

**THE STATE OF HAZARDOUS WASTE MANAGEMENT
IN THE PHILIPPINES**

FINAL REPORT

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DISCLAIMER

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Table of Contents

1. Executive Summary		PHIL-4
2. Industrial Hazardous Waste		PHIL-7
2.1 Hazardous Waste Problems		PHIL-8
2.1.1 Sources		PHIL-8
2.1.2 Location		PHIL-9
2.2 Government Structure for Dealing with Hazardous Waste		PHIL-11
2.2.1 Agency Structure		PHIL-11
2.2.2 Legislation		PHIL-12
2.3 Current Solid and Hazardous Waste Activities		PHIL-13
2.3.1 Current Waste Management Practices		PHIL-13
2.3.2 Philippine Government Activities in Hazardous Waste Control		PHIL-14
2.3.3 Philippine Government Activities in Municipal Waste Control		PHIL-15
2.3.4 Uncontrolled Site Remediation Activities		PHIL-16
2.3.5 Multilateral and Bilateral Activities		PHIL-17
2.4 New Hazardous Waste and Municipal Solid Waste Project Opportunities		PHIL-19
References		PHIL-22

1 EXECUTIVE SUMMARY

Hazardous Waste Management The management of hazardous waste is a relatively new activity in the Philippines. A coordinated program to deal with hazardous wastes has not yet been implemented. The majority of the solid and hazardous waste generated in the Philippines is still improperly stored, transported and disposed. Specific facilities for their treatment and disposal have not been developed in the country. The most serious shortcomings dealing with the hazardous waste problems in the Philippines are:

- (1) the lack of an integrated strategy for the management of wastes (this is needed as a basis for planning and identifying priority projects and directing resources);
- (2) inadequate facilities and equipment and severe shortages of properly trained individuals, particularly at the local and community level, to deal with toxic chemicals and hazardous wastes;
- (3) the lack of an adequate inventory of the generation and disposition of hazardous waste (this can be an impediment to planning of hazardous waste management);
- (4) absence or lack of interagency coordination and operational specifics in the regulations to be enforced;
- (5) the lack of emphasis given to regulation and enforcement as vital components of successful urban and environmental management; and
- (6) the lack of awareness of workers and general public about the hazard and potential risks associated with hazardous wastes.

Socio-economic Factors The quality of the environment in the Philippines' urban and industrial sectors is, in large measure, linked to the structure and performance of the economy. The Philippines' continuing problem with foreign debt, accelerating inflation, high interest rates and reduced over-all growth affect the capacity of both the public and private sectors to undertake investments in environmental management. They also constrain the public sector's ability to address socio-economic and institutional issues that significantly contribute to the deterioration of environmental quality in urban and industrial areas. At the same time, rapid population growth, widespread poverty and inequality, persistent rural-urban income disparity, and continuing migration to urban and industrial centers are overwhelming already overburdened social services and infrastructure. Their effects are manifested in rapid urbanization, mushrooming congested communities, and increasing abuse of the natural environment by uncontrolled waste disposal.

Public Sector The DENR, the government agency charged with management of the country's environmental and natural resources, is tasked with four-fold mission of: (1) sustainable development of forest resources; (2) optimal utilization of lands and minerals; (3) social equity and efficiency in resource use; and, (4) effective environmental management. To achieve its mission, the DENR identified specific strategic concerns and proposed a total of 127 projects costing almost US\$3.38 billion over the period 1990-1995. (TRD 1991) The majority of the proposed spending is allocated for the rehabilitation of degraded ecosystems, mostly involving forestry-related projects. The urban and industrial environmental concerns are given relatively low priority. Only eight of the DENR's proposed projects directly deal with industrial pollution. Most involve conducting studies on specific aspects of industrial pollution. The cost of these eight projects is estimated at US\$12.25 million, representing merely 0.36 percent of total DENR proposed project costs. (TRD 1991)

Private Sector The manufacturing industry in the Philippines, as a whole, seems to be ill-prepared, both technically and financially, to institute the necessary measures for the management of toxic chemicals and hazardous wastes. (Diaz 1991) The consulting capability in the Philippines is generally adequate but specialists in hazardous waste handling, treatment and disposal are often secured from abroad. Competent technicians for operating and servicing equipment are available locally.

U.S. Presence Only a handful of U.S. firms in the environmental area are present in the Philippines. The majority of these are consulting firms (e.g., PRC, Dames and Moore, Inc., James Montgomery Consulting Engineering, Louis Berger International, Inc) and are engaged in environmental assessment and planning projects sponsored by international agencies (e.g., World Bank, Asian Development Bank, ASEAN, WHO) and/or foreign agencies (e.g., USAID, TDA). The presence of U.S. environmental equipment suppliers or engineering firms is limited. The local consulting and engineering firms are expecting to team up with foreign firms for projects to deal with domestic hazardous waste problems when needs arise.

Technology Transfer U.S. technologies and equipment, in general, have enjoyed a good reputation in the Philippines. The local end-users regard American products as technologically sophisticated with a high degree of reliability. Complete information on U.S. goods and services is limited.

The key factor that will increase environmental activities and affect the demand of environmental goods and services in the Philippines is the incentive provided to industry for compliance with regulations. Thus far, the environmental and enforcement activities in the Philippines appear to be ineffective due to lack of money and staff. Most of the limited amount of money actually spent for environmental management comes from foreign development agencies.

Government-Industry Cooperation Although faced with constraints that have no easy solutions, the Government of the Philippines recognizes that environmental management must be improved to meet the needs of an expanding population with expectations for an improved

quality of life. Industrial pollution control is becoming one of the highest priorities in DENR. This objective is clearly stated in the *Philippine Strategy for Sustainable Development*, which outlines DENR's activities to improve the industrial environment. DENR's programs encourage the active participation of Philippine industrial firms and citizens in the formulation, implementation, monitoring and evaluation of pollution control policy. (USAID 1991)

Presently, there appears to be emerging efforts from industry, government and the public to establish a more market-led pattern of prevention and control. The Philippine government is attempting to enforce compliance with existing environmental standards. The government recently demonstrated its commitment to industrial pollution control by shutting down several polluting facilities, including a temporary shutdown of one of the largest copper-mining operations in the country, when abatement procedures were not performing as required. The government's role as the sole enforcer of pollution regulations is beginning to change. The interest of industry associations, environment-oriented non-government organizations and citizens' group in decisions concerning the country's pollution problems has increased. As a result, public consumer pressure on industry and the government is becoming more influential.

2. INDUSTRIAL HAZARDOUS WASTE

More than 15,000 industrial and manufacturing plants presently operate in the Philippines. These plants are diverse both in terms of the size of the business establishments and the activities undertaken. The Philippines' industrial sector can be described by the following structural characteristics:

- the presence of a very broad range of industries - ranging from the large scale petroleum refining operations to the food industry;
- highly toxic materials, such as chlorinated hydrocarbons, mercury compounds, cyanide, arsenic, etc.;
- a large concentration of manufacturing activities in Metro Manila and surrounding core regions;
- an increasing share of "nontraditional" manufactured exports as a portion of total exports, with concentration in three products: garments, electrical and electronic components, and handicraft; and
- a large number of small, diverse and unregistered establishments that make up the Philippines' informal industrial subsectors, which contributes significantly to total output and around 40 percent of the Gross National Product.

From 1985 to 1990, large increases in the value of production and employment occurred in the transportation equipment industry. In addition, the basic metal, non-metallic mineral products, paper and paper products, furniture and fixtures, and wearing apparel industrial sectors all doubled their value of production. Based on a survey conducted by the Department of Trade and Industry, the major sectors that exhibited substantial growth rates in sales during the first quarter of 1990 were: the plastic industry, with sales growth of 58%; consumer durables 49%; garments 46%; cement 41%, and agro-based industries 39%.

The Philippines' chemical industry is relatively small. The country imported more than \$1.5 billion of chemicals, with major items being petrochemicals and such inorganic chemicals as ammonia and soda ash. Most of the local chemical industries concentrate on downstream processing operations such as plastics fabrication, pharmaceutical formulation, cosmetics manufacture and other compounding operations. (Uriarte 1992) Table 1 lists the number of large industrial firms in 1987 in the Philippines given by industry classifications. (Fuentes 1991)

Table 1. List of Large Manufacturing Firms in the Philippines

Industry Classification	Number of Firms
Textile	297
Leather and leather products	39
Wood and wood products	254
Industrial chemicals	89
Other chemical products	206
Plastic products	162
Iron and steel	99
Non-ferrous metal	22

Source: Fuentes 1991

2.1 HAZARDOUS WASTE PROBLEMS

2.1.1 Sources

Currently there is no national inventory on hazardous wastes in the Philippines. There are, however, several studies that resulted in data on hazardous waste characteristics for specific regions of the country. The results of these studies are briefly described below:

The Laguna Lake Toxic and Hazardous Waste Management Feasibility study sponsored by Laguna Lake Development Authority (LLDA) and the U.S. Trade and Development Agency (TDA) indicated that the Laguna de Bay in the Metro Manila produced more than 10% of nation's manufacturing output. This amounted to about 1,155 industrial establishments within the watershed. About 65% of the industries operating in the urbanized northwestern region and in the agro-industrial southwestern region contributed significantly to the pollution loading of the lake. These industries had a variety of hazardous waste discharges, which resulted from operations including, among others, the manufacturing of basic industrial chemicals or chemical products (synthetic resins, plastics, paints, rubber tires), machine and equipment assembly, tanning and leather finishing, iron and steel milling, and livestock and poultry raising. The most commonly discharged hazardous contaminants were identified to include metals (copper, zinc, chromium, lead, nickel) and organics (bis-2-ethylhexyl) phthalate, chloroform, methyl chloride, toluene, benzene, and phenol). Sediments from the lake and selected tributary streams were found to have low concentrations of hazardous contaminants. The same was found in the tissue-cumulative metal analysis carried out in macro-invertebrates and fish food species.

However, the concentration of hazardous contaminants in lake water exceeded criteria in several locations near the main inflow points.

The Industrial Technology Development Institute, using information from a study sponsored by the Economic and Social Commission for Asia and the Pacific (ESCAP), reported that the gold and copper mining industries were the major hazardous waste generators in the Cordillera Autonomous Region. These industries generated mine tailings and metal containing wastewaters. The survey also provided preliminary estimates of hazardous waste generation for the Metro Manila area: 20 to 40 million liters per year of concentrates with a predominance of acid and metal wastes and smaller volumes of toxic washing and alkalis; 80 to 150 million liters per year in the form of dilute aqueous solutions; and imported chemicals, which could potentially result in hazardous waste. These imported chemicals included, among others, 20 metric tons per year of organo-mercury, 10 metric tons per year of organic arsenic compounds, and 2,000 to 3,000 metric tons of PCB-containing fluids in transformers and capacitors.

A national hazardous waste inventory workshop jointly sponsored by the Department of Environment and Natural Resource and USAID was held in September 1992 in Tagaytay City, with more than 40 participants representing government agencies, industries, consulting firms, and advisory groups. Based on current industry statistics, the workshop attendees identified the following wastes as priority hazardous wastes in the country: plating wastes, organic solvents, and acids and alkalis. Some wastes were considered to be of little consequence, including reactive wastes, waste containers, putrescible waste, and oily organic waste. There was little waste generated from the pesticide and pharmaceutical industries, as these industries are mainly formulation and packaging operations in the Philippines. Wastes from the petroleum refining industries were very specific to a limited number of plants. Little hazardous wastes are generated from the textile industry, but in view of the importance of textile and cloth exports, the waste generation from the textile industry was felt to require independent checking. (Barnes 1992) It was suggested that the workshop participants be reconvened in late-1993 to review a preliminary inventory of hazardous waste in the country, which is expected to be compiled.

2.1.2 Location

Though industrial plants are distributed throughout the country, the majority of waste generating industries are found in Metro Manila and its nearby provinces. Several major industries operate in Bulacan, a neighboring province of Metro Manila in the north. In addition, a number of large industrial plants such as cement plant and steel mill are located in Mindanao, the southern portion of the country.

Two major areas with semi-conductor production plants are located in Baguio City and Cebu City. Most sugar industries are found in Negros Occidental. Gold and copper mining industries are located in the Cordillera Autonomous Region. Big hospitals which generate infectious waste abound in the extended metropolitan areas, while those in the provinces can be found only in urban areas. (A map of the Philippines is provided in Figure 1.)

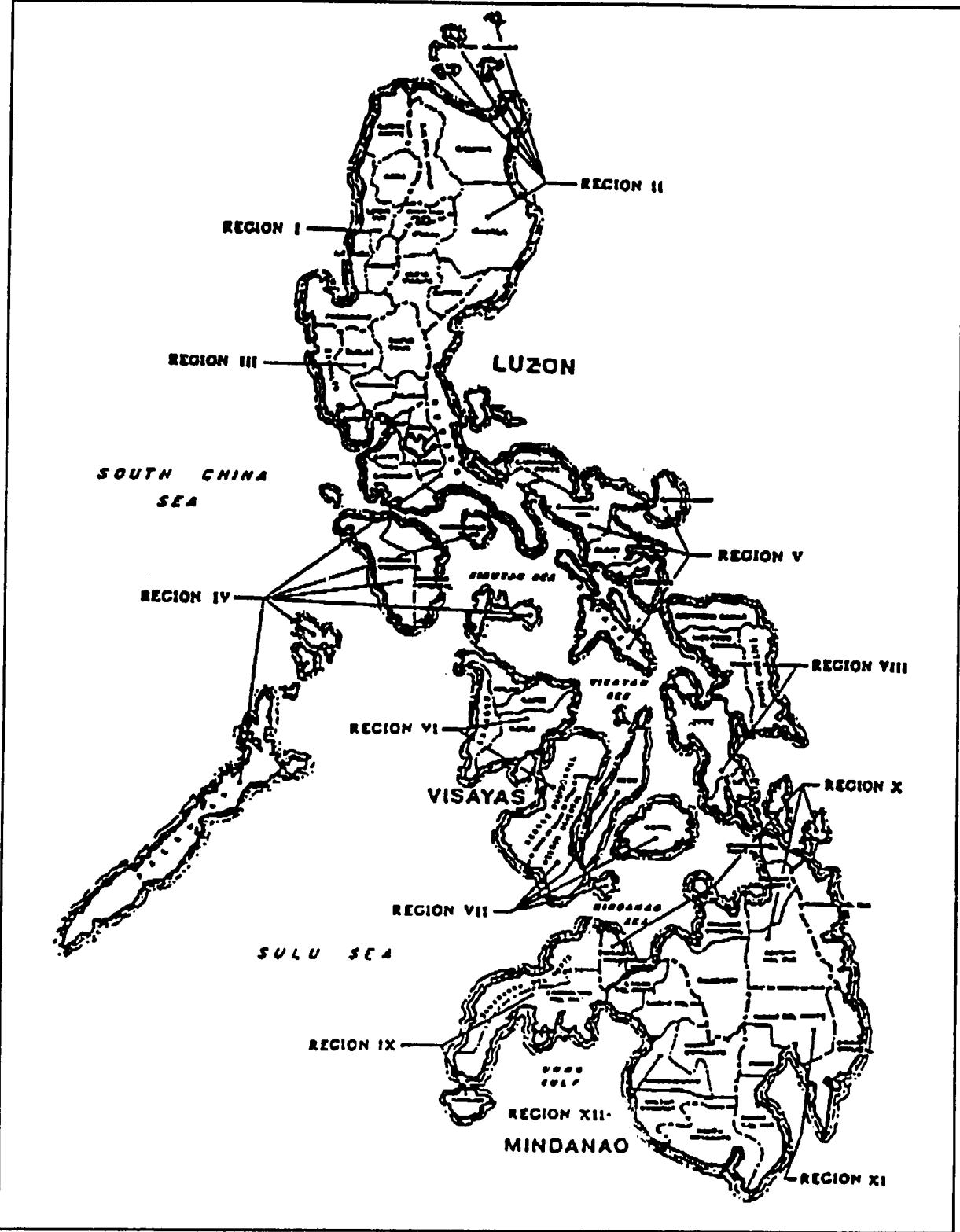


Figure 1 Map of the Philippines

BEST AVAILABLE DOCUMENT

2.2 GOVERNMENT STRUCTURE FOR DEALING WITH HAZARDOUS WASTE

2.2.1 Agency Structure

In the Philippines, the National Water and Air Pollution Control Commission (NAWAPCO) was instituted in 1964. This commission later became the National Pollution Control Commission (NPCC). The National Environmental Protection Council (NEPC) was established in 1977. In 1987, NEPC and NPCC were both abolished and their functions were given to the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR), the leading agency responsible for formulating and implementing environmental policies, laws, plans and programs, including those that pertain to hazardous waste. DENR/EMB has 13 field offices for the 13 regions of the country. The offices implement the policies, laws, plans and programs.

In addition to DENR/EMB, there are several government agencies that are involved in the control and management of environmental pollution, including hazardous waste. These agencies and their responsibilities are delineated as follows:

- **Department of Trade and Industry:** Responsible for planning and implementing commercial and industrial development programs, the agency is concerned with availability of adequate pollution control capacity, including that of hazardous waste treatment/disposal facilities.
- **Department of Transportation and Communication (Land Transportation Office):** This office is concerned with the transportation of hazardous waste and the response capability for spills and other accidents in the transportation of hazardous materials.
- **Department of Public Works and Highways:** The primary responsibility of this national government agency is development of the nation's infrastructure, such as highways, public buildings, and flood control systems. At the direction of the Presidential Task Force on Solid Waste Management, it has been charged with responsibility for design and construction of solid waste transfer stations and sanitary landfills for Metro Manila.
- **The Department of Health:** The agency is responsible for public sanitation and inspection of foods and crops. It has also been charged with responsibility for developing and implementing a plan for management of waste from hospitals.
- **Central Bank:** The importation of hazardous chemicals is currently regulated through an ad hoc arrangement between the Central Bank and other pertinent government agencies.

•**Lake Laguna Development Authority (LLDA):** The agency has been authorized under its charter to "... carry out the development of the Laguna Region with due regard and adequate provisions for environmental management and control, preservation of the quality of human life and ecological systems, and the prevention of undue ecological disturbance, deterioration and pollution". LLDA is also charged with setting water quality standards for waste discharges, and enforcing these standards, and pursuing violators under penal or civil actions. (James A Montgomery Consulting 1990)

•**Other agencies:** The Philippine Coast Guard has primary responsibility for enforcement of marine pollution regulations, including oil spill response and contingency planning in conjunction with EMB. There are several government agencies that are involved in the licensing, permitting and monitoring of toxic chemicals and hazardous wastes. The Fertilizer and Pesticide Authority controls registration, labelling and use of pesticides, and licenses handler and pest control operators. The Bureau of Food and Drugs controls chemical content of food and drugs.

2.2.2 Legislation

The pressure from rapid population growth combined with high population density and inadequate (sometimes unavailable) environmental sanitation facilities have resulted in the generation of severe negative environmental impacts in the Philippines. Several environmental laws were established in the late 1970s and early 1980s to deal with the problems. The framework for the national environmental policy is Presidential Decree (PD) 1151 or the "Philippine Environmental Policy". This legislation was complemented by PD 1152 or the "Philippine Environmental Code". Additional laws and regulations dealing with the environment have been enacted and amended. These statutes include assorted environmental legislation, regulations, decrees, etc.

The legislation pertinent to hazardous waste control has been signed into law only very recently. On July 23, 1990, the two highest legislative bodies of the country proposed Senate Bill No. 225 and House Bill No. 25194, which were subsequently passed and consolidated on September 6, 1990. The law was approved by the President of the Philippines on October 26, 1990 as Republic Act (RA) 6969 known as "Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990". At the writing of this report, this Act has not been enforced pending the promulgation of rules and regulations as stipulated in the Act. The Act covers regulation and control of toxic chemicals, hazardous wastes, and nuclear wastes. The types of regulatory controls included in RA 6969 and specific sections dealing with hazardous waste controls are listed below:

- Definition/listing of wastes: Sections 5 and 6
- Transport/storage control: Sections 26, 27, 28, 29
- Pretreatment requirements: Sections 26, 27, 28, 29
- Treatment and disposal requirements (including land ban of specific hazardous waste): Section 30

- Reporting requirements: Sections 26, 27, 28
- Waste minimization requirements: Section 24
- Regulations on Waste import/export: Section 31
- Policy on sustained development/clean technology: Section 24
- Policy on multi-media control: RA 6969 Section 7

The Philippine approach to hazardous waste management, according to DENR will be that of a simplified "cradle to grave" system using registration, notification and permitting requirements to monitor and regulate the movement and fate of wastes in the environment. The following factors are being considered in the preparation of the rules and regulations implementing RA 6969: (1) minimal requirements for additional government resources; (2) use of available data from other sources; (3) incentives for industry to self regulate; (4) polluter pays principal; (5) industry responsibility to provide data; and (6) controls through licenses/permits. (Fuentes 1991)

2.3 CURRENT SOLID AND HAZARDOUS WASTE ACTIVITIES

2.3.1 Current Waste Management Practices

Waste Collection A specific system for the collection and transportation of hazardous waste has not been implemented in the Philippines. Solid and semi-solid hazardous waste apparently are collected by using the same system as that used for the collection of municipal solid waste.

Treatment/Disposal Available information indicates that, at present time there are not many facilities specifically designed to treat hazardous waste in the Philippines. The only treatment afforded to liquid hazardous waste is that provided by conventional wastewater treatment plants in some industrial complexes. These plants, however, generally lack the facilities to treat and dispose of the concentrates and sludges produced. Based on the results of waste survey conducted in 1985 (Uriate 1992), the present disposal methods for hazardous wastes (including toxic and hazardous concentrates and sludges) from industrial sources include:

- Discharge to drains and rivers without treatment. This practice contributes to severe organic pollution and constitutes the main source of heavy metal pollution of several river systems. It was also found to cause heavy metal contamination of Manila Bay.
- Dumping at municipal landfills. Co-disposal of industrial hazardous waste with municipal solid waste in open-dumps, which is still practiced in most cities in the country, could cause a direct health hazard to scavengers, and contribute to the contamination of land, surface water and groundwater.
- On-site Storage/Treatment/Disposal. This practice may be employed in industries, but little information on the extent of use is available.

- Private landfills operated by a single industry or a haulage contractor. Little information is available about their location or operation but their presence was confirmed.

- Ocean dumping. This procedure is carried out for some mining wastes and caustic and fly ash wastes.

Emergency Planning and Response The Philippines has an emergency plan known as the "Calamities and Disaster Preparedness Plan". The plan was developed by the Office of Civil Defense and serves as the foundation for all contingency and operation plans that may be formulated. In the Philippines, the contingency plans at the national and local level are carried out by an inter-agency group coordinated by the Disaster Coordinating Council. Some of the contingency plans that have been formulated include the contingency plan for active volcanoes and the contingency plan for unusual water releases from major dams in Central Luzon.

Emergency planning and response actions for industrial accidents are relatively undeveloped. It is reported that only a few industries have developed contingency plans in case of industrial accidents. (Diaz 1991)

Industrial Waste Exchange An Industrial Waste Exchange, Philippines (IWEP) project was initiated in 1987. The main objective of the project is to reduce negative environmental impacts due to industrial wastes through the promotion of waste exchange and recycling among industries. The project is partially funded by the Canadians and is administered by the EMB. (Diaz 1991)

Hospital Waste The results of a study conducted in October 1988 to assess the status of hospital waste management in Metro Manila indicated that the majority of the hospitals surveyed disposed of all their wastes (including infectious wastes) in conjunction with the municipal waste collection and disposal system. The study also indicated that only six of the 64 hospitals surveyed have incinerators and that some of the hospitals practice unsatisfactory disposal methods such as burning and burying within the hospital compound as well as discharging contaminated fluids into the hospital's plumbing system. (Diaz 1991)

2.3.2 Philippine Government Activities in Hazardous Waste Control

Current hazardous waste activities by the Government of Philippines (GOP) are focused on development and enforcement of regulations and standards under RA 6969. A national workshop for the safety and control of toxic chemicals and hazardous wastes, jointly sponsored by DENR/EMB, the World Health Organization and the United Nations Development Programme, was held in Manila over three days from 13 to 15 November 1991. Workshop participants discussed overall chemical safety program planning and implementation, the preliminary assessment of the country-level situation, potential approaches/projects for

resolving identified problems, and program coordination issues. The workshop was attended by 82 participants from various government departments, nongovernmental organizations, and private industry. Following the workshop, a framework for the preparation of a national strategy for the control and management of toxic chemicals and hazardous wastes was developed. A series of 15 projects were identified for immediate implementation. (Moss 1992)

Presently, EMB is in the process of preparing an inventory of hazardous waste generation, which is expected to be completed by mid-1993. It is also developing rules and regulations applicable to the hazardous waste generators and owners and operators of hazardous waste storage, treatment, and disposal facilities. Other EMB efforts in the hazardous waste area include: providing training for both agencies and industry to prepare for the eventual implementation of the regulations; and identification of the needs for hazardous waste treatment and disposal facilities. (Fuentes 1991)

2.3.3 Philippine Government Activities in Municipal Solid Waste Control

The strategy for municipal solid waste management used in the Philippines varies from place to place and is unique to the local culture and other activities in the area. One thing common to all is the use of open dumps as the final waste depository.

About 4,000 tons of municipal solid waste are generated daily in Metro Manila Region (MMR). (TRD 1991) Management of the waste is weak. There are currently no facilities that can be classified as sanitary landfills. After the recyclable and reusable materials have been removed by household and neighborhood scavengers, only 60% of the solid by-product and residue is actually transported to dumps; the remaining 40% remains uncollected. The uncollected fraction remains along streets and alleys, or ends up in the estuaries and canals that cut through the city. During the rainy seasons, these materials, along with the septic tank leachate, are washed out to Manila Bay or dumped into Laguna de Bay. Even after the material reaches an open dump, material sloughs into the water or contributes to air pollution as a result of smoldering fires in the dumps. Some open dumps are adjacent to water bodies and waste material sloughs into the water on a regular basis, contributing to organic pollution of surface and ground water resources.

The municipal solid waste collection and disposal system of the Metro Manila Region has reached critical proportions after decades of neglect. Much pressure has been mounted on the Metro Manila Authority, the lead implementing agency for this problem, to come up with an efficient, practical, yet economic solution.

The Metro Manila Solid Waste Management Feasibility Study funded by TDA proposed a series of integrated solid waste management activities. This proposed project consisted of the following components: (1) development of two environmentally secure landfills, including gas recovery, material recovery, and composting; (2) provision of communal containers for

collection of waste in those communities that are inaccessible to collection vehicles; (3) establishment of five transfer stations for transfer of waste to larger, more efficient long-haul vehicles; (4) construction of a refuse pit at each transfer station for temporary storage when needed; (5) a resettlement and livelihood support program (including job training and job placement) for the squatters and scavengers that will be affected by closure of the open dumpsites; (6) closure of all existing open dump sites, covering them with dirt and providing for removal of gases; and (7) a solid waste management training program and groundwater monitoring around landfill sites.

Some of the projects above are presently being implemented. The construction of the first transfer station in Metro Manila has been completed. At the new San Mateo landfill site, pilot landfill cells and a leachate collection system have been installed and are being tested. They are funded by local agencies and built by local firms. Additionally, the project is being appraised by interested funding agencies. The Metro Manila Authority is reportedly negotiating with World Bank for a US\$100 million loan to implement the projects suggested by the feasibility study. (Cayton 1992; also Sec 2.3.5 of this report)

2.3.4 Uncontrolled Site Remediation Activities

There are likely many, although yet uncharacterized, sites that have been contaminated with hazardous wastes in the Philippines. These sites include a number of open dumps, industrial plants, and creeks and rivers. There is no information (at least in the public domain) on the location and nature of contaminated sites, no established technical standards for cleanup, nor any guidelines pertaining to the liabilities of responsible parties. At the present, however, limited activities are being conducted or planned by the government and foreign agencies aimed at rehabilitating selected polluted or "dead" rivers by dredging of bottom sediments. Priority for river rehabilitation has been given to the following waterways: (1) Navotas-Malabou-Tullahau-Tinajeros River, (2) Pasig River, (3) Laguna Lake, (4) Manila Bay, and (5) Calancan Bay. (Carpenter 1992)

The Danish government has provided funding of US\$1.6 million to DENR through the Danish International Development Agency (DANIDA) to assist in the Pasig River Rehabilitation Project. A feasibility study to develop a long-term strategy for reduction of pollutant loading to the river was scheduled to be completed by the end of 1992. Additional funding for implementation has been requested.

There are many existing open dumpsites in the country that are becoming the major sources of environmental and health problems. In Manila alone, at least 7 large open dumpsites should be closed. Many of these sites are located in shallow waterways or rice paddies. Closing of existing dump sites is one of the priority projects in the Philippines. Presently, however, there is no specific on-going closure or cleanup program. Several developments must be set in motion in order to allow the government to begin the closure process: (1) at least one of the new sanitary landfills should be in operation, (2) cost effective

transport of refuse to the new landfill should be developed, and (3) a closure plan should be developed for each site. In addition to these prerequisites, closing dumpsites will take a considerable amount of money and time in order to adequately address the environmental issues at each site.

2.3.5 Multilateral and Bilateral Activities

In addition to the Philippine government activities, there are several hazardous waste and municipal solid waste activities funded by bilateral or multilateral organizations. These activities are as follows:

U.S. Agency for International Development (USAID) The USAID has previously sponsored environmental initiatives and studies on the Philippines' tannery and semiconductor industries. The agency is presently sponsoring the Industrial Environmental Management Project (IEMP) with a goal of encouraging sustained economic growth in the industrial sector in the Philippines along with corresponding improvements in the control of industrial pollution. With DENR as the lead implementation agency, the project will spend a total of US\$12 million over five years from 1991 to 1996. The IEMP is expected to achieve measurable reduction in the generation of industrial emissions, effluents and wastes at a number of industrial sites in the Philippines. It is also expected to accomplish: an improved efficiency and management of energy, raw materials, and waste recovery and recycling; increased investments by targeted firms in pollution control technologies; strengthened Philippine capacity to conduct pollution management appraisal, environmental risk assessments, environmental impact assessments and compliance audits; advances in the policy and regulatory framework regarding pollution management in the Philippines; and expanded public participation in the development of policies and projects to prevent, reduce and manage the country's industrial pollution. (USAID 1991)

These objectives of IEMP will be accomplished through a series of activities, including pollution reduction initiatives; policy studies and public/private dialogues; and training and technology transfer. Some of these activities are:

- Completion of an environmental risk assessment that identifies the five industry sectors that pose the highest social costs from industrial pollution,
- Completion of pollution management appraisals at up to 150 industrial sites,
- Completion of about ten policy analyses to support advances in regulatory, fiscal, and administrative dimensions of pollution issues, and
- Training of a substantial number of Filipinos in pollution management appraisal (200), environmental risk assessments (60), environmental impact assessments (700), compliance audits (200), compliance monitoring (200) and data collection/analysis (300).

World Bank The World Bank has funded the following projects aimed at improving environmental management in the Philippines:

- **Metropolitan Environmental Improvement Program (MEIP):** A regional program funded by the UNDP and executed by the World Bank to assist governments, industries, NGOs and communities to arrest and reverse environmental degradation in rapidly growing Asian urban centers (including Metro Manila). MEIP is involved in the formulation of an Environmental Management Strategy and Action Plan and the conduct of studies on industrial efficiency and pollution control, public sanitation facilities and community-based recycling and resource recovery programs. It also supports NGOs involved in solid waste management and information dissemination campaigns on urban environmental issues.

- **Environmental Sector Study:** To be performed from July 1992 to March 1993, the study is intended to provide the Philippine government with a comprehensive holistic framework and action plan to strengthen the environmental management process for infrastructure and industry, especially in light of the imminent changes arising from the implementation of the Local Government Code. The study will formulate a definition of the government's objectives and role in managing environmental processes, map out an appropriate strategy for meeting such objectives, and estimate the resources needed to implement the strategy.

- **Industrial Efficiency and Pollution Control:** This project (being planned) is intended to strengthen the framework, incentives, planning, and enforcement mechanisms dealing with industrial pollution in Metro Manila and Cebu. This proposed project will also establish financial arrangements for firm-level investment in pollution control and waste management identified in the MEIP study.

- **Metro Manila Solid Waste Management:** This project is intended to improve environmental conditions in Metro Manila through the introduction of sanitary landfill methods and closure of existing open dumps sites. This project (being planned) will comprise the development of two sanitary landfill sites, construction of four refuse transfer stations, procurement of transfer trucks and equipment for landfill site operations, rehabilitation of maintenance shops, and technical assistance. A grant (\$576,000 equivalent) has been obtained from the Japan Environmental Fund for the design and initial assessment of the feasibility of the project.

Asian Development Bank The Asian Development Bank (ADB) has been assisting the Metro Manila Environmental Improvement Project and various projects for water and wastewater treatment. An ADB-financed environmental sector assistant loan of US\$300,000 began in 1992. The bank is planning to provide a technical assistance grant of US\$100,000 for developing hospital services. (USAID 1991) It was not clear whether the project will include an element that addresses the problem of medical waste. (TRD 1991)

Germany GTZ, a German international aid agency, has funded the Philippines-German Project at \$1 million per year in an attempt to improve the hazardous waste management situation in City of Cebu. (Faensen-Thiebes, A. 1992) The project elements include: (1) providing training courses for the DENR staff aimed at improving the knowledge and skills concerning the recognition of hazardous waste and methods for their proper treatment; (2) establishing a data inventory on type, quantities and chemical characterization of industrial wastewater and hazardous wastes from local industries, and data bases on regional surface and groundwater water quality, hydrology, and ecology; (3) providing technical assistance through the Cebu Chamber of Commerce and Industry to bridge the information gap on industrial waste management and hazardous waste treatment technologies; (4) upgrading, by supplying analytical equipment, an existing water laboratory of the University of San Carlos so that it will be able to analyze a wide range of toxic substances; (5) disseminating information on hazardous waste to the general public through newspaper articles and local radio and TV to raise the public awareness on hazardous waste issues; and, (6) construction of central waste treatment facility for metal finishing industry. GTZ will pay for the capital cost of the treatment unit. The operating costs will be obtained from user fees. (A secure landfill for Cebu may not be needed in near future as hazardous waste generation is still limited. Temporary storage may be needed for the next 10 years.) (Faensen-Thiebes, A. 1992)

Canada Funding of US\$3 million was provided by the Canadian government through the Canada International Development Agency (CIDA) for the establishment of a waste exchange program in the Philippines, and for providing assistance in environmental planning and management.

2.4 NEW HAZARDOUS WASTE AND MUNICIPAL SOLID WASTE PROJECT OPPORTUNITIES

A number of specific projects have been identified by Argonne National Laboratory for the U.S. Trade and Development Agency in the draft report: *Evaluation of Hazardous Waste Programs Activities in the Pacific Basin* as possible activities to enhance solid and hazardous waste management and to promote US trade opportunities in the Philippines. The projects are summarized in Table 2.

The projects can be summarized as follows:

Project Philippines-1: Technical Support to Philippine Government Agencies Involved in Waste Control This project is designed to provide technical assistance to the relevant government agencies, primarily DENR. The sub-projects are focused on giving these agencies technical information that can resolve some of the outstanding issues on the approach to be taken in setting up the waste control effort.

Project Philippines-2: Management Support to Philippine Government Agencies Involved in Waste Control This project, like the above, focuses on providing support to

DENR but concentrates on the management issues. The implementation of the waste control program is a primary objective.

Project Philippines-3: Technical Support to Philippine Industries in Hazardous Waste Control Unlike the two previous projects, this effort is focused on Philippine industries rather than on the government agencies. As one of the primary customers for hazardous waste control, the industrial sector needs more direct attention than has been given in the past.

Project Philippines-4: Direct Support Activities This project is designed to provide direct financial support rather than technical assistance. The funding provided can be tied directly to the purchase of U.S. goods and services; it need not be a pure funds transfer to the Philippines.

Project Philippines-5: Research Activities This effort is designed to carry out some collaborative research activities in areas that are of special importance to the Philippines.

Project Philippines-6: Training This project deals with both short-course training and academic, degree-oriented training.

Project Philippines-7: U.S.-Based Activities This project deals with efforts that need to be carried out in the U.S. or involving U.S. companies.

In the interest of completeness, a full spectrum of projects has been identified. The complete list may exceed both the scope of interest and the resources available to potential sources of funding. A prioritization of these activities is necessary to select those of most interest and which can be included within resource limitations.

Table 2. List of Possible New Waste Projects in the Philippines

PROJECT PHILIPPINES-1: TECHNICAL SUPPORT TO PHILIPPINES GOVERNMENT AGENCIES INVOLVED IN WASTE CONTROL	
Sub-Project Philippines-1A:	Revision of the Hazardous Waste Generation Inventory
Sub-Project Philippines-1B:	Provide Technical Advice to the Philippine Government on the Control of Specific Hazardous Wastes
Sub-Project Philippines-1C:	Conduct Technical and Economic Analyses of Smaller-Scale, Industry-Specific Hazardous Waste Treatment Facilities
Sub-Project Philippines-1D:	Conduct Technical and Economic Analysis of Hazardous Waste Treatment Facilities For Small- and Medium-Sized Industries
Sub-Project Philippines-1E:	Conduct Study on Infectious Waste Control Options
Sub-Project Philippines-1F:	Conduct Feasibility Study on Municipal Solid Waste Incineration in the Philippines
PROJECT PHILIPPINES-2: MANAGEMENT SUPPORT TO PHILIPPINES GOVERNMENT AGENCIES INVOLVED IN WASTE CONTROL	
Sub-Project Philippines-2A:	Develop Management Plan for Hazardous Waste Control
Sub-Project Philippines-2B:	Develop Management Plan for Implementation of a Hazardous Waste Manifest System
Sub-Project Philippines-2C:	Develop Plan for Emergency Response to Hazardous Material Accidents
Sub-project Philippines-2D	Develop Plan for Promoting Industrial Waste Minimization
PROJECT PHILIPPINES-3: TECHNICAL SUPPORT TO PHILIPPINES INDUSTRIES IN HAZARDOUS WASTE CONTROL	
Sub-Project Philippines-3A:	Conduct Programs for Philippines Industries on Identifying Hazardous Waste Control Options
Sub-Project Philippines-3B:	Conduct Demonstration Projects for Hazardous Waste Control
PROJECT PHILIPPINES-4: DIRECT SUPPORT ACTIVITIES	
Sub-Project Philippines-4A:	Provide Funding to the Philippine Environmental Agencies
Sub-Project Philippines-4B:	Provide Initial Set of Hazardous Waste Monitoring and Analytical Equipment to Philippine Government Agencies
PROJECT PHILIPPINES-5: RESEARCH ACTIVITIES	
Sub-Project Philippines-5A:	Conduct Research on Contaminated Sites
Sub-Project Philippines-5B:	Conduct Research on Adapting Hazardous Waste Control Technology to the Philippines Conditions
PROJECT PHILIPPINES-6: TRAINING	
Sub-Project Philippines-6A:	Provide Hazardous Waste Training Courses
Sub-Project Philippines-6B:	Provide Environmental Education Grants to Filipino Students in the U.S.
PROJECT PHILIPPINES-7: U.S.-BASED ACTIVITIES	
Sub-Project Philippines-7A:	Conduct Seminars for U.S. Companies on Doing Business in the Philippines
Sub-Project Philippines-7B:	Conduct Study Tours for Filipino Personnel to the U.S.
Sub-Project Philippines-7C:	Conduct Study Tours for U.S. Personnel to the Philippines

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