Treaters

There are currently only 28 registered HW treaters in the Philippines. However, 7 treaters has shut down or suspended their business operations. Besides the 6 comparatively large-scale treaters, the remaining ones are all small size treaters.

Table 8.4.1 categorizes the existing HW recycling and treaters by types of activities and kinds of HWs to deal with.

Table 8.4.1 Summary of Existing HW Recyclers and Treaters

Category	Types of wastes	No. of Establishments
Recyclers	Solvent	2
	Waste oil	4
	Used battery	1
	Lead, solder dross	2
Recycle/treaters	Solvent, inorganic chemicals	1
	Solvent, inorganic chemicals, sludge	2
Treaters	Hospital wastes	1
	Plating waste	1
	Waste oil, tanker sludge, waste water treatment sludge	4
Businesses that reuse waste directly (as raw materials or fuels)	Mine drainage, waste oil, waste water sludge	3
TOTAL		21

In addition to the above, there are also some on-site treatment facilities developed by HW generators themselves though exact conditions cannot be identified because of limited information about on-site treatment facilities. According to the results of the interview survey on HW generators conducted by the Study Team, some of them have physicochemical facilities to detoxify and neutralize the HWs. There are also some small incinerators and solvents recycling facilities on-site. It is also found that some of the HWs are exported for recycling and treatment.

(2) Present Conditions of HW Treatment

Table 8.4.2 summarizes the present conditions of HW treatment on the basis of the data from the currently registered 1,079 HW generators. It should be taken into account that it only represented the results of registered generators and not cover the whole Philippines. However, because this is the only comparatively reliable data on HW generation and treatment, the Study Team decided to use this as a base for the Master Plan.

Table 8.4.2

Present Conditions of HW Generation and Treatment of the Registered Generators

Types of Waste	Volume of HW Generated (A)	Volume of HW Recycled On-site (B)	Volume of HW Treated On-site (C)	Volume of HW Requires Off-site Treatment (D)
Plating Waste with Cyanide	11,233	0.00	9,572	1,661
Acid Wastes	26,900	1,087.00	24,667	1,146
Alkali Wastes	56,099	1,522.74	11,107	43,470
Inorganic Chemical Wastes	67,756	33,391.71	1,917	32,447
Reactive Chemical Wastes	347	0.44	98	249
Paints/ Resins/ Lattices/ Dyes/ Adhesives/ Organic Sludge	14,769	296.63	1,871	12,602
Organic Solvent	2,175	808.86	161	1,204
Putrescible/ Organic Wastes	30,588	8,217.40	9,942	12,429
Textile	81	0.20	9	71
Oil	22,549	12,539.92	1,377	8,632
Containers	3,499	1,248.71	154	2,097
Immobilized Wastes	516	60.50	64	391
Organic Chemicals	16,226	8,649.49	6,151	1,426
Pathological/ Infectious Wastes	15,467	1,529.24	1,412	12,526
Asbestos	10,145	161.00	0	9,984
Drug wastes, Medicines	1	0.00	0	1
Pesticides	1	0.00	0	1
Total	278,351	69,514	68,501	140,336

Remark:
Incinerators deal with about 3000 tons of on-site treatment amount. With the enactment of the Clean Air Act, proper off-site treatment may be required on this amount.

Around 70 thousand tons of HW, which covers about 25% of the total HW generation of 278 thousand tons per year, is recycled on site by generators. Meanwhile, the amount of on-site HW treatment reaches 68 thousand tons. Consequently, about the half of generated HWs are recycled and treated on site.

The amount off-site HW treatment reaches about 140 thousand tons per year. Since the amount of off-site treatment (column D) includes around 3.6 thousand tons of off-site recycling, the actual amount will be 136 thousand tons.

This amount of off-site treatment does not necessarily represents that it is properly treated off-site. In fact, 39 thousand tons of the above did not identify the treatment measures. Only 3.6 thousand (2.5% of the off-site treatment total) tons are assumed to be properly

handled by reliable treaters. The remaining amount are stored on-site or maybe improperly treated and disposed because there will be almost no other treatment and disposal facilities to properly handle HWs.

Subsequently, region-by-region characteristics of HW generation and treatment are given below. To analyze regional characteristics, the Study Team divided the Philippines into 4 greater regions as given in Figure 8.4.1.

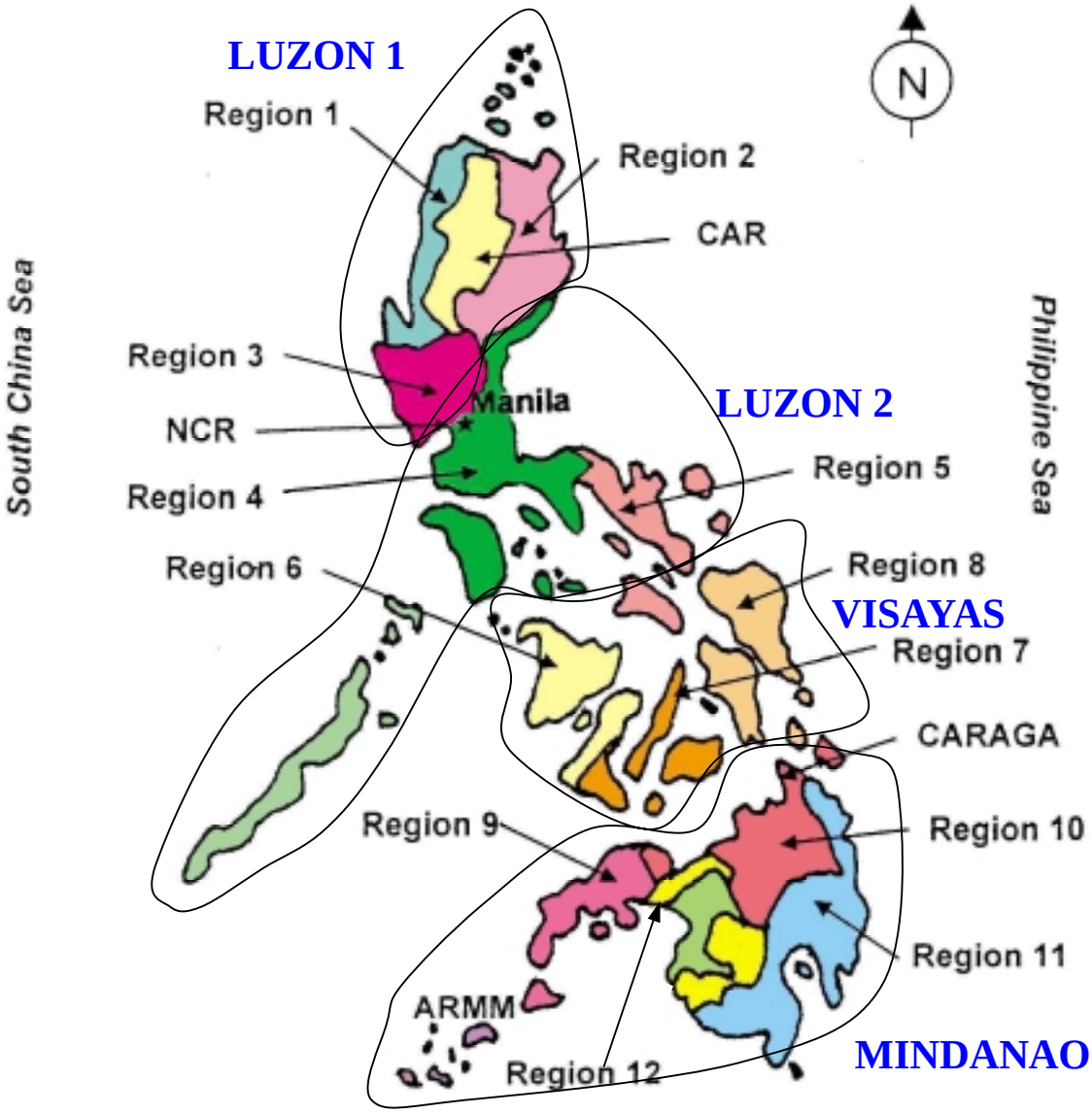


Figure 8.4.1 Regional Grouping of the Philippines

Table 8.4.3 outlines the region-wise conditions of HW generation and treatment. Each region has a considerable amount of off-site treatment. Therefore, it also needs proper HW treatment and disposal facilities.

The amount of off-site HW treatment is the most in Luzon 2 Region, where industrial and business activities are most active. It means that Luzon 2 Region is currently under the largest threat of HW in the Philippines. Although they are not as much as Luzon 2 Region, other regions also generate a sizable amount of HW to be treated off-site.

Regarding Region 7, Cebu Island, there is a new private chemical treater of HWs (Cebu Common Facility). Therefore, chemical treatment capacity is now increasing in Cebu Island.

As to disposal facilities, there have been no landfill facilities to properly handle HWs in the whole Philippines so far. It is presumed that HW generators have no choice but store the HWs on-site or improperly treat and dispose them.

Table 8.4.3 Region-Wise Conditions of HW Generation and Treatment

Unit: tons/year

Region	Grand Total	01-Recycle	On-site	Off-site
Luzon 1	23,499	10,197	5,654	7,647
Luzon 2	188,006	51,560	44,958	91,489
Visayas	27,445	3,035	3,363	21,048
Mindanao	39,444	4,763	14,526	20,154
Total	278,394	69,555	68,501	140,338

	Region #	Grand Total	01-Recycle	On-site	Off-site
Luzon 1	Ilocos	3,937	171	3,717	49
	Cagayan Valley	1	1	0	0
	C. Luzon	18,939	10,006	1,665	7,268
	CAR	10	0	0	10
Luzon 2	S. Tagalog	56,613	11,214	20,906	24,494
	Bicol	97	2	4	92
	NCR	131,295	40,345	24,048	66,901
Visayas	W. Visayas	7,210	1,464	525	5,221
	C. Visayas	8,912	1,109	2,788	5,014
	E. Visayas	11,323	462	49	10,812
Mindanao	W. Mindanao	60	60	0	0
	N. Mindanao	14,178	91	11,541	2,546
	S. Mindanao	7,771	4,143	2,790	838
	C. Mindanao	17,383	467	159	16,757
Mindanao	CARAGA	42	3	36	3
	ARMM	622	19	273	330
	Total	278,393	69,555	68,501	140,336

Out of the on-site treatment amount of around 68,000 tons per year, 5,000 tons are considered to be incinerated from our analysis of the registration data. With the enactment of the Clean Air Act, these 5,000 tons will come out as the amount to be properly treated off-site.

Regarding the total amount of off-site treatment amount of around 140,000 tons per year, there is approximately 50,000 tons of HW stored on or off-site due to lack of proper treatment and landfill facilities.

As stated above, this Master Plan clearly prohibits direct disposal of organic HWs at landfill. Thermal treatment of organic HWs is required to comply with the waste acceptance criteria for landfills. However, construction and operation of thermal treatment facilities will not be possible in terms of treatment cost unless the annual treatment amount reaches 15,000 to 20,000 tons. Therefore, it will not be able to be built in all regions above.

To implement proper HWM in the Philippines, a full-scale development of HW treatment facilities are needed including:

- HW landfills,
- Chemical treatment facilities,
- Solidification facilities, and
- Thermal treatment facilities.

Although these facilities are necessary in each region above, many of them cannot build and operate those facilities at the allowable treatment costs because of limited treatment demand.

The Study Team establishes the feasible HW treatment demand by types of facilities as follows:

Table 8.4.4 Lower Limits of Treatment Capacity
For Feasible Operation of HW Treatment Facilities (Estimated)

Treatment Type	Treatment Volume
Thermal Treatment Facility	15,000～20,000 t/yr
Landfill Facility	10,000 t/yr
Chemical Treatment Facility	1,500～3,000 t/yr

The Study Team estimated the region-wise demand for HW treatment by types of facilities on the basis of detailed data analysis on the on-site treatment amount. Table 8.4.5 shows its results.

Table 8.4.5 Estimated Region-Wise HW Treatment Demands by Types of Facilities

unit: tons/year

	Physico -chemical	Thermal	Landfill	Total
LUZON1	545	6,977	125	7,647
LUZON2	40,705	25,359	25,425	91,489
VISAYAS	4,940	4,445	11,662	21,048
MINDANAO	335	11,394	8,425	20,154
TOTAL	46,526	48,174	45,638	140,338

Remark:
The landfill demands given above include the amount to come directly to landfill from HW generators. Residues generated from physicochemical and thermal treatment are not included.

This projection only includes potential demands from the registered HW generators. Considering the demand from the potential non-registered HW generators, it will be much larger in each region. However, to remove uncertainty as much as possible from the demand projection, the Study Team decided to formulate TSD facility plan on these figures.

The treatment demand in Luzon 1 is not enough to build and operate any of the HW treatment facilities to handle HWs generated inside the region. Meanwhile, Luzon 2 has enough demand to build and operate any of the HW facilities.

In the case of Visayas, physicochemical treatment facilities and landfills can be operated. Mindanao has a certain possibility of developing thermal treatment and landfills although the projected demand is a little bit short of the required amount. However, since both regions are archipelagoes consisting of geographically dispersed into small islands, additional cost will be needed to collect HWs to the facilities. It implies that it is also difficult to operate HW treatment and landfill facilities in these regions.

8.4.2 Region-Wise Policies on TSD Facilities Development

(1) Basic Policies on TSD Facilities Development by Regions

Table 8.4.6 outlines the basic development policies on TSD facilities by Regions. An important issue to be solved is how to manage the HWs generated from the regions where it is difficult to build and operate TSD facilities.

1) LUZON 1

The HWs generated in Luzon 1 Region will have to be temporarily stored or transported to Luzon 2 Region for their treatment and disposal. However, there are some developments plans on industrial estate in Luzon 1. It will make it possible to build its own treatment and disposal facilities in the future.

2) LUZON 2

Luzon 2 Region has enough demand to build and operate one or more HW treatment facilities in financially feasible conditions.

3) VISAYAS

In the case of Visayas Regions, there is a considerably large physicochemical treatment facility in Cebu Island. It will be enough to deal with the HWs generated within the Region. As to landfill facilities, only one facility can be built in Visayas, taking into account the present projected demand. In this case, because of its archipelagic condition of the Region, the HWs need to be transported to the landfill by ship. To make smooth hauling of the HWs, a storage or transfer station will be needed at portside.

Concerning thermal treatment, there is no enough demand in this Region to have its own facility. Therefore, the HWs of organic state has to be stored and transferred to the facilities in Luzon 2, to be disposed of at the landfill as a transitional measure until thermal treatment becomes possible in the Region. Another option is the use of cement kilns for HW treatment in cooperation with the existing cement factories in the Region.

4) MINDANAO

Mindanao Region cannot have enough demand for physicochemical and thermal treatment to build its own facilities. Only one landfill facility will be possible in the Region under the present project demand. Therefore, the same measures as the Visayas Region has to be taken i.e. transfer to the facilities in Luzon 2 or landfill as a transitional measure. The HWs subject to physicochemical treatment will also have to be transferred to the facilities in other regions.

Table 8.4.6 Basic Development Policies on TSD Facilities by Regions

Region	HW required for physicochemical treatment	HW required for thermal treatment	HW required for Landfill
LUZON1	・To be treated in the facility in Luzon 2	・To be treated in the facility in Luzon 2	・To be treated in the facility in Luzon 2
LUZON2	・To be treated in the model integerated HW treatment facility in the region.	・To be treated in the model integerated HW treatment facility in the region.	・To be treated in the model integerated HW treatment facility in the region.
VISAYAS	・To be treated in the existing facility in Cebu.	・To be temporarily stored or transported to the facility in other regions, or disposed at landfill tentatively.	・To be treated in the land-fill to be preared in the region.
MINDANAO	・To be temporarily stored or transported to the facility in other regions.	・To be temporarily stored or transported to the facility in other regions, or disposed at landfill tentatively.	・To be treated in the landfill to be preared in the region.

In the case of Luzon 2, there is a comparatively large demand for HW treatment for all types of facilities. Therefore, necessary facilities need to be developed at the earliest possible so as to prevent possible danger of HW to the human health and environment.

There are several policy options of promoting TSD facilities development including encouragement of private sector participation through providing economic and financial incentives, governmental direct investment and operation of facilities for HW treatment, public-private partnership, etc. However, taking into account the present difficulties in private sector investment in TSD facilities, the Study Team suggested here to develop a model facility under the governmental initiative.

As to the landfills and transfer stations that are estimated feasible to build and operate in other Regions, private sector investment has to be promoted by the government based on the experience obtained from the above model facility.

In addition, because some of the cement kilns in the domestic cement production industries can thermally treat organic HWs of high calorific value, cooperation with these cement industries will also be useful to promote proper HW treatment.

(2) Basic Policies of designing the locations of TSD facilities

In properly locating and controlling TSD facilities, the following issues need to be taken into account:

- Transportation distance and transshipment of waste has to be minimized,
- The number of TSD facilities has to be controlled and limited,
- Total cost of HWM has to be duly considered.

Complicated and long-range transport of HWs will increase the burden of regulating authority to monitor and control the flow of HW. It may also cause proliferation of HW. In principle, the HW has to be treated and disposed at the nearest place from the generators.

Although the existence of a considerable number of treaters is favorable in terms of competition under the free market mechanism, too many numbers of treaters will subdivide the market to smaller size that makes treatment business itself difficult. Moreover, transportation routes will also be too intricate for the regulating authority to monitor and control. Therefore, the regulating authority may be necessary to control locations and numbers of TSD facilities by utilizing some policy measures.

The total cost of HWM is another important issue to be duly considered in developing TSD facilities. In particular, the cost to be covered by the HW generators is of great importance, especially for financially weak SMEs (small and medium size enterprises). The regulating authority has to properly locate and control TSD facilities so as to minimize the total cost of HWM.

Taking all these issues into account, TSD facilities development policy needs to be formulated.

(3) Transitional HWM Policies Before the Development and Operation of TSD Facilities

HWM policies in the transitional period before the development and operation of TSD facilities will be as follows:

- To maximize on-site recycling and treatment of HW by generators.
- Non-recyclable and non-treatable HWs will be stored on site or transferred to the regional HW storage centers to be built by public or private initiative. The centers will regularly transport the HWs to the TSD facilities when they start operation.

- Comparatively low cost treatment facilities such as physicochemical treatment will be built in the regional HW storage centers if it is financially feasible to build and operate.
- Some of the organic HWs, that has to be thermally treated essentially, will be disposed at landfills as a transitional measure if hazardous level is comparatively low enough.

It is afraid that the investment will decrease in the Regions of no HW treatment and disposal facilities since availability of these facilities will be an important factor for the investors in selecting the locations. Especially, the investment by hi-tech industries, which may use and generate HWs, will avoid these regions. Therefore, to realize balanced economic and industrial development of the country, TSD facilities have to be properly developed in parallel with industrial development. The regional HW storage centers mentioned above will be the necessary infrastructure for development of industrial estate in case there is no nearby HW treatment facility. The government may also be necessary to develop a model HW storage center so as to promote private sector participation.

In Luzon 2 Region, the cost of thermal treatment of HW will be more or less 300 dollars US per ton. If the HWs are transported from other regions such as Visayas and Mindanao, incremental cost of around 50 dollars US will be needed for the transportation. Taking into account this difference in cost, the amount of HW transport to Luzon 2 should be minimized. Except for the high potential ones to be thermally treated, disposal of HWs at landfills may be temporarily accepted in these regions. In this case, waste acceptance criteria for landfill will be deregulated while technological requirement for landfill facilities such as water barriers works and leachate treatment is necessary to be tightened.

(4) Region-Wise Development Scenario of TSD Facilities

Taking into account the whole preparation process before starting TSD facilities operation, including project planning, feasibility study, EIA, fund raising, ECC, obtaining consensus from nearby residents, facility construction permits, and construction itself, it will take at least 4 to 5 years. This long-term preparation is a reason why the investors hesitate to participate in TSD facility business.

Even though the project preparation starts from now on, the facility will be able to start its operation in 2005. If the project is carried out under the government initiative, the government cannot commit with other facilities development any deeper. Therefore, starting preparation of the second TSD facilities can be only possible sometime around 2003. Initiating operation of the second facility will be 2007.

Taking this project cycle into account, region-wise development scenario of TSD facilities in the Philippines can be described as Table 8.4.7.

Table 8.4.7 Region-Wise Development Scenario of TSD Facilities

Region	1st Period	2nd period	3rd Period
	2001-2004	2005-2007	2008-2010
LUZON1	・ HW to be stored on-site	・ Storage/ transfer facility to be built. ・ HW to be transferred to Luzon 2.	・Same as left
LUZON2	・Model facility to be built by government initiative.	・2005: Model facility begins operation	・Model facility in operation
		・2nd facility planned.	・2nd facility to be built and operated.
VISAYAS	・Expansion of the existing plant in Cebu	・Same as left	・Same as left
	・Development plan for landfill facility in 2003	・Development and operation of a landfill with tentative standards by private sector	・Facility to be expanded
	・HW to be stored on-site	・HW subject to thermal treatment to be transferred to Luzon 2.	・Same as left
MINDANAO	・Development plan for landfill facility in 2003	・A landfill to be developed and operated.	・Facility to be expanded
	・HW to be stored on-site.	・Storage/ transfer facility ・Transfer to Luzon 2	・Same as left

The above scenario can be redrawn in view of national development perspective of TSD facilities as follows:

1st Step	Develop a Model Integrated HW Treatment Facility (MIF) in CALABARZON, Luzon by 2002-2004
2nd Step	The next step is to establish a storage/ transfer facility in the regions where development of treatment facility in the foreseeable future is difficult. The HW will be regularly transported to MIF above. In VISAYAS and MINDANAO regions, a landfill will be developed to accept HW temporarily until proper treatment facility becomes available.
3rd Step	Develop the 2nd integrated treatment center in Luzon2 by a private sector initiative. HW treatment facilities will be further developed and operated nationwide as a response to the increasing HW treatment demand.

Figure 8.4.2 shows the conditions of TSD facilities development in the target year of 2010.

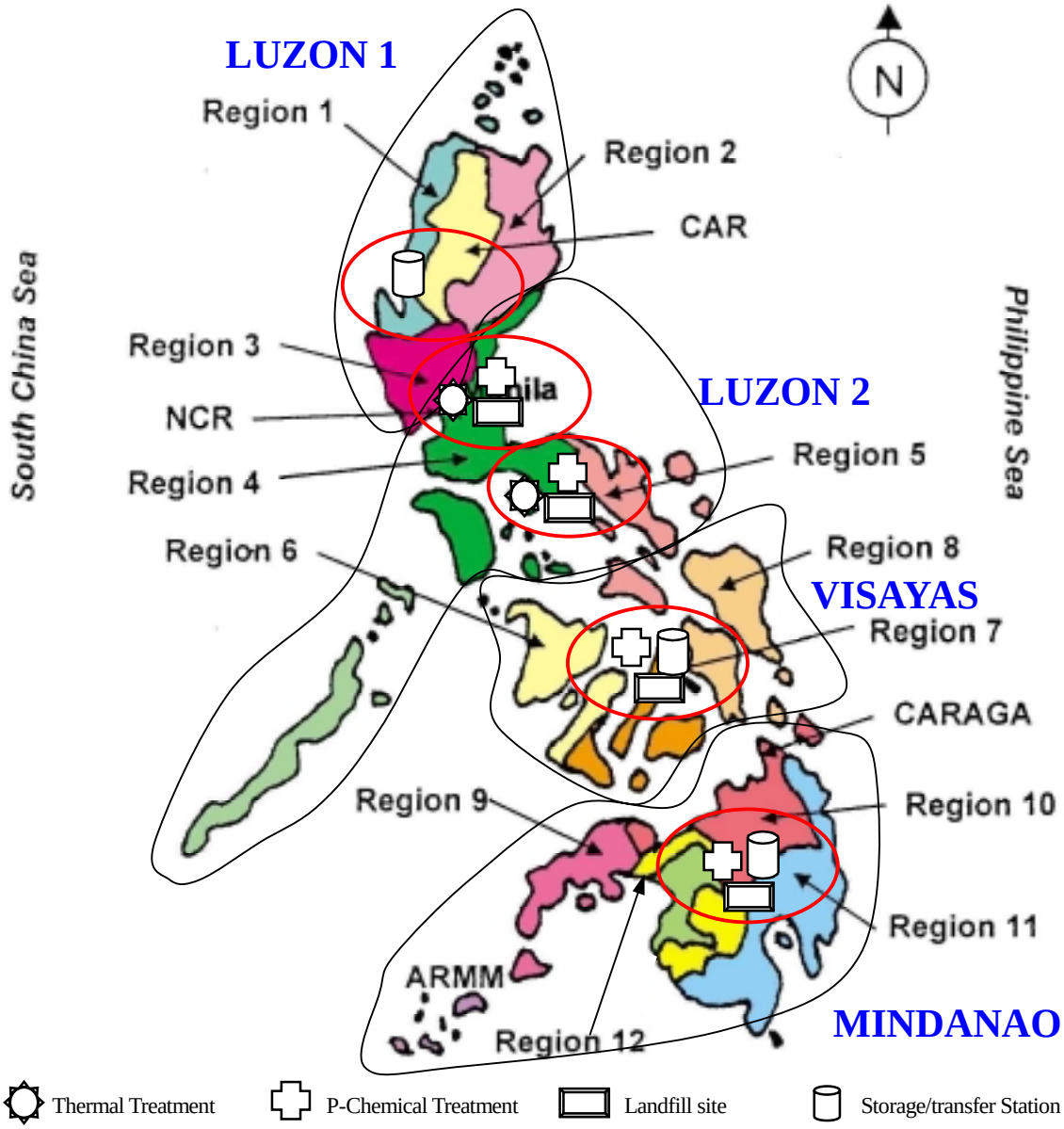


Figure 8.4.2 The Distribution of TSD Facilities in 2010

(5) Treatment of Specially Controlled HW

1) PCBs Treatment

Although the Master Plan does not discuss in detail about PCBs treatment, it is also an important HW issue to be properly dealt with by the regulating authority. The Study Team suggests that the Philippines should develop PCBs treatment system basically in accordance with the steps given in Table 8.4.8.

Table 8.4.8 Development Plan of PCBs Treatment System

1st Period	2nd Period	3rd Period
2001-2004	2005-2007	2008-2010
・ Inventory development	・ Same as left	・ Same as left
・ Develop storage standard and its enforcement.	・ Inspect conditions of on-site PCB storage.	・ Same as left
・ Establish a PCB treatment council organized by regulating authority and PCB generating or storing enterprises. ・ Formulate a plan on PCB treatment..	・ Construction of facility. ・ Thermal treatment of PCB contaminated materials.	・ Begin operation of PCB treatment facility.

The high temperature thermal decomposition system to be introduced in the model HW treatment facility will be able to detoxify PCBs by 99.9999%. Therefore, this facility can be used to treat PCB contaminated HWs.

Anyway, the first step of PCBs treatment is to locate the sources and their amount. The regulating authority has to make an inventory of PCBs. in the Philippines at the earliest possible.

2) Asbestos

Asbestos waste is irregularly generated when buildings or plants are demolished. There is a big fluctuation in its quantity of generation according to the occasions. Although asbestos waste needs to be treated by melting process, it will not be feasible to build such facility. Considering these present conditions, there will be no way but temporarily stored it until its potential quantity of generation becomes clear and large enough to build melting furnace facilities. However, it should be properly stored so as not to be missing and exposed to the living environment. The regulating authority may have to designate storage for asbestos waste.

3) Medical Waste (Pathogenic/Infectious Waste)

Although medical waste is not the subject of this Study, the Study Team makes some recommendations here.

Currently, there is at least one treater who incinerates medical wastes in the Philippines. Also, there are some large hospitals having their own small scale incinerators to specially treat medical wastes generated on site.

With the enactment of the Clean Air Act, incineration of medical waste is now prohibited. Originally, since the existing incinerators do not comply with the emission standard for dioxin compounds, proper medical waste management has to be fundamentally re-examined in the Philippines.

In fact, the model facility that is introduced in this Master Plan can also properly treat these medical wastes. The use of this facility can also be taken into account when the regulating authority formulates medical waste management policies and plans.

8.4.3 Measures Against Increasing Demand

With the increase in the number of registered HW generators and strengthened law enforcement on HWM, the HW treatment demand will also be expected to rise.

According to the estimation by the Study Team, HW treatment demand will reach approximately 1,200 thousand tons per year, which is about 7 times of the current estimated demand if the target of 6,500 registered HW generators is complied. This incremental demand for HW treatment will be only realized when the model facility starts its operation and the proper HWs flow begins to take its shape by the strengthened law enforcement on HWM by the regulating authority.

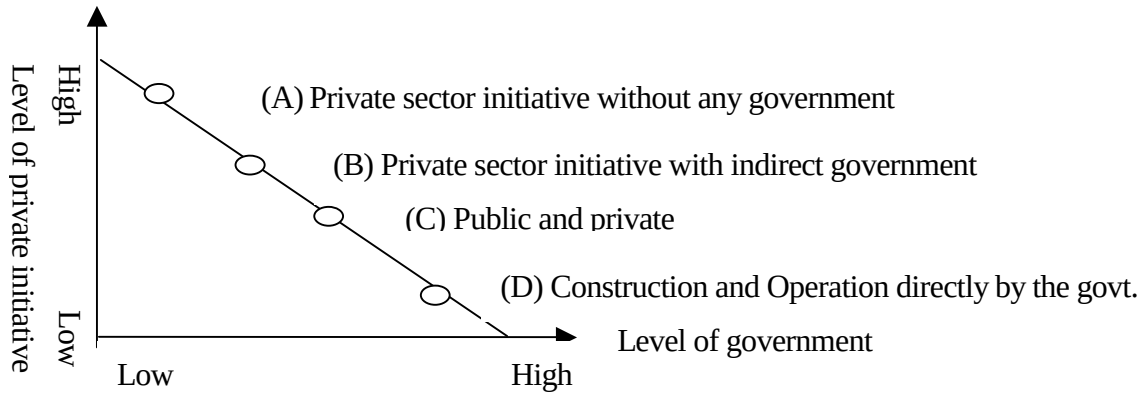
Once the incremental HW treatment demand is realized in the market, it will be easier for the regulating authority to promote private sector participation in TSD facilities development because the investors can get a clear prospective of TSD operation businesses.

8.5 Development of TSD Facilities under Government Initiative

8.5.1 Options of Government Intervention in the Development of TSD Facilities for HW

There are four types of government intervention in the development of TSD facilities, namely:

(A) Private sector initiative without any government intervention,
(B) Private sector initiative with indirect intervention by the government,
(C) Public and private partnership,
(D) Construction and operation directly by the government.



The level of government intervention is the highest in Option (D) while level of private initiative is the highest in Option (A), as shown in the figure above.

The Government of the Philippines presently applies Option (A), in which feasibility of TSD facilities is completely in the hands of market mechanism. However, as far as looking into the present conditions of TSD facilities in the Philippines, Option (A) does not work effectively in promoting their development.

On the other hand, Option (D), a full-fledged government intervention in the development of TSD facilities has to be avoided in the case of HWM sector since it is basically of private sector's businesses and not public ones in terms of well-known "Polluter Pays Principle".

The master plan recommends Option (C), development of TSD facilities by private-public partnership to be applied in the Philippines. This is because private-public partnership is indispensable to develop thermal treatment and landfill facilities for HW, both of which are presently difficult to build and operate only by private sector.

Lastly, Option (B), private sector initiative with indirect government intervention, is the most basic stance of the government intervention in HWM. However, the Study Team suppose that Option (B) will not work effectively for development of TSD facilities since market conditions of HWM have not yet been well developed enough to apply Option (B) in the Philippines. Development of HWM business market will be the first thing to be dealt with by the government.

The details of the above four options are further discussed respectively below.

(1) Private sector initiative without any government intervention (Option A)

Development and operation of TSD facilities fully by private sector is one of the ideal ways of HWM. Japan basically applies this option in HWM.

However, this option inevitably causes instable HW treatment and disposal practices before the market mechanism is fully developed and properly control HWM businesses. The Philippines is now in such a stage where proper HW treatment can rarely be expected. Furthermore, there is no promise that the Philippines will eventually transform onto a level where the market mechanism properly controls HWM without any government intervention. In the course of the market development, improper HWM practices may damage the environment and its impact may be left unsolved over generations. For these reasons, this option is not recommendable, especially in terms of protecting human health and environment from the potential risk of HW.

In addition, this option may lead private sector to develop small-scale TSD facilities, which only require small capital investment, but only deal with small amount or limited types of HWs like the existing TSD operators in the Philippines. As a result, HW generators are obliged to find different treaters for each type of HW and transport it separately. It complicates the HW stream and increases loopholes of improper treatment.
To properly control HW stream in the above situation, a large number of staff is needed to oversee HWM practices by scattered TSD operators. In the case of Japan, more than 3,000 government staff members are allocated to manage industrial waste. Since around 400 million tons of industrial wastes are generated every year, every 7 to 8 persons have to control one million tons on average. Even with these 3,000, illegal dumping of waste cannot be eliminated or even difficult to be mitigated and becomes a big social problem in Japan. The manifest system presently operated in Japan is not enough to completely control improper practices by private TSD operators. Once private TSD operators are scattered over the HWM business market, it needs an enormous administrative cost to control them. It will be also difficult to develop an integrated treatment facility dealing with various HWs in such a situation because of the conflict of interest with the existing TSD

operators. Thus, in terms of human health and environment protection as well as effective administration of HWM, government intervention is obviously needed in the development of TSD facilities for HW.

The necessity of government intervention can be raised from another point. In the current market conditions, the TSD facilities requiring only a small capital investment and dealing with small amount of easily recyclable or treatable HWs will be gradually developed in the Philippines while development the facilities which need large capital investment such as thermal treatment or disposal facilities will be delayed or not realized by private sector. The main issues hindering the private sector participation in building and operating these facilities include:

- Unclear demand for HW treatment and disposal,
- Large capital requirement for TSD facility development,
- Investment and operation risks of TSD facility development and operation,
- Weak law enforcement and administration on HWM

All of the above issues indicate the big market risk of HW treatment and landfill facilities construction and operation. Therefore, the government has to consider the policy measures to mitigate these market risks, especially for the development of the facilities requiring large capital requirement and big risk taking, such as the integrated HW treatment facilities that collectively deal with various HWs. The remaining three options mentioned below represent the types of policy measures to mitigate these risks.

(2) Construction and operation directly by the government (Option D)

Option D is a full-fledged government intervention in the development of TSD facilities. In this case the government, as a public project, directly carries out TSD facilities development and operation. However, this option is not appropriate in the case of HWM sector since it is basically of private sector's businesses and not public ones in terms of well-known "Polluter Pays Principle". It is not the government or public but the generators who have the primary responsibility for proper treatment of HW. This type of government intervention is only allowed if the impacts of HW on human health and environment raise serious public concern. In this respect, the issues of HWM do not yet become serious public concerns in terms of their impacts on human health and the environment. Therefore, it is difficult in the present conditions to justify a full-fledged government intervention in developing TSD facilities.

(3) Private sector initiative with indirect government intervention (Option B)

Option B includes the following indirect government intervention in promoting the development of TSD facilities under private sector initiative:

(a) Controlling and regulating issuance of TSD operation permits or licenses,
(b) Providing exclusive concession of TSD operations in accordance with the BOT Law,
(c) Providing economic and financial incentives to the private TSD operators.

(a) Controlling and regulating issuance of TSD facilities operation permits and licenses

In this case, the issuance of TDS operation permits and licenses are controlled and regulated by the government. To do this, the government first formulates regional HWM plans by regions, in which the development plan of TSD facilities are specifically indicated. With these plans, the government controls the development and operation of TSD facilities. The issuance of TSD facilities operation permits and licenses will be limited to those who are completely in compliance with the development plan of TSD facilities, which is formulated and may be officially announced in the form of DENR administration order or the likes by the government.

However, to formulate the development plan of TSD facilities at regional level, the government has to clearly identify the present conditions of HW generation and treatment at regional level as well. The present availability of data and information on HWM in the Philippines is far from formulating the region-wise development plans of TSD facilities. It will take at least two more years to prepare the all necessary data and information necessary for these plans.

Furthermore, another critical issue is that these policy measures may not mitigate the market risk enough to encourage private sector to participate in the development of TSD facilities requiring a large capital investment, such as thermal treatment and landfill facilities for HW. In this case, the government will be required to guarantee with the private sector proponent the amount of HWs to be dealt with by the planned TSD facilities. It is difficult for the Philippines Government to provide such guarantees to all the private sector proponents.

(b) Providing exclusive concession of TSD operations in accordance with the BOT Law

In this case, the private sector proponents can apply for development and operation of TSD facilities in accordance with the BOT Law in the Philippines. The main advantage of utilizing the BOT Law here are as follows:

- Exclusive concession of TSD operations,
- Government guarantee on the amount of HW,
- Economic and financial incentives.

However, the Philippines government, under the current situation, can provide neither exclusive concession nor government guarantee on the amount of HW. The only available advantages under the BOT Law are economic and financial incentives, which will be not enough to mitigate market risk of TSD facility development and operation. Therefore, the BOT Law cannot effectively work until the scale of HW treatment market becomes clear to the private sector proponents.

(c) Providing economic and financial incentives to the private TSD operators

Economic and financial incentives here include the followings:

- Tax incentives (reduction, exemption, accelerated depreciation, etc.),
- Low interest loans,
- Promotion of the investment partnership by HW generators,
- Subsidy from the Environment Fund

Some of the tax incentives and low interest loans are presently available in the Philippines. The government also needs to consider the investment partnership by HW generators and subsidy from the Environmental Fund, which is established in accordance with RA6969.

Besides the economic and financial incentives above, the government can promote development and operation of TSD facilities for HW treatment by the following measures.

- Intermediation of land acquisition (including allocation of the state-owned land),
- Arrangement of necessary infrastructure and utility for TSD facilities,
- Supporting in building consensus with local authority and peoples.

Although these economic and financial incentives may be useful to promote small-scale TSD facilities requiring small capital requirement, they are not enough to mitigate the risks of a large investment in TSD facilities such as thermal treatment and landfill. Therefore, these incentives will not contribute to early development of proper TSD facilities in the Philippines.

Accordingly, to develop proper HW treatment and landfill facilities as early as possible, not indirect but direct government intervention will be needed.

(4) Public and Private Partnership (Option C)

The master plan recommends Option C, public and private partnership in developing TSD facilities in the Philippines. Option D is combination of TSD facility development by the government and operation by private sector. In this case, the government covers financial risk of TSD facility development while the private sector proponent covers operation risk. By applying this system, market risk of TSD facility business can be evenly covered by public and private sectors.

Even though the scale of market is not clear, private sector will participate in operation of the TSD facility with the conditions of risk-taking of TSD facilities development by the public sector. This option is the only way to realize early development of proper HW treatment and landfill facilities in the Philippines.

Considering the present conditions of HWM in the Philippines, the development of proper HW treatment and landfill facilities is an urgent issue to prevent possible impacts on human health and environment. For early development of such facilities, the Philippines Government should take Option C, the public and private partnership in TSD facility development and operation, which will mitigate market risks and provide private sector proponents with the opportunity for participating in TSD operation businesses.

8.5.2 Development of Model TSD Facilities by the Public and Private Partnership

Although the master plan recommends public and private partnership in developing TSD facilities in the Philippines, it should be kept in mind that the main objective of government intervention here is to promote private sector participation in TSD facility development and operation by providing the model of TSD facility business on HW. Therefore, public and private partnership will be limited to the development and operation of model TSD facilities for HW in accordance with the following policies:

- The model TSD facility is to be fully operated by private sector partner so that other private sector proponents can learn from it,
- The scale of facility is to be minimized in the range of economically feasible operation,
- The facility is to be disclosed to the stakeholders as a place for learning about proper HWM.

To avoid impacts on the current and future HW treatment and landfill markets, the scale of model facility must be minimized in the range of economically feasible operation. If the treatment and landfill demands increase, they should be open to private sector proponents.

If the model facility is not developed by direct government intervention, development of proper TSD facilities will be delayed and cause the following negative impacts on the Philippines:

- Negative factors of foreign capital investment in the Philippines will be increased,
- Environment risk will be increased with the rise of improper HW treatment and disposal,
- The government reliability as the law enforcement institution will be decreased.

Considering the above negative impacts, the urgency of direct government intervention is very high in HWM sector in the Philippines. Taking into account the estimated HW treatment demand by regions, it is Luzon 2 where building and operation of all the HW treatment and landfill facilities are financially feasible. Especially CALABARZON area, where HWs are intensively generated, is a suitable region to build these treatment facilities. It also needs immediate action to prevent potential danger of HW-induced pollution.

The following positive effects are expected by the development of this model facility.

- To minimize possible environmental risk that may arise from improper or insufficient hazardous treatment by the present generators and treaters,
- To facilitate law enforcement of hazardous waste management as well as accelerate establishment of overall hazardous waste management system in the Philippines,
- To learn from the model TSD facility on HW treatment technologies, facility operation and maintenance, and so forth,
- To provide the citizens with the opportunities to deepen their understanding of TSD facilities,
- To use the model facility for the treatment of the HWs generated in other regions.

The model facility has to comply with the high level of technological and environmental requirements so that all the peoples including the nearby residents can support it.

The public and private partnership in the development of model TSD facilities has the following merits for the government:

- Governmental intervention in TSD facilities development will minimize possible environmental risk that may arise from improper or insufficient hazardous treatment by

the present generators and treaters,
- The development of a model TSD facility will appeal a strong intention of the government to realize proper hazardous waste management,
- Anyone can learn from the model TSD facility on HW treatment technologies, facility operation and maintenance, and so forth,
- The officials of national and local government can accumulate a lot of practical experience, knowledge, and know-how of hazardous waste management from the model TSD facilities,
- Governmental hazardous waste management system will be strengthened through the development and operation of the model TSD facilities, and
- The course of TSD facilities development will be further clarified through the pilot operation of the model facility (actual demand, necessary treatment technologies, necessary capacity of the facility, etc.)

Furthermore, the model TSD facility also contributes to enhancing the HWM administration by the government through the following methods:

- The model TSD facility can be utilized for capacity building of the government officials.
- The model TSD facility will facilitate the centralized management of Waste Tracking System,
- Strict law enforcement to HW generators may be possible when the model facility starts its operation.

The establishment of a HWM training center will be a good idea in terms of providing government staff, treaters, and generators with the opportunities to learn together about HWM.

In the case of Thailand and Malaysia, the integrated TSD facilities were developed by private sector under the strong government leadership. The integrated TSD facilities simplified the HW stream enough to ease HWM in both countries. The simplified HWM administration made it possible to pay further attention to protection of human health and environment. It also increases the government reliability on proper HWM. Both countries jumped out from the quite inadequate conditions to the high level of HWM in the short term. Administrative cost of HWM is also reduced through the development of the integrated TSD facilities in both countries since the number of TSD facilities that the government has to oversee is minimized.

Learning from these experiences in the neighboring countries, the master plan recommends promoting development of the integrated TSD facility as a model of private TSD operations in the Philippines.

8.5.3 Structure of the Model TSD Facility Development Project

The figure below outlines the structure of the model TSD facility development project in the Philippines. In this structure, the government takes the risks of TSD facility development itself and relevant loan repayment while the private partner will cover the risk of TSD facility operation. Since the private sector proponents cannot take all the above risks in the present HWM conditions in the Philippines, the government takes the former risks to promote private sector participation in TSD operation business.

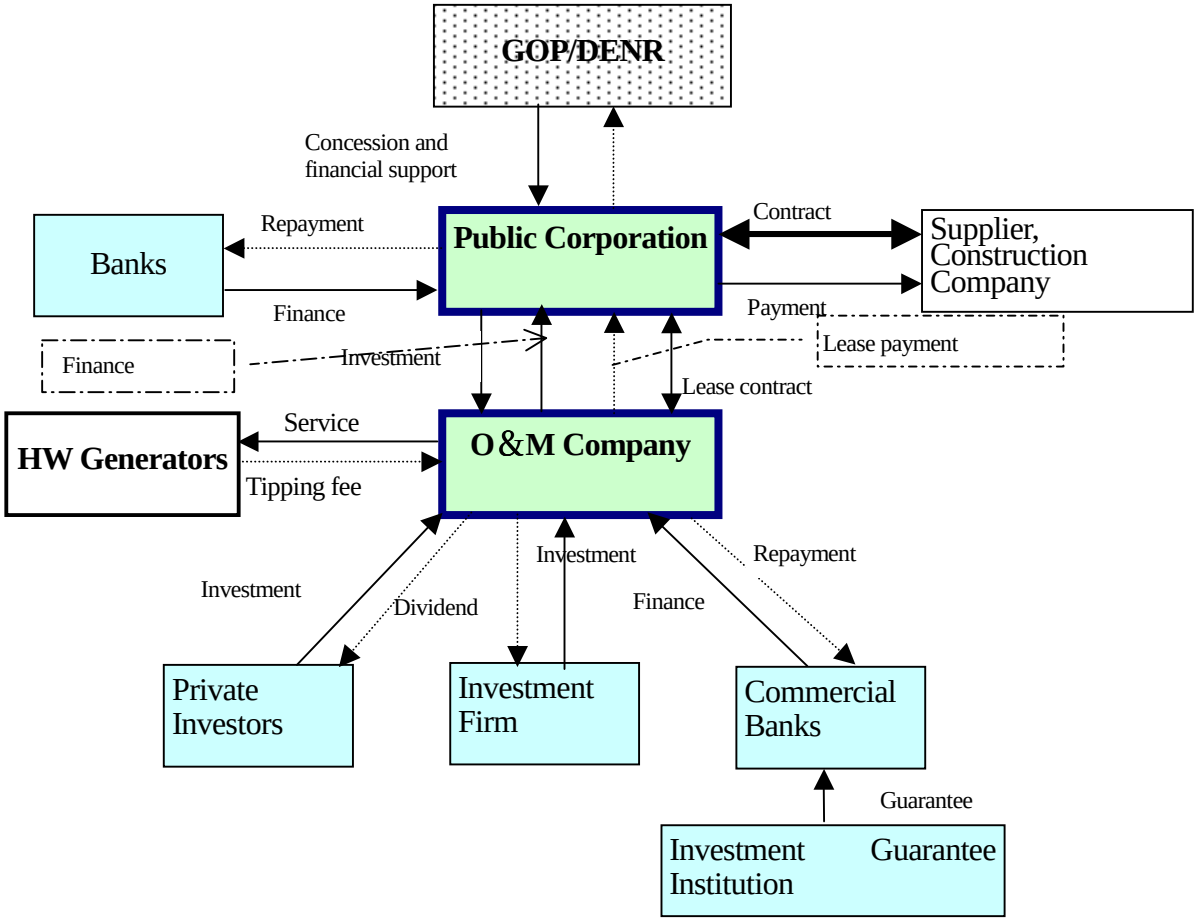


Figure 8.5.1 The Structure of the Model TSD Facility Development Project

Under this project structure, the government has to make an effort in enforcing the laws and regulations on HWM so as to minimize the risks of TSD facility construction and loan repayment, which results in mitigating the risk of TSD operation by the private partner. On the other hand, the private partner will jointly hold the risks under the lease contract of the TSD facility with the government since he is obliged to pay the lease fees from the income of the TSD facility operation. If this project structure works successfully in a economically

feasible manner, private sector will be able to take the all the risks of TSD facility development and operation with the indirect government interventions.

Moreover, this project structure does not need any subsidy by the government since the public capital investment will be recovered by the TSD operations by the private partner under the contract between the Public Corporation and the O & M Company in the figure above.

As the long term loans from the commercial banks by the O & M Company, which is indicated in the figure above, may be difficult in the case of the Philippines due to no security of the project itself as well as the guarantee by the relevant project bodies, it is necessary to invite as much as possible the foreign capital investment in the project.

Although the Public Corporation in the figure above is considered to be NRDC or LLDA, both of them do not have any experience in constructing TSD facilities. Their financial capacity must be duly investigated.

In addition, since there is no private O & M company having enough experience in TSD facility operation, involvement of the experienced foreign firms will be needed to properly operate TSD.