11. DEVELOPMENT PLAN OF THE MODEL HW TREATMENT FACILITY

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

11.1 Basic Concept of the Model HW Treatment Facility

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

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

11.2 Physicochemical Treatment

(1) Purposes

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

(2) HWs to be Treated

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

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

(3) Treatment Technologies and Process

The physicochemical treatment includes various processes, such as;

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

(4) Establishment of Treatment Capacity

Desirably treatment capacity of the MIF is over 3,000 ton per year, however the design capacity will be aimed at 50% of that amount.

(5) Facilities and Equipment

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

- Measuring and weighing equipments
- Waste analysis laboratory
- Waste storage facility
- Tank yard
- Chemicals storage facility
- Reaction tanks
- Flue gas treatment facility
- Flocculent reaction tanks
- Thickener
- Sludge dehydration facility
- Wastewater filtration facility
- Wastewater monitoring facility
- Instrumentation facility (Central control room)

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

(6) Operation

Expected operating conditions are as follows;

- Operation : 8 hours per day
- Operation of reaction tanks : Batch operation

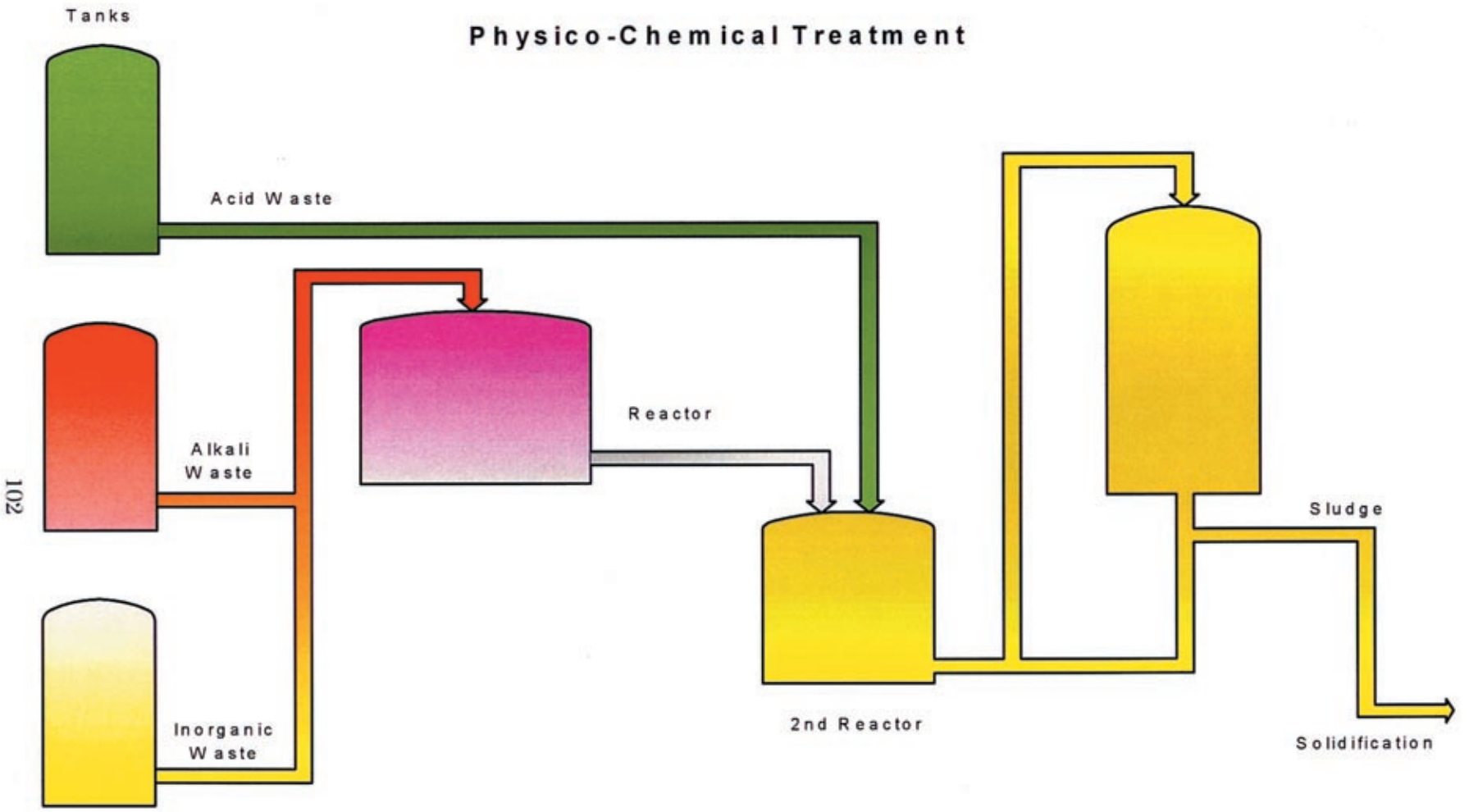

Figure 11.2.1 Process Flow of Physicochemical Treatment

11.3 Solidification Treatment

(1) Purposes

An object of the Solidification Treatment is to prevent toxic materials from leaching out from solid HWs, and comply with the waste acceptance criteria for landfill. Also it is to control the elution from the HWs, that could not be treated through a wastewater treatment system at landfill facility.

(2) HWs to be treated

The following HWs will be subject to treatment by the solidification process.

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

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

(3) Design Concept of Treatment Capacity

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

(4) Treatment Technologies and Process to be applied

A process of the stabilization / solidification shown on Figure 11.3.1 will be applied for the above described HWs. The heavy metals, which will be subject to the process, include cadmium, arsenic, mercury, and lead.

(5) Facilities and Equipment

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

- Storage facility,
- Waste feeding facility,
- Measurement and weighing facility

- Chemicals dosing tanks
- Water tanks
- Mixing equipment
- Granulating machine
- Conveyor system
- Pit for waste treatment

(6) Operation

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

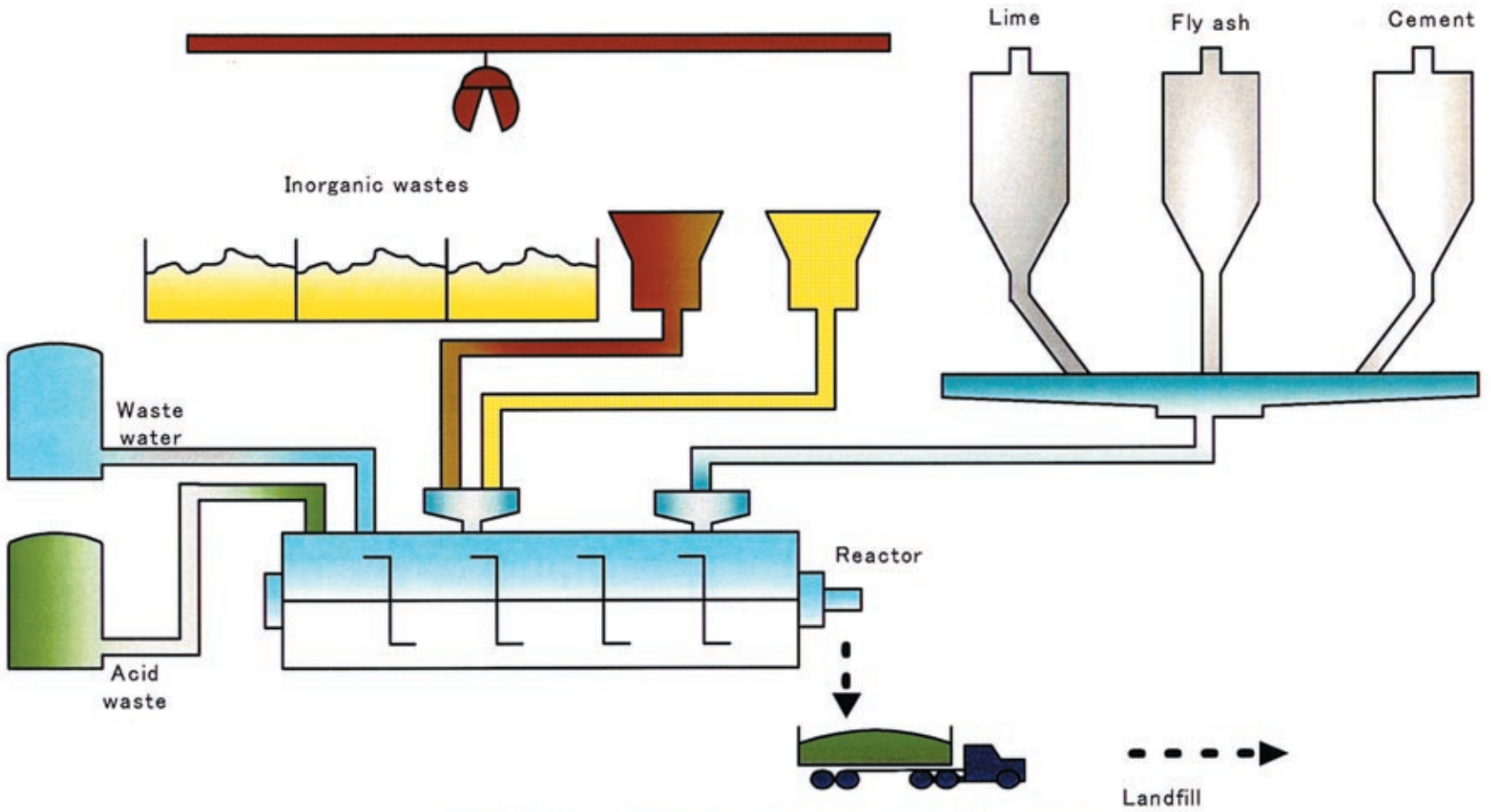

Figure 11.3.1 Process Flow of Solidification Treatment

11.4 Thermal Treatment

(1) Purposes

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

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

(2) HWs to be Treated

Wide ranges of organic wastes are subject to be treated by the thermal destruction process. The containers and fibers, which are contaminated with organic hazardous substances, have to be treated by the thermal destruction process. Even the inorganic sludge, which is contaminated with solvents and does not meet the waste acceptance criteria for landfill, will be a subject to treat by the thermal treatment.

Types of HWs, required the thermal destruction process for the organic HWs, will be determined based on the waste acceptance level of organic materials at landfill. The master plan proposes to establish 5% of TOC as a realistic standard for the acceptance level of organic HW.

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

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

(3) Basic Concept for Designing Treatment Capacity

With operated 80% capacity, the Study Team estimated that 60 ton per day of HW treatment is the minimum size for the treatment facility to be economically feasible.

(4) Treatment Process

As a premise, an incineration process cannot be employed for complying Clean Air Act. Therefore, the state of the art technology of pyrolysis process will be utilized.

(5) Flue Gas Treatment Process

The flue is a subject to be complied with the "emission gas standard at a stationary source" on Sec. 19 of the Clean Air Act. According to the standard of hazardous materials on the Clean Air Act, the emission standards for HCl is 10mg, and HF is 1 mg per a cubic meter on daily average. Likewise, the requirement for the standard for both mercury and cadmium content is 0.05mg per a cubic meter in the total average. In addition, the emission standard for the dioxin is less than 0.1ng/m^3. All of these requirements are one of the highest standards in the world.

Although the electrostatic precipitator is a typical flue gas treatment method, this process alone does not satisfy the standard, 10 mg per a cubic meter of the total dust. Similarly, relaying solely on a bag filter system is not practical as this process cannot guarantee to achieve this standard. Therefore, it is necessary to apply an additional wet type scrubber system. Besides, flue gas cooling system is also needed in prior the flue gas treatment.

(6) Dust Treatment

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

(7) Facilities and Equipment

Figure 11.4.1 shows the process flow of thermal destruction treatment. The process will be consisted with the following equipment and facilities.

- Storage Facility for HWs
- Pre-treatment Facility
- Pit for HWs
- HWs Feeding Facility
- Fuel Tank
- Rotary Kiln and Secondary Combustion Furnace
- Slug Conveyer, Slug Storage Facility
- Waste Heat Boiler

- Flue Gas Treatment System, Fly Ash Silo, Flue Gas Stack
- Monitoring Facility
- Instrumentation, Central Control System

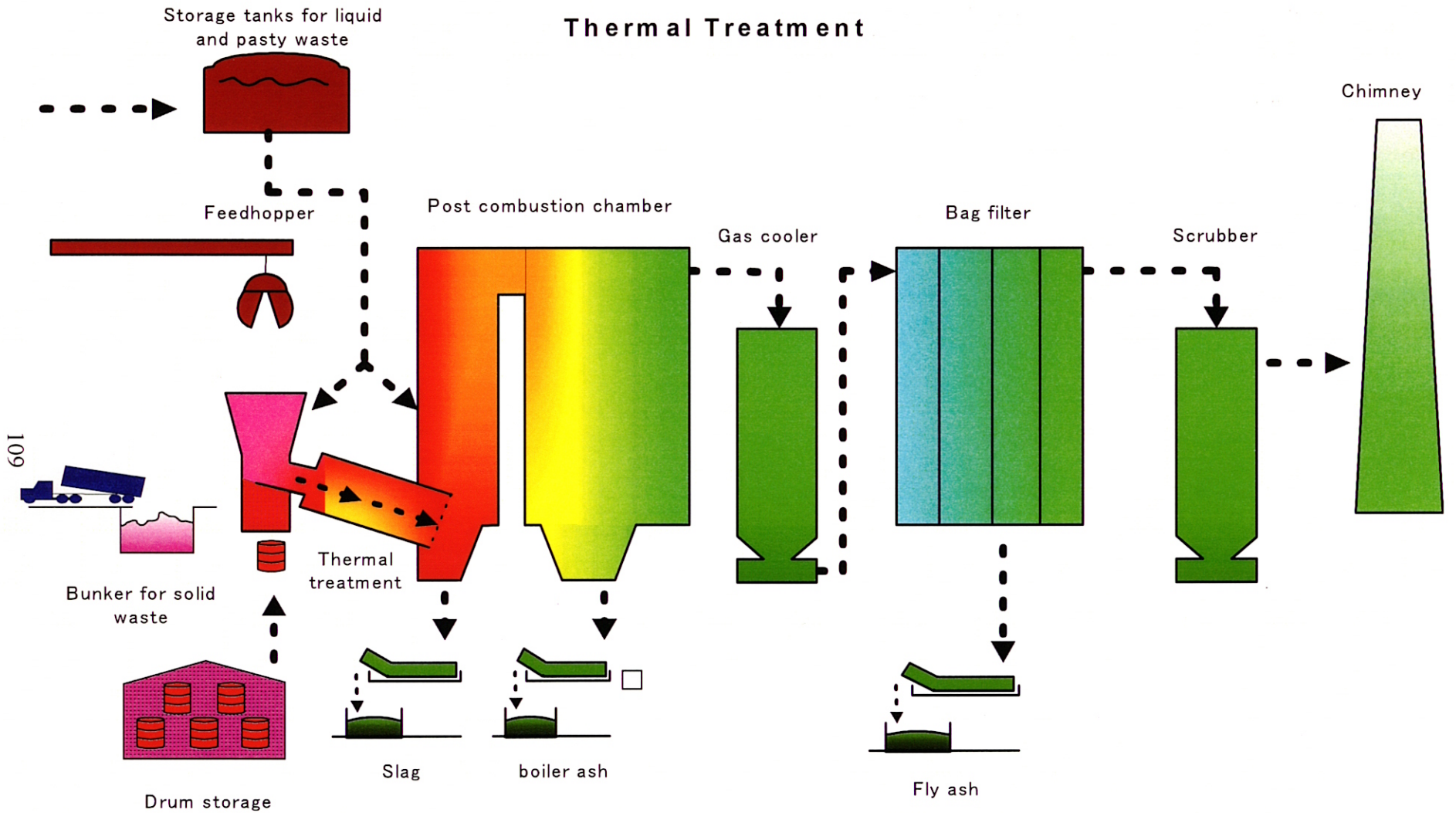

Figure 11.4.1 Process Flow of Thermal Destruction Treatment

11.5 Landfill Facility

(1) Waste Acceptance Criteria

The landfill facility to be developed in MIF shall not accept the organic HWs unless it is sufficiently detoxified and stabilized.

The solidified wastes are still defined as the hazardous wastes in compliance with the DAO92-29. The hydroxides that have been generated though neutralization process may be possible to be defined as the waste alkalis; however, these are not hazardous wastes, if satisfies with acceptance criteria for landfill. Thus in some cases, since the treated hazardous wastes will be unable to be defined as completely non-hazardous ones, these shall not be disposed with another general non-hazardous wastes since these still contains some toxic metals.

(2) Structural Standard of Landfill

The landfill is generally consisted with surface and lower layers, water collecting facility, leachate treatment facility, monitoring facility, and so forth. Technological requirement for landfill facility is provided in Chapter 11.

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

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

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

The structure of the HWs landfill shall be determined in due consideration of geological

characteristics, rainfall, costs and so forth. The Study Team herewith only provides basic criteria for the landfill construction.

- Water barrier works are required to reach the level that almost no permeability is detected.
- Groundwater monitoring are required,
- Water barrier works are required at the occasion of surface soil cover.
- Leachate collection and treatment facility is required.
- Landfill is required to divide into several sections so that an each section can be separately controlled.

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

(3) The Scale of Landfill in MIF

The landfill is essential process for residuals that will be generated from the HWs treatment facilities. Therefore, since the landfill is an object as a model facility, the Study Team designs that an operational capacity in the landfill operation will be 10 thousand tons per year with economical feasibility taken into account. Therefore the landfill will be designed to accept this amount of HWs for 10 years of which land space will be required 3 to 5 hectares.

(4) Facilities and Equipment

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

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

11.6 HW Collection and Haulage

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

11.7 Reception and Analysis of HWs at MIF

(1) Reception of HWs

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

(2) Analysis of HWs

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

i) Required HWs Quality Analysis by Types of Treatment

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

ii) Monitoring MIF Operation

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

To conduct the analysis for the HWs perfectly and precisely, MIF will establish a HW analysis laboratory.

10.8 Other Related Facilities

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

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

11.9 Location of MIF

MIF is similar with chemical factory in its processes and characteristic. Therefore, the area designated for industrial use is suitable for its location. It is also favorable that public utilities and infrastructure such as electricity, water, and roads are well provided.

Taking into account environmental safety, the location where groundwater level is high or shallow well water is used for drinking purposes by nearby residents has to be avoided.

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

Table 11.9.1 The Ranking of Priority Site

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

Note: The low score is more favorable

11.10 Construction Cost for Facility

An estimated construction cost as per shown Table 11.10.1 is not precisely built in compliance with a detail specification for the MIF. It is rather rough calculated by utilizing experience costs. Therefore, the total investment cost is estimated to be around 2.3 billion Pesos (approximately 5.7 billion Japanese yen). It is assumed that a treatment capacity will be scheduled with 30,000 ton in 300 days operation per year.

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

As a result, the treatment fee will be come more than 1,500 Pesos per ton, when included with labor cost, operation cost and maintenance cost for MIF. The treatment fee shall be reviewed precisely later.

Table 11.10.1 Construction Cost for Facility (Rough Estimation)

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

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

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

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

12.1 Basic Policies

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

- Promoting proper storage of HW
- Taking measures to promote development of HW treatment facilities by private sector initiative
- Proper enforcement of laws and regulation on HWM
- Establishing the policy measures to promote TSD operation business.
- Establishing the policy measures to mitigate risks of TSD facility development and operation

12.2 Promotion of TSD Facilities Development by the Private Sector

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

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

(1) Promotion of HW Storage Facility Development

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

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

(2) Promotion of TSD Facility Development

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

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

(3) Promotion of HW Recycling Facility Development

The government shall take note of the following measures to promote HW

recycling by private sector.

- Identification of priority areas of HW recycling
- Promotion of private sector investment in HW recycling
- Promotion of waste exchange program

12.3 Policy Measures to Promote Private Participation and Partnership

(1) Capacity Building of HW Treaters

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

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

(2) Economic Incentives

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

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

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

For TSD facilities

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

- Accelerated depreciation of TSD facility,

For generators

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

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

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

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

(4) Providing and Exchanging Information and Raising Awareness

- Providing Information
- Training Seminars and Workshops

12.4 Main Roles of Stakeholders in Promotion of TSD Facility Development

A. DENR/EMB (National Regulating Authority)

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

B. HW Generators

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

C. TSD Facility Development Proponents

- To propose TSD facility development project according to the national TSD facility development plan. The proposal includes construction plan, financing, anticipated operational and treatment costs, and insurance schemes.

D. Financial Institutions

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

E. Local Government

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

F. Other Government Ministries and Agencies

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

G. Public Service Corporations

- To finance and organize private businesses (NRDC).

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

- Informal meetings of treaters and recyclers
- Set up a council in the government to examine economic incentives for HW treatment and recycling.

13. SHORT-TERM ACTION PLAN

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

13.1 Action Plan

Table 13.1.1 gives the targets for DENR/EMB to be achieved by 2003.

Table 13.1.1 Targets to Be Achieved by DENR/EMB

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

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

Table 13.1.2 Policy Actions and Programs (2001-2003)

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

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			
	④Formulation 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			

13.2 Promotion of A Model TSD Facility Development

Objectives of a model integrated TSD facility (MIF) development by the government initiative are to establish and visualize proper flow of HW treatment, raise awareness of the stakeholders on proper HWM, and establish a basis of TSD facility development by the private initiative.

MIF will be built and operated in an economically feasible manner; capacity of the MIF is planned to be 1,500 tons/year for physicochemical treatment, 60 tons/day for thermal treatment, and 10,000 tons/year for landfill disposal for 10 years. The overall treatment flow of HW in MIF is given in Figure 13.2.1.

Relevant facilities include a facility control building, a waste analysis lab, and a training facility. Besides HW treatment and landfill operations, MIF will also provide HW hauling and analysis, as well as sale of HW containers.

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

The total construction cost of MIF is estimated to be around 2 billion pesos of the Philippines, excluding costs of land acquisition.

The government constructs a facility and puts it under private operation. The fund will be supplied by “soft loan” invested from overseas. The project proponent will be selected from public corporations.

Construction and operation of MIF will be carried out in accordance with the schedule given in Table 13.2.1. It will take at least 5 years to initiate facility operation.

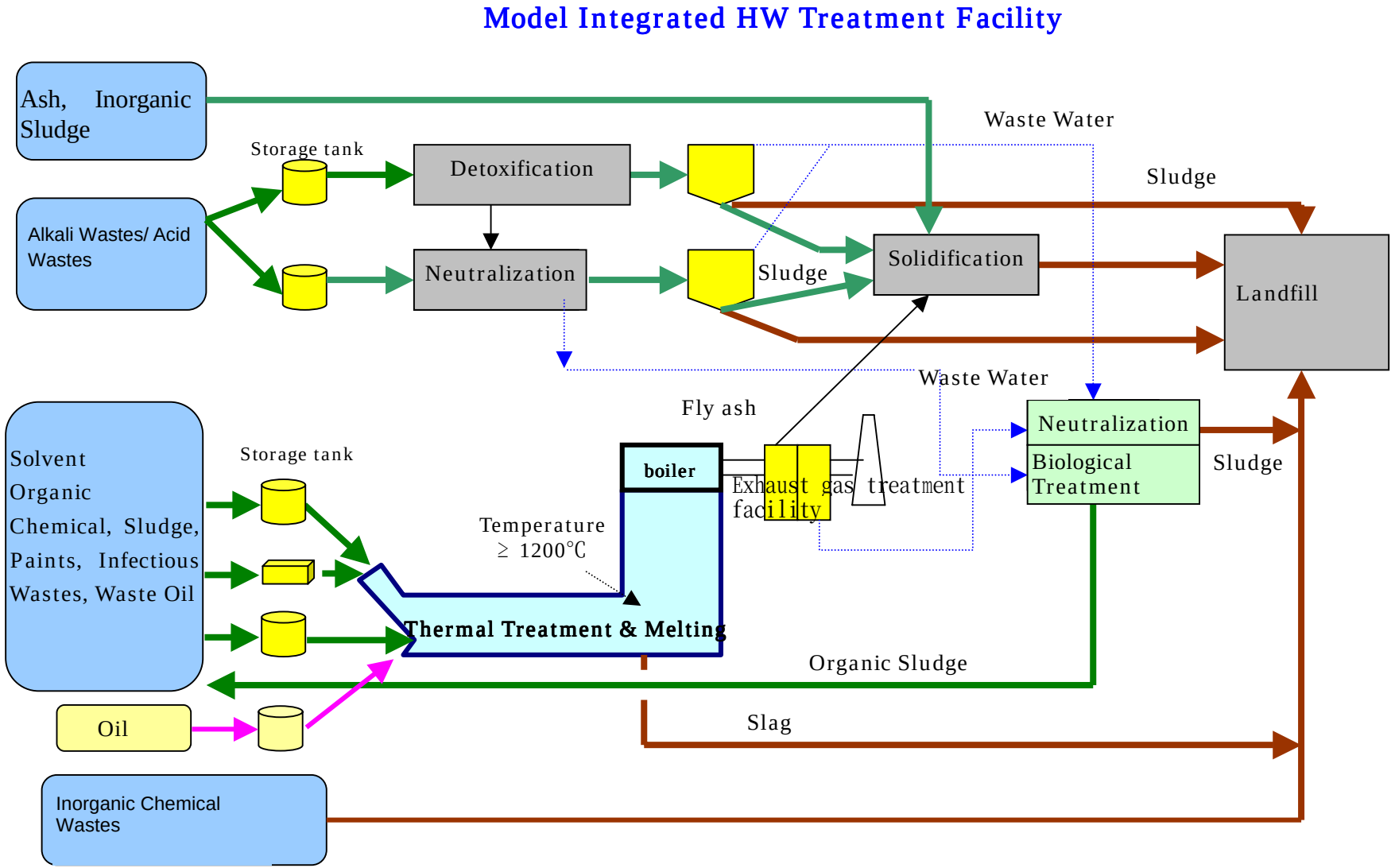

Figure 13.2.1 HW Treatment Flow in the Model Integrated HW Treatment Facility

Table 13.2.1 Project Implementation Schedule

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

13.3 Implementation and Reviewing Process of the Master Plan

(1) Authorization of the Master Plan

To authorize the master plan, the Secretary of DENR shall make it public after the discussion at and approval of the Inter-Agency Technical Advisory Council. DENR should ask all the interested parties to make comments on the plan.

(2) Allocations of Roles

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

HW Generators

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

Regulating Authority at National Level (DENR/EMB)

The roles of the regulating authority at national level are to prepare laws and regulations, formulate policies, develop and implement plans, formulate TSD facilities development plans, manage and provide HWM information, ensure proper licensing, raise awareness, and establish cooperative relationship generators and NGOs. It also tries to obtain reliance from the public on proper HWM through conversation with EMB regional offices and residents.

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

The main roles of regional regulating authorities are to enforce laws and regulations, promote registration of generators, disseminate information on proper storage of HWs on site, and raise awareness of generators, and the like.

Line Ministries and Other National Government Agencies Concerned

The national government authorities, especially in charge of business promotion and management of HW generators, such as PEZA, BOI, and Department of Health, are expected to cooperate and coordinate with DENR/EMB in guiding proper HWM, providing relevant information and developing policies on HWM.

Local Governments

A local government is expected to support development and operation of proper TSD facilities in its jurisdiction in order to protect the local living environment. A local government also plays a role in cooperation with national authorities to prevent disposal of HW into municipal waste landfills.

Financial Institutions

The National Economic Development Authority (NEDA) and Development Bank of the Philippines (DBP) are expected to develop and implement financial policies effective for promoting proper HWM. Private financial institutions are also expected to develop a mechanism to hedge credit risk of investing in TSD facilities.

Industry Groups and NGOs

Industry groups relevant to HW generation sectors are the keys in raising awareness of HW generators that are member of the groups on HWM. Environmental NGOs are also expected in cooperation with DENR/EMB to contribute to increasing the capacity of HW generators in HWM.

(3) Policy Implementation

The implementation of policies proposed in the master plan has to be annually reviewed and reflected to the next year's implementation. To clearly evaluate the

results, quantified indicators should be selected.

The regulating authority will submit an evaluation report to the Secretary of DENR and the Inter-Agency Technical Advisory Council.

14. CONCLUSIONS AND RECOMMENDATIONS

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

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

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

(1) Basic Concept

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

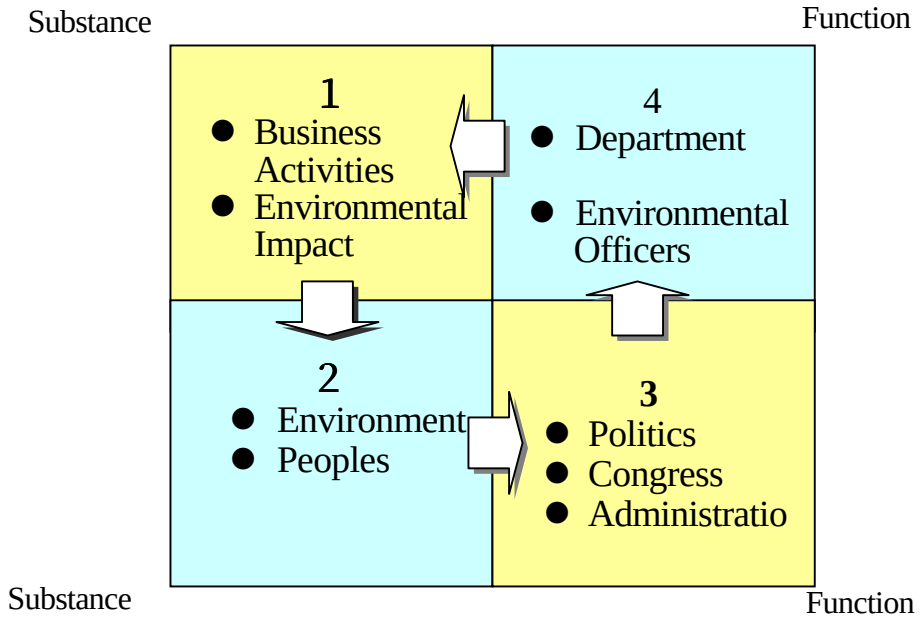

Figure 14.1.1 Structure of Environmental Problems in HW

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

The third compartment is created on the basis of these activities in the second compartment. This is the compartment of laws and regulations. Key actors here are politicians and government officials. This compartment created the RA6969/DAO92-29 for HWM in the Philippines.

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

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

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

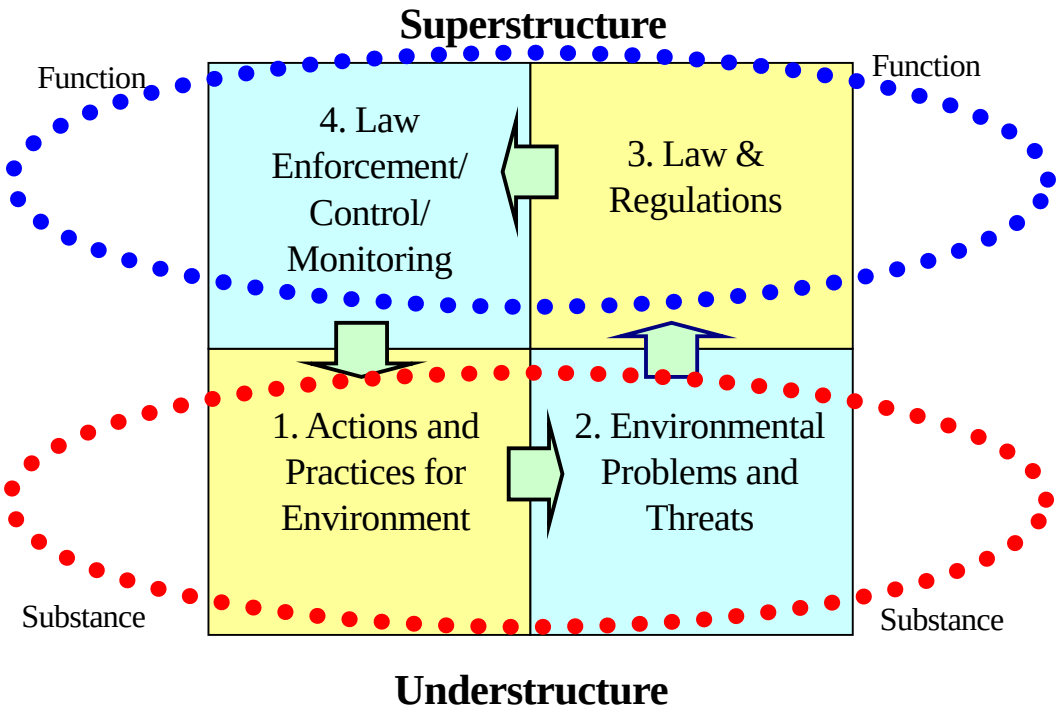

Figure 14.1.2 Superstructure and Understructure of Environmental Problems

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

One of main issues in the superstructure is laws and regulations in the third compartment have not been sufficiently established. The current situation can be described as Figure 14.1.3 below.

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

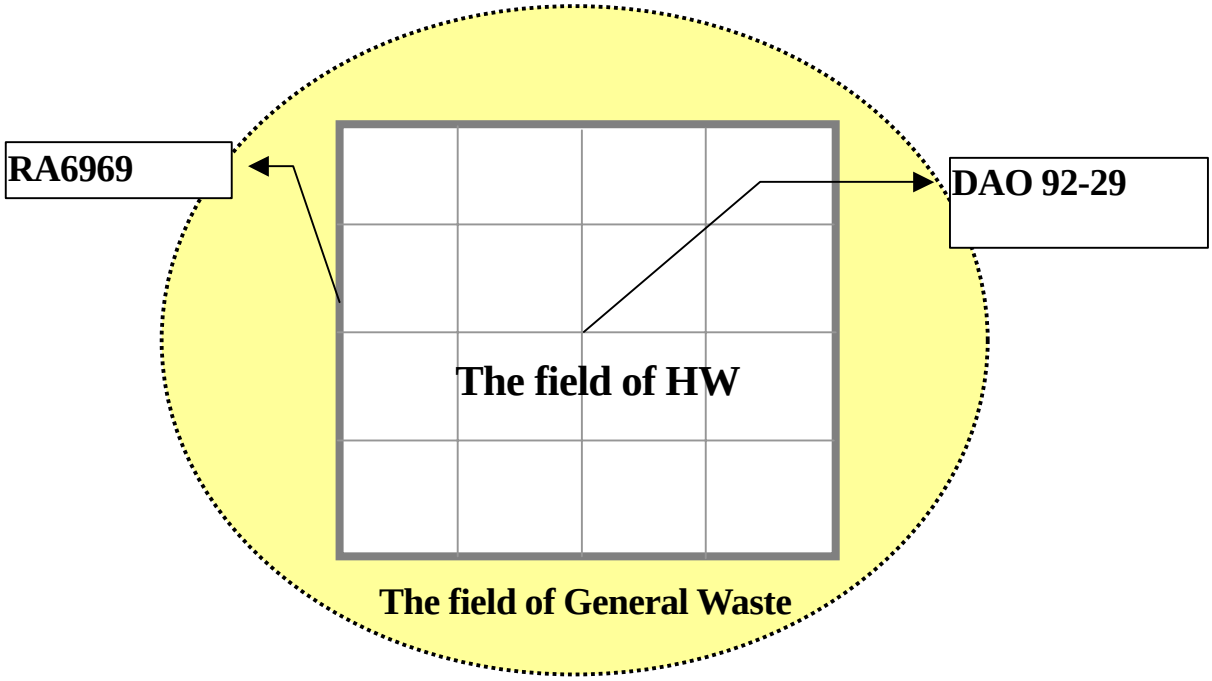

Figure 14.1.3 Image of Insufficient Establishment of Laws and Regulations in Superstructure

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

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

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

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

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

The Government should first address these issues.

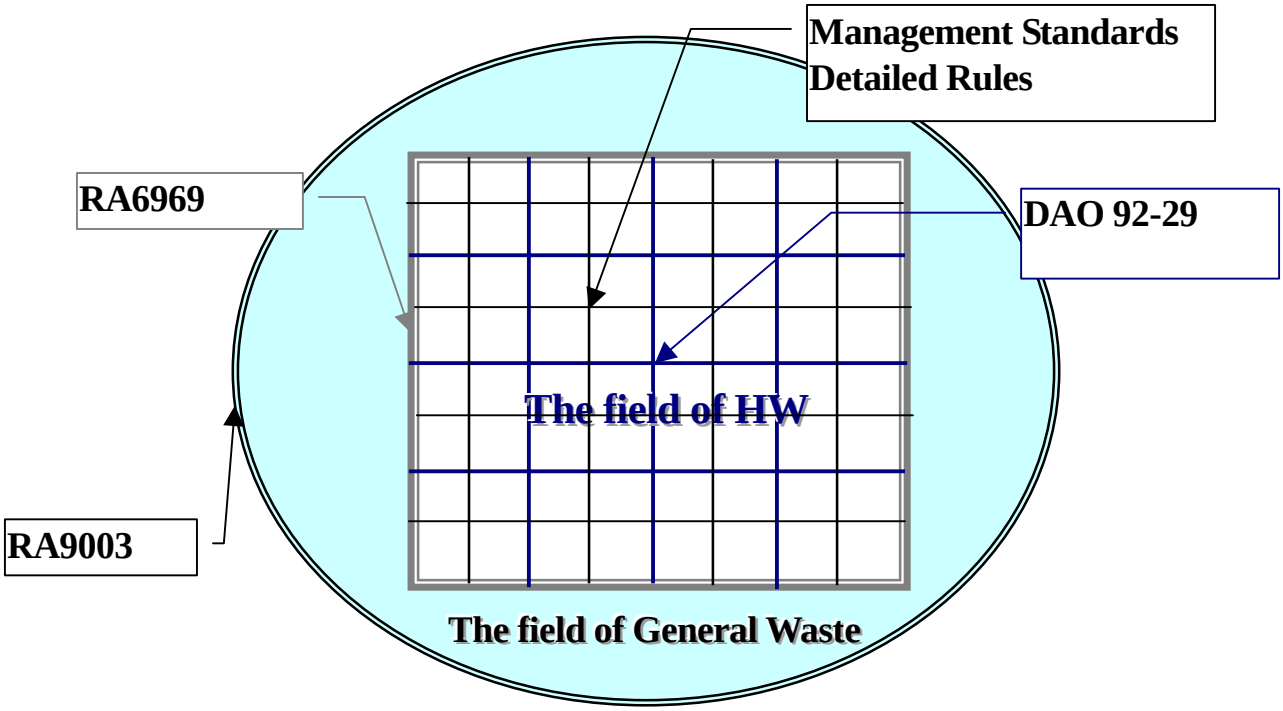

Figure 14.1.4 Image of Sufficiently Established Laws and Regulations in Superstructure

(2) Setting Philosophy/Principles for HWM

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

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

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

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

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

14.2 Administration Tools and Their Effective Use

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

- Registration
- Reporting
- Manifest

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

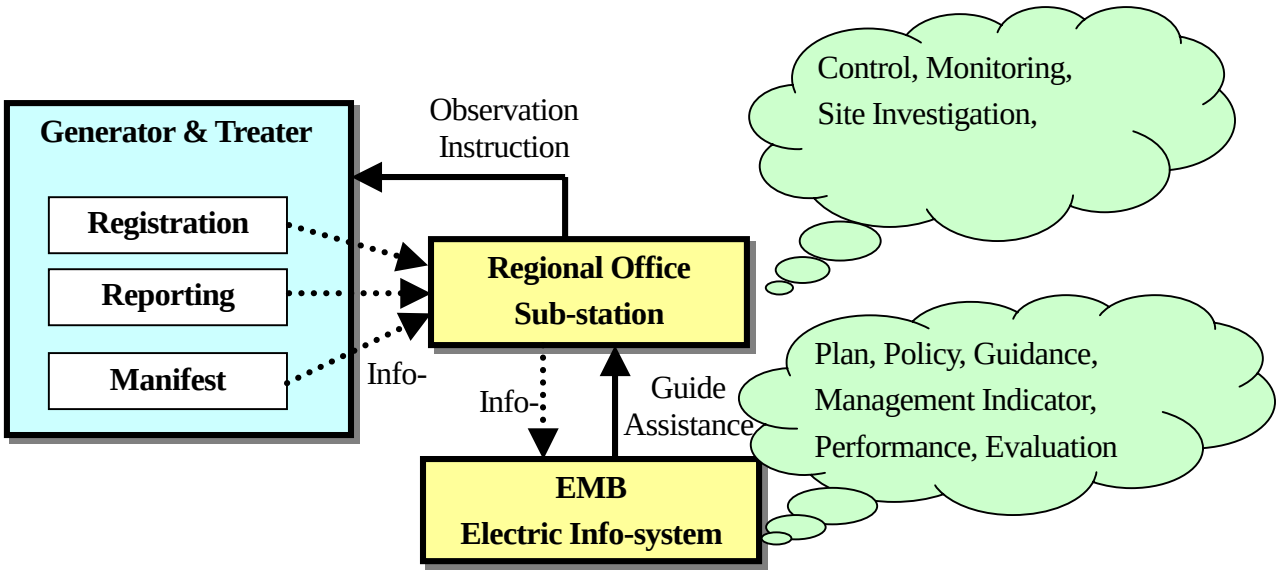

Figure 14.2.1 Image of Data Management System on HWM

14.3 Institution and Capacity Building

It is obvious that HWM is not carried out sufficiently by EMB, but nobody can blame them because of its organizational limitation. There is a basic organizational problem that the

staff members in HWM section cannot concentrate on planning and policy making on HWM. They spend a lot of time for operational routine works. It is important to establish an independent unit that is exclusively in charge of planning and policy making in EMB.

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

14.4 Establishing Economic Instruments and Measures

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

14.5 Establishing In-House HWM System by the Generators

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

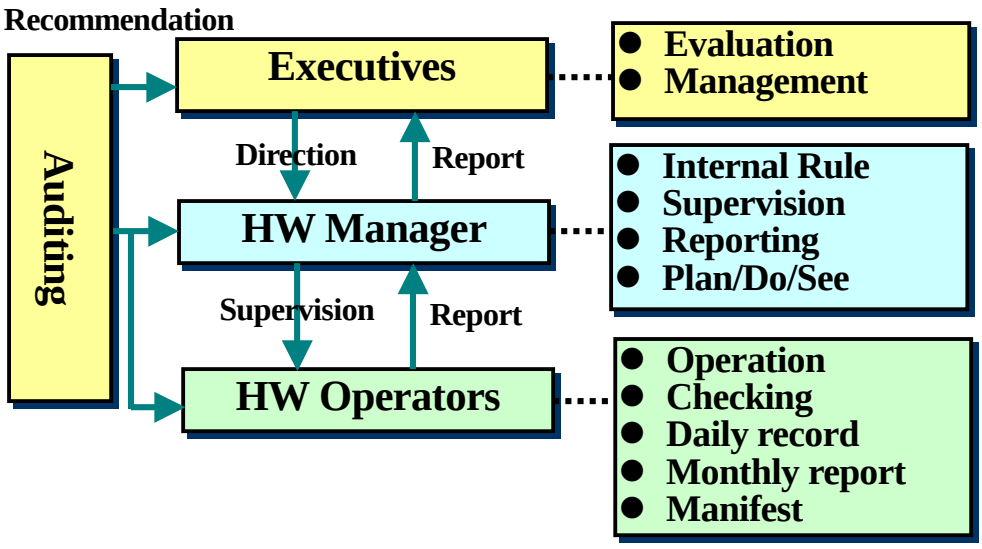

Figure 14.5.1 Image of HWM System at Generators

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

14.6 Promotion of HW TSD Facility Development

(1) Establishment of storage measure

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

Measures needed are as follows;

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

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

(2) Development of A Model HW TD Facilities by DENR/EMB Initiative

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

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

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

14.7 Plan and Action

(1) Organizational system for implementation

It will be meaningless if this Master Plan never implemented. Actions need to be taken according to the plan, and establishing following organizational system is an inevitable.

- National government

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

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

- Relevant Organizations

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

- NGOs and other related Organizations

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

(2) Review of Plan-Do-Check-Action

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