

ANNEX 2.2

Results of the Follow-up Survey on Companies Participated in Former IEM Projects

CHAPTER 1 INTRODUCTION

1.1 OBJECTIVE OF THE SURVEY

The objective of this survey is to identify how the companies that participated in previous waste minimization projects expand and enhance their environmental management after the completion of the projects. It shall draw lessons from an evaluation of these achievements since the previous project completion. These lessons shall help other enterprises learn from the experiences of participants of the previous waste minimization projects.

1.2 SELECTION OF TARGET MANUFACTURERS

The original arrangement for the selection of target manufacturers was to make a list using the manufacturers' directory that was developed by the USAID projects on IEM. These manufacturers shall then be categorized as manufacturers into appropriate industrial sectors from which a selection of desirable enterprises shall be made.

Participating companies from the hog and chicken raising sectors were also excluded from the survey. Only the manufacturing sector was considered for the survey.

However, companies that had been appointed as candidates for the Waste Minimization Project of EMPOWER were excluded from this survey. Participation of potential respondents was confirmed through communication by telephone, facsimile and/or e-mail.

1.3 SURVEY AREA AND NUMBER OF TARGET MANUFACTURERS

The survey area included a total of thirty (30) manufacturers in the islands of Luzon and Cebu. Table 1 shows target industry sectors and number of companies interviewed. Although original target manufacturers included the 18 industrial sectors, there was no previous waste minimization projects participants in the following sectors: cosmetics, glass and glass products, machinery and tool, petroleum products, and printing (offset). Likewise, participants from the pharmaceuticals and soap and detergents sectors had since ceased operations.

Table 1 Target Industry Sector

	Industry Sector	# of Interviewees
1	Beverage	2
2	Cement manufacturing	2
3	Chemical products (industrial and agro-chemical)	1

	Industry Sector	# of Interviewees
4	Coconut-based industries, edible oil and spirit distillation	6
5	Cosmetics	-
6	Electroplating and metal finishing	4
7	Food processing (tuna and small-scale food processing)	6
8	Glass and glass products	-
9	Machinery and tool	-
10	Metal foundry and forging	2
11	Petroleum products	-
12	Pharmaceuticals	-
13	Plastics and rubber	1
14	Printing (offset)	-
15	Pulp and paper	2
16	Soap and detergents	-
17	Spinning, textile and dyeing	1
18	Sugar milling and refining	3
	Total	30

1.4 SURVEY ITEMS

Survey interviews were directed to pollution control officers (when available) and included the following items:

- Profile and contact person of enterprise
- Process description, or specialties and factors of the environmental impact
- Details that were taken by the previous waste minimization project
- Environmental management items carried out through the past until the present
- Major impacts, if progressed
- Reasons for pursuing
- Reasons for non-progress, if it existed
- Issues of waste minimization and environmental management
- Future directions to be taken

In addition, for companies that did not participate in the Survey of 100 companies conducted by JICA in August 2002, the Study solicited top management attitudes on towards production management as well as environmental management.

Annex provides for the survey questionnaire utilized to collect the former information.

1.5 PREVIOUS INDUSTRIAL ENVIRONMENTAL MANAGEMENT PROJECTS

This Section summarizes the previous IEM projects funded through foreign technical and/or financial assistance in the country since 1990. Note that enclosed in parenthesis are the implementing and funding agencies and the project duration:

- Industrial Efficiency and Pollution Control or IEPC (UNDP, World Bank, DENR, 1991-1992)

The study proposed institutional, management, economic, regulatory, financial, and technical measures to establish the conditions under which a significant reduction of industrial wastes can be achieved.

- Industrial Environmental Management Project or IEMP (USAID, DENR, 1991-1996)

IEMP aimed to encourage sustainable growth in the Philippine industrial sector while reducing pollution from industrial activities and improving human health and the environment. It conducted pollution management appraisals at 150 facilities nationwide to identify pollution prevention opportunities.

- Metropolitan Environmental Improvement Project or MEIP (World Bank, DENR, 1991-1998)

One component of MEIP conducted pollution management assessment of 25 facilities in the Metro Manila and suburbs. Like the IEMP appraisals, MEIP assessment also identified opportunities for waste reduction. MEIP also rated environmental performance of industries under its Industrial Eco-Watch Project. It also provided assistance to the Laguna Lake Development Authority in piloting the implementation of the Environmental User's Fee.

- Industrial Waste Exchange Program or IWEP (IDRC, EMB, 1989-1991 and USAID, PBE, 1994-date)

Originally funded by IDRC of Canada and implemented by EMB, IWEP promotes the concept of resource recovery and recycling among industries. To date, IWEP uses of the *Business and Environment* magazine as a tool in disseminating information and maintaining a database of industrial wastes.

- US-ASEAN Environmental Improvement Project or US-AEIP (ASEAN, 1995)

US-AEIP conducted waste reduction assessments of industrials sectors such as food, cement, pulp and paper, and iron and steel. In 1999, UNIDO study made a post-evaluation of the results of US-AEIP in pulp and paper and cement plants in the Philippines.

Among the preliminary general conclusions of the UNIDO study is that while many firms are aware of CP as a practical means to reduce costs, it is difficult to measure how much they benefited. It was also found that most firms would not make substantial capital investments for CP, except with new plants. Supportive policy elements are also needed in finance, environment, education and science and technology. An integrated national CP policy and planning is likewise needed to accelerate adoption of CP.

- Pasig River Rehabilitation Program or PRRP (DANIDA, DENR, 1995-1999)

PRRP reduced pollution load to the Pasig River from 50 tons of BOD per day to 27 tons/day through waste minimization and pollution control in industries, urban poor resettlement, dredging of waterways, and riverside development.

- Green Productivity Program or GPP (APO, DAP, 1997-2002)

GPP targeted to minimize all sources of pollution in order to achieve continuous improvement and higher productivity in the industrial sector. It also tapped the

Private Enterprise Accelerated Resource Linkages of the Canadian International Development Agency to develop institutional capabilities of the Program.

- Industrial Initiatives for Sustainable Environment or IISE (USAID, DENR, 1998-2002)

IISE's objective is to promote the widespread use of environment management systems and pollution prevention practices among industries in the Visayas and Mindanao area. It also aims to establish policy incentives favouring the adoption of the system to enhance stakeholder awareness to cleaner production and strengthen local consulting capacity to support the adoption of pollution prevention.

- Private Sector Participation in Managing the Environment or PRIME (UNDP, DTI-BOI, 1998-2002)

The objective of PRIME is to enhance business competitiveness in the global marketplace through environmental management. It also enhances the participation of the private sector in protecting the environment and reducing pollution of industries on a voluntary basis. It maintains a database of environmental information, including regulations and clean technologies. It also formulated Business Agenda 21 policy statements for various industries and chambers of commerce.

- Regional Environmental Technology Assistance or RETA (ADB, 1999-2000)
RETA will directly assist participating Asian nations in developing policy framework, integrated plans, and institutional capabilities required for rapid and efficient adoption of cleaner production.
- Employers Confederation of the Philippines/International Labor Organization/Norway Cleaner Production Project (ILO, ECOP, 1999)

This project was part of ECOP's activities in environment and sustainable development. It aimed to promote cleaner production through extensive networking awareness-raising, research and plant-level initiatives. Five (5) companies volunteered for an in-house training and waste minimization audits of their facilities.

- Environmental Technology Assessment System (ETAS) Preparatory Study (UNIDO, DENR-EMB, 1997-1998)

The objective of ETAS Preparatory Study was to develop a basic system design and pilot program, suited to the specific needs and situation in the Philippines, and to evaluate potential benefits and financial sustainability of such a system. The system is a support mechanism for the industrial sector for the identification, evaluation, selection, and acquisition of cost-effective technologies for pollution prevention and control.

Aside from the above projects, the Department of Science and Technology (DOST) also undertook the following projects related to IEM:

- The *Wastewater Treatment and Technology Transfer and Cleaner Production* project funded by the Australian Agency for International Development through the ASEAN-Australian Economic Cooperation Program (AAECP III) and

implemented by Overseas Project Corporation of Victoria. The primary goal of this project is to foster environmentally sustainable development in the ASEAN region through the implementation of cleaner production technology and improved wastewater treatment in the industry sectors of textiles, food processing and distilling. The Philippines will have two demonstration plants, one on wastewater treatment technology for textile industry and another one on cleaner production technology for food industry.

- *Environment and Compatible Type Water Resource Effective Utilization System*, project funded by the New Energy and Industrial Technology Development Organization (NEDO), Japan and implemented by Water Re-use and Promotion Center (WRPC), Japan. This project aims to study the application of wastewater treatment systems (anaerobic and aerobic) and water recycling technologies to different type of industries. The project is now setting up the one pilot wastewater demonstration facility at a paper manufacturing facility.
- *Small and Medium Scale Industries (SMIs) in Asia: Energy, Environment and Climate Interrelations* project under the Asian Regional Research Project on Energy, Environment and Climate Program funded by Swedish International Development Agency, and implemented by the Asian Institute of Technology in Thailand. The project is expected to provide information on energy consumption and pollution of the processes, research priorities for energy use and pollution mitigation and national policy guidelines for promotion of environmentally sound technologies and processes with linkages to the on going activities on greenhouse gas emission and Kyoto Protocol. In the Philippines, the target beneficiaries are the ceramic/brick making and desiccated coconut industries.
- *Resource Recovery and Waste Utilization*, project funded by the United States – Asia Environmental Partnership Program (US-AEP) and administered by the US Council of State Governments through Clean Washington Center in Seattle Washington, USA. The aim of this project is to provide free technical and consulting assistance to Philippine firms and municipalities in turning waste into profits.
- *Enhancement of Environmental Technology Assessment System (ETAS) Capabilities of the Environmental Division (EnD) of the Industrial Technology Development Institute* project funded by US-AEP through Clean Technology and Environmental Management (CTEM). DOST staff attended an in-house training at the Civil Engineering Research Foundation of the American Society of Civil Engineer on technology verification. Likewise, DOST, in consultation with the possible stakeholders (from government agencies, private sectors, academe and non-government organization), developed the environmental technology verification program governing principles, operating policies, technical protocols and application form.

CHAPTER 2

IMPLEMENTATION OF INDUSTRIAL ENVIRONMENTAL MANAGEMENT AT SURVEYED COMPANIES

Initially, a total of 60 companies were identified as potential participants to the survey of recipients of previous IEM foreign-assisted projects. However, 12 of these companies had since ceased operations. Another company was not operating during the survey period. Others could not be located because their contact addresses and persons are no longer available. Still there are those who opted not to cooperate in the survey. For those who refused to cooperate, the assumption was that these companies did not realize benefits of previous IEM projects. Eventually, 30 companies were surveyed in the Luzon (20) and Cebu (10) islands.

Chapter 1 presented the previous IEM projects. However, not all of these projects had participants to the survey. Only the IEMP and ASEAN-EIP of USAID, MEIP of World Bank, ECOP/ILO CP Project and AusAID's AAACP III project beneficiaries were included in the survey.

Public version reports of pollution management appraisals (PMAs) of IEMP participating respondents were secured from EMB/DENR and Tetra Tech-Environmental Management, Incorporated (TT-EMI). TT-EMI was the prime contractor of IEMP. MEIP and ASEAN-EIP reports were not available from EMB/DENR as reports were submitted directly to beneficiary companies. The Study Team had to rely with either the files of the respondents, which unfortunately were no longer available, or with local consultants hired by MEI and ASEAN-EIP. This was the same case as in the ECOP/ILO CP Project. The AAACP III reports were available from the Integrated Program on CP Technologies (IPCT) of the Department of Science and Technology (DOST). The Study Team had the consent of the AAACP III beneficiaries to use these reports.

2.1 OVERVIEW OF SURVEY RESULTS

The survey of the 30 companies focused on IEM measures taken prior to the previous projects, adoption of measures recommended by the previous projects and actions taken after the previous projects. The survey also looked into future plans of the respondents on issues like energy conservation, water conservation, effluent control, emission control, non-hazardous industrial solid waste management, hazardous waste management, management of chemicals, noise and vibration, and offensive odors.

2.1.1 IEM Measures Taken before the Previous Projects

Fifty (50) per cent (%) of the respondents implemented end-of-pipe measures as part of the IEM activities prior to the previous projects. Of this total, 12 companies constructed wastewater treatment plants while 3 invested in air pollution control devices.

An electroplating/metal finishing shop had intensive capital investments in clean technologies. It installed spray rinse and overhead hoists in their decorative chromium plating line. A dyeing company started their operations using dyeing equipment that used less water than conventional ones.

Only two companies surveyed did not implement any IEM measure prior to the previous projects.

2.1.2 IEM Measures Proposed by the Previous Projects

Most of the respondents implemented low cost/low risk measures because most of the previous projects recommended only such measures. One reason for this is probably because IEMP hired consultants who were more of generalist rather than specialists in the respective industry fields. MEIP and AAECF III projects, however, provided experts not only in environmental management but also experts in appropriate processes.

AAECF III participating companies had capital-intensive investments. However, AAECF III provided the cost of equipment for wastewater treatment while the local companies shouldered civil works related costs.

Other four companies also implemented capital-intensive measures and financed these through their own means.

2.1.3 IEM Measures Taken after the Previous Projects

Two companies did not mention any IEM measure taken after the previous projects. Both companies cited economic difficulties as the reason for this. One, in particular, is contemplating on ceasing operations upon the retirement of its general manager.

Like the IEM measures taken prior to the previous projects, 15 respondents identified end-of-pipe investments as their activities after the projects. This included investments for new waste treatment systems, replacement of old waste treatment facilities and/or upgrading of existing air pollution control or wastewater treatment plants.

One company secured an environmental compliance certificate as part of its IEM measures after the previous project.

Five companies had capital-intensive investments on clean technologies.

2.1.4 Environmental Management System

Seven (7) companies established an environmental management system within their structure. However, only 3 of these are ISO 14001 certified. These companies are in the cement manufacturers. Both cement plants are affiliates of a multinational company. Aside from the cement plants, one company is also ISO 14001 certified.

2.1.5 Future Plans

Two companies did not mention any future plans related to IEM. Another one company also did not respond to questions on future plans.

Ten (10) respondents still have plans of further upgrading or installing additional waste treatment systems to comply with existing and new environmental regulations.

Nine (9) companies plan on instituting energy conservation and efficiency programs through fuel substitution and use of higher efficiency pumps and motors.

2.2 INDIVIDUAL RESULTS OF THE 30 COMPANIES

2.2.1 Beverage Industry A

I. PLANT BACKGROUND

Beverage Industry A is a producer of fruit purees, juices, green peas, and chickpeas (also called garbanzos). The company is family owned. Among the fruits that Beverage Industry A processes include mangoes, sour sap, kalamansi (a local lemon variety), guava, papaya, and purple yam. As such the activities at the site are broken up into three (3) production lines: Fruit puree production; fruit juice canning line; and peas canning line. Its operations are very seasonal, depending on the particular fruit available in season. However, Beverage Industry A produces juice from fruit or puree all year round.

The factory typically operates for one extended shift, seven days a week, although this varies as necessary, especially during peak periods. Cleaning of equipment occurs at the end of the each production day. Unfortunately, the factory is prone to flooding during heavy monsoon rains, mainly from runoff from the road. This can lead to flooding of the processing areas, however, the wastewater treatment plant is elevated above the highest historical flood level.

Beverage Industry A participated in the World Bank Metropolitan Environmental Management Project (MEIP) in 1994 and the Australian Agency for International Development (AusAID) Wastewater Treatment Technology Transfer and Cleaner Production (W2T3CP) Demonstration Project from 1996 to 2000.

II. PROCESS DESCRIPTION

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices, at Beverage Industry A.

Input	Process/ Operation	Output	Current Waste Management Practice
	Fruit Storage	Rejects	
Water	Washing	Wastewater	To wastewater treatment plant (WTP)
	Pulping	Seeds, peels	Hauled by 3 rd
Water, sugar	Blending	Spillages	To WTP
Cans	Filling	Spillages	To WTP
Steam	Pasteurization	Condensate	Return to boiler
Water	Cooling	Water	To cooling tower

III. IEM MEASURES

Listed below are IEM measures undertaken by beverage industry A prior to, during and after the MEIP and W2T3CP Projects.

Prior to Previous Project(s)

Measures	Benefits	Costs/Inputs	Motives for Implementation	Remarks
Construction of WTP	Treatment of wastewaters prior to discharge	N.A.	Compliance to pollution control law	WTP was inadequate to meet effluent standards

Proposed by Previous Project(s)

Measure	Benefits	Remarks
<i>World Bank MEIP</i>		
Conversion of solid waste to vinegar	-	Not implemented due to financial viability
Convert from 3-stage washing to countercurrent washing	Reduced water consumption	
Recovery condensate and feed to boiler	Fuel savings	
Use of low volume high pressure water hose	Reduced water consumption	
Utilize clean-in-place (CIP) water as wash water	Reduced water consumption	Implemented with modification; CIP water used as make-up water for cooling tower
<i>AusAID (W2T3CP) Demonstration Project</i>		
Process optimization	Reduced BOD load	This option was combined with preventive maintenance and adjustments of equipment operating parameters
WTP modification	Final effluent BOD = 20 mg/L	AusAID provided cost to buy filter; beverage industry A funded civil works

Measures Taken After the Previous Project(s)

Measures	Benefits	Motives for Implementation
Improve storage facilities	Reduced fruit spoilage	High costs of fruits
Shift from manual washing to mechanical washing	Reduced water consumption	High pollution load from particular fruit; high water consumption

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Beverage Industry A cited the following benefits of practicing IEM:

- Increased productivity
- Reduced operating costs
- Reduced waste treatment and disposal costs
- Improved worker health and safety

Driving forces for implementing IEM at Beverage Industry A includes the following:

- Top management commitment
- Strong motivation on the part of operating personnel
- Technologies are simple and easy to implement
- Immediate realization of benefits
- Waste assessment by trained and unbiased personnel to identify waste sources and waste minimization options

Beverage Industry A's top management participated in the IEM projects because the general manager viewed that implementing IEM, particularly cleaner production can help reduce his operating costs and waste treatment and disposal costs. Aside from this reason, the general manager saw that the technical and financial assistance that was being extended to him through the AusAID project would be beneficial to Beverage Industry A. The project staff (both local and Australian) involved in the AusAID project demonstrated that they had the skill to conduct an independent and knowledgeable assessment of Beverage Industry A's operations. Local counterparts

for the AusAID project were project staff of the Integrated Program on Cleaner Production Technologies (IPCT) of the Department of Science and Technology (DOST). The financial assistance (AusAID provided for the purchase of a rotary filter for the wastewater treatment plant of Beverage Industry A) helped the company defray some expenses for their operations. Note, however, that Beverage Industry A still provided for civil works at the wastewater treatment plant and costs for maintenance of their equipment to complement the technical and financial assistance of AusAID.

➤ Restraints:

- Technical – effect on product quality
- Conceptual/institutional – resistance to change

V. FUTURE PLANS

Beverage Industry A is currently negotiating with the Water Re-Use and Promotion Center (WRPC) of Japan for the installation of an upflow anaerobic sludge blanket (UASB) to treat highly polluted wastes. At the same time, the UASB can be a source of methane or biogas.

VI. CONCLUSION/EVALUATION SUMMARY

Even without a formal environmental management system (EMS), Beverage Industry A has demonstrated that through IEM, particularly cleaner production, a company can not only comply with environmental regulations but also improve its competitiveness.

The commitment of the General Manager is best demonstrated by the existence of programs and facilities at Beverage Industry A to address IEM issues. Beverage industry A made full use of the assessments of the previous projects. Among the reasons that the General Manager cited as factors that influenced his decision to pursue IEM were the study tours to observe actual situations of production and environmental management interface and the expertise of unbiased assessment of his facility.

2.2.2 Beverage Industry B

I. PLANT BACKGROUND

Beverage Industry B is a principal producer of carbonated bottled beverages and was established in 1974 at initial capital valued at P40 million and a workforce of just about 70 personnel. Today, the plant employs around 200 workers and has likewise grown in production capacity to 12.2 million cases (at P160/case).

Last year's sales output was placed at around P2 Billion. Unlike most other businesses, Beverage industry B has been getting reasonable returns through adoption of continuous improvement and cost reduction programs.

Carbonated beverages production involves the following operations: depalletizing of bottles, uncasing, bottle washing, filling, coding, and packing operations.

Beverage Industry B volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1994. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Waste Management Practices
➤ Sales agent/dealers	Depalletizing, uncasing of bottles	➤ Trash ➤ Empty pallets ➤ Empty cases/shells ➤ Bottles	➤ Municipal dumpsite ➤ Reuse ➤ Reuse ➤ To washing
➤ Bottles ➤ NaOH ➤ Water	Bottle washing	➤ Wash water	➤ WTP (neutralization, aeration)
	Bottle inspection	➤ Rejects ➤ Broken bottles	➤ Return to washing ➤ Sold/return to supplier as cullets
➤ From carbo cooler (Liq. CO2, Syrup, Water) ➤ Crowns	Filling	➤ Off specs ➤ Seepage/floor spills	➤ WTP ➤ Minimal - goes with floor washing to WTP
➤ Cases, pallets (empty)	Case packing and palletizing		
	Market distribution		

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Implementation Costs	Remarks
1. Reuse of effluent for vehicle washing	• Reduced water use	None	From 1992 to 2002 (vehicle contract was changed in 2002)
2. Reuse of final rinses for prewashing bottles	• Reduced water use/wastewater generation	ND	On-going
3. Ammonia refrigeration cooling water recovered as make-up for evaporative condenser	• Reduced water use	ND	Still on going
4. Recovery and treatment of wash water (with caustic soda) from bottle washing for use in pre-rinse.	• Reduced water use/chemical use/waste generation	ND	Treatment: anthracite filter, carbon purifier, ion exchange). Ended 1997
5. Reuse rinsing water from dispensers/fountains for toilet flush	• Reduce water use /wastewater generation	N.	Still on-going

IEM Measures Proposed by IEMP

Measures	Benefits	Implementation Costs	Remarks
1. Various housekeeping practices (in addition to existing)	• Water use/ waste reduction	-	-
2. Improved lubrication of conveyor liner (presently	• Cut chemical use/waste	ND	Eliminated conveyor lubricant (CIP

Measures	Benefits	Implementation Costs	Remarks
using soap as lubricant)	generation		adopted)
3. Installation of shut off valves to control rinsing water	• Reduced water use/wastewater generation	ND	Installed instead pneumatic system
4. Segregation of waste water generated from filling with those from other areas	• Reduced waste water/WTP load	ND	Modified washer design (rotary type)
5. Reuse of overnight wash water for preparation of NaOH and chlorine solutions	• Reduced waste water/WTP load	ND	Adopted CIP process

IEM Measures Taken after IEMP

Measures	Benefits	Costs	Remarks
1. Collection of rinse water to a cistern for raw water make up	• Reduced water use	Minimal	To start shortly within 2003
2. Employ dry cleaning in all areas	-do-	None	Started 2001
3. Modify backwash procedure for filters, softeners based on turbidity and no longer on pre-set time	-do-	-do-	Started 2001
4. Reduce final rinse time at final washing	-do-	-do-	Started 2002
5. Reduced UF back washing frequency from every 45 minutes to every 4 hours.	-do-	-do-	Started 2002
6. Replacement of oversized rinser nozzles	-do-	P12T	Started 2002
7. Reduction of final rinse pressure from 40 to 20 psi	-do-	None	Started 2000

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

Among the benefits gained by Beverage Industry B from implementing waste minimization, IEM, and related productivity improvement programs include the following:

- Reduced operating costs
- Improved productivity
- Improved corporate image
- Reduced waste treatment/disposal costs

Driving factors:

- Management commitment/directive
- A strongly motivated workforce
- Benefits can readily be realized
- Easy to implement IEM programs

Owned by the country's big food conglomerate, top management of Beverage Industry B (plant level) has always been one of the prime advocates of environmental

stewardship and quality/productivity improvement programs. It has the tradition of holding annual national inter-plant competitions for environmental and related productivity programs, where the best performers are rewarded and sent to compete internationally. Top management commitment is the main driver in pursuing IEM and other programs at Beverage Industry B.

The plant has its own environmental management system (though not ISO certified) in place. This is in response to a corporate (headquarters) directive.

The highly motivated workforce of the plant also enables management to reap full benefits of the implemented programs. Beverage Industry B recognizes the contributions of its workers and is considered a good employer resulting to have a highly motivated workforce.

Beverage Industry B is also driven into pursuing low cost, easy to do and readily realizable IEM measures.

- Restraints:
 - Financial
 - Economic

There seems to be no major barriers in pursuing IEM measures at Beverage Industry B, although the plant manager considered financial and economic (with respect to present market demand) as minor barriers.

V. FUTURE PLANS

- Energy conservation – Reduction of base load: Plans to procure smaller equipment/ motors to run during low periods.
- Water conservation – Target water use of 3 Liter/Liter of beverage
- Emissions –Meeting Clean Air Act – High S in fuel: Plans to mix diesel and bunker oil or use of special fuel oil (SFO) to meet emission standards.
- Noise – Exceeds 85 dBA level of noise in the bottling area: Be stricter in enforcing safety rules (use of PPE)

VI. CONCLUSIONS/EVALUATION SUMMARY

IEM and related productivity program implementation at Beverage Industry B can be classified with reasonable level of success as shown in this evaluation/survey. They even implemented most of the IEMP suggested options with modifications. In addition, they also have done more before and after IEMP launched the project. Factors that greatly influenced the company's efforts to institute IEM programs on their own are:

- Strong management support and
- High level of worker motivation with technical expertise

2.2.3 Cement Manufacture A

I. PLANT BACKGROUND

Cement Manufacture A is one of the oldest cement manufacturers in the country. It started its business in the 1930s and has likewise undergone several management turn-overs. In 1995 during the IEMP project, it was operated by the A group and in 1999 the B group handled over management the business.

At as of last year, Cement Manufacture A employed some 160 regular workers and 300 contractual workers. Production was placed at 800 tons clinker/day (at about P70 per 40-kg bag). Sales were estimated at P500 million.

Cement manufacturing at Cement Manufacture A involves the following operations: primary crushing, calcining, clinker cooling, mixing with gypsum, fine milling (ball mills), and bagging.

The company volunteered in a waste minimization project of IEMP (Industrial Environmental Management Project) in 1995. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now TetraTech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Waste Management Practices
	<i>Dry process (line 2)</i>		
➤ Limestone from quarry	Crushing	➤ Dust/fines	➤ Collected/dumpsite
➤ Hot gas from furnace	Calcining (clinker formation) (rotary kiln)	➤ Used lining contains Cr	➤ Accumulated ➤ Electrostatic Precipitator
➤ Air	Clinker cooling	➤ Fines	➤ EP
➤ Gypsum	Mixing with gypsum		
	Fine milling (ball mill)	➤ Fines	➤ EP
➤ Bags/sacks	Bagging	➤ Rejected bags	➤ Sold
	<i>Wet process (line 1)</i>		
➤ Limestone	Crushing	➤ Dust/fines	➤ Collected/dumpsite
➤ Water	Slurry tank (mixer)	➤ Spills (minor)	➤ WTP (lagoon)
	Raw mills		
➤ Hot furnace gas	Clinker formation	➤ Fines	➤ EP
➤ Gypsum	Gypsum addition		
	Fine milling	➤ Fines	➤ EP
➤ Bags/sacks	Bagging	➤ Damaged bags	

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Cost	Remarks
1. Installation of cyclones and wet scrubbers for dust emissions control	<ul style="list-style-type: none"> Improved product quality Reduced rejection 	High cost/ND	Upgraded when plant was rehabilitated 1996
2. Establishment of community relations affairs	<ul style="list-style-type: none"> Regulatory requirement (Mining Law) 	ND	Continuing
3. Tree planting along perimeter fence	<ul style="list-style-type: none"> Dust control 	Minimal	Still being maintained

IEM Measures Proposed by IEMP

Measures	Benefits	Costs	Remarks
1. Operate only the primary crusher when there only are large boulders accumulated cement. (e.g. once per week)	<ul style="list-style-type: none"> Reduced energy Reduced operating cost 	ND	Still on-going
2. Improvement in dust emissions control	<ul style="list-style-type: none"> Regulatory compliance 	Very high	Modified by installing 6 units electrostatic precipitators
3. Water recycling	<ul style="list-style-type: none"> Reduced water use 	ND	Still continuing

IEM Measures Taken after IEMP

Measures	Benefits	Costs	Remarks
1. Installation of 6 units diesel generators (11 MW total). Only 4 are working on normal operations.	<ul style="list-style-type: none"> Energy savings Reduced operation costs 	High cost – ND	Done 1997
2. Sponsorship for coastal marine sanctuary, tree planting off-site	<ul style="list-style-type: none"> Corporate image/commitment 	ND	Still on-going
3. Installation of cooling tower for cooling water recycling	<ul style="list-style-type: none"> Water use reduction 	ND – High cost	Continuing
4. Collecting rainwater for irrigation	<ul style="list-style-type: none"> Reduced water use 	Minimal	On-going
5. Rehabilitation of the wet process line to dry process and installation of a dry process (line 2)	<ul style="list-style-type: none"> Expansion/Improved productivity Reduced emissions 	High cost – ND	Accomplished 1997
6. Adoption of electronic system to eliminate use of paper for administrative work	<ul style="list-style-type: none"> Material/cost savings Waste reduction 	Minimal	On-going
7. Certified to ISO 9001 in 2000	<ul style="list-style-type: none"> Quality/improvement 	ND	Continuing
8. Certified to ISO 14001 in 2002	<ul style="list-style-type: none"> Improved overall environmental performance/image 	ND	Continuing

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Benefits gained include:

- Increased productivity
- Improved public health/worker safety and corporate image
- Reduced waste treatment/disposal costs
- Reduced operating costs

Driving factors:

- Management commitment/directive
- IEM measures are easy to adopt and benefits can readily be realized
- Immediate realization of benefits

Until the nineties, Cement Manufacture A still used the wet process in cement processing. It had been a contributor of air pollution problems in the southern part of Cebu. Business during the time was bad which triggered a sell-out of the company to a series of 2 turnovers, one after the other. The new owner downscaled the inefficient wet cement line and invested to install a much bigger and more efficient dry cement line equipped with complete air pollution control facilities. The new owners belong to a multi-national corporation with various industrial interests worldwide. With the commitment of new top management for environmental advocacy, Cement Manufacture A had since been vigorously implementing good environmental practice in its operations. In fact in 2002 it acquired an ISO 14001 certificate.

The competition and pressure of the industry to get certified to ISO 14001 also had a big influence on Cement Manufacture A's pursuing IEM.

The company is driven or interested to institute IEM measures which are low cost/easy to do and where benefits can be readily realized.

Restraints:

- Organizational issues (work overload of employees as a result of continuous streamlining operations by new management)

On the other hand, Cement Manufacture A's reduced workforce as a consequence of labor reduction program (for cost-cutting measures) and seemingly increasing number of contractual or part-time workers appear to be a deterring factor in pursuing further IEM and related productivity improvement programs.

V. FUTURE PLANS

- Energy conservation - Shift to diesel from bunker fuel for power generators
- Water conservation - Reuse of effluent from lagoon for irrigation/dust control along roads and passageways during dry season.
- Emissions control - Meeting Clean Air Act emissions standards
- Hazardous wastes - Final disposal of spend kiln lining/insulation (chromite bricks) for construction of pavements/hollow blocks, etc. Presently these are accumulated on-site

VI. CONCLUSIONS/EVALUATION SUMMARY

Cement Manufacture A has shown remarkable level of success in its IEM implementation. It has gone beyond simple waste reduction programs to in fact getting certified to ISO 14001.

The major factor that has contributed to its performance in IEM may be top management/corporate commitment towards environmental programs.

2.2.4 Cement Manufacture B

I. PLANT BACKGROUND

Cement Manufacture B produces 3,200 tons of clinker per day by dry process and employs 175 personnel.

When the company was established in 1964, it had wet-type cement kilns and employed over 1,000 people. The facility added a dry process in 1992 and eventually ceased the operations of its wet process in 1999.

Cement Manufacture B participated in the United States Agency for International Development (USAID) project entitled ASEAN-Environmental Improvement Project (EIP) in 1993.

II. PROCESS DESCRIPTION

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices, at Cement Manufacture B.

Input	Process/Operation	Output	Current Waste Management Practice
Limestone	Crushing	Dust	Cyclone dust collector, bag house filter, electrostatic dust precipitator (EP)
Silica	Raw grinding	Dust	
Coal	Pre-heating	Air emission	
Coal	Burning	Air emission	
Gypsum	Finish grinding	Dust	
	Packaging	Dust	

III. IEM MEASURES

Listed below are IEM measures undertaken by Cement Manufacture B prior to, during and after the EIP Project.

Prior to Previous Project(s)

Measures	Benefits	Costs/Inputs	Motives for Implementation
Installation of EP	Reduced particulate matter emission	N.A,	Compliance to air pollution control laws

Proposed by Previous Project(s)

Measure	Benefits	Remarks
Dust recovery system for wet process	Recovery of dust	Wet process no longer operational
Installation of vertical raw mill	Energy efficiency	

Measures Taken After the Previous Project(s)

Measure	Benefits	Motives for Implementation
ISO 14001 and 9002 certification	Competitiveness	Competitiveness
Installation of the following equipment (worth ₱ 52 million): <ul style="list-style-type: none"> ▪ Oil-water separator ▪ Additional dust collectors ▪ Capacitors ▪ Fire protection equipment ▪ Vehicle emission testing 	Compliance to environmental and ISO standards:	Particularly for oil-water separator, Solid Cement paid ₱ 150,000 as damage to farmers for their oil spill
Burner design change	Reduce NO _x emission	Compliance

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Cement Manufacture B cited the following benefits of practicing IEM:

- Increased productivity
- Reduced operating costs
- Reduced waste treatment and disposal costs
- Reduced risk of liability
- Improved public health and environmental benefits
- Improved worker health and safety
- Improved corporate image and competitiveness

Driving forces for implementing IEM at Cement Manufacture B include the following:

- Top management commitment
- Strong motivation on the part of operating personnel
- Waste assessment by trained and unbiased personnel to identify waste sources and waste minimization options

Cement Manufacture B participated in the ASEAN-EIP project through one of their vice-presidents who was very active in environmental issues during the PHINMA time. Currently, Cement Manufacture B still pursues IEM because of pressure from their mother company (CEMEX). The company also had to contend with complaints from farmers within their area. The farmers complained about oil spill from Cement Manufacture B to their farmlands. As part of settlement, Cement Manufacture B compensated the farmers to the amount of ₱150,000. The current environment, health and safety coordinator of Cement Manufacture B views that prevention (of accidents and pollution) can make his job easier, thus he orients even contractors on their IEM and safety measures.

On the other hand, restraining forces for Cement Manufacture B for pursuing IEM are as follows:

- Financial
- Conceptual/institutional – resistance to change; however, staff later realized the benefits of IEM

V. FUTURE PLANS

Cement Manufacture B is currently discussing with ITDI/DOST, through the Integrated Program on CP Technologies, the use of alternative fuels/raw materials (AFR) for its operations. Cement Manufacture B identified both the technical and financial viability of AFR as a challenge to pursuing this plan. AFR can lead to energy conservation and efficiency in Cement Manufacture B's operations.

Cement Manufacture B is poised to launch its safety program as part of their efforts to attain OSHAS 18000 certification.

VI. CONCLUSION/EVALUATION SUMMARY

Cement Manufacture B had demonstrated its commitment to its environmental policy through the existence of programs and facilities at their plant to address IEM issues. Emission from its smoke stack is very different from smoke stacks of cement plants in the early 1990s wherein particulate matter is very visible.

2.2.5 Chemical Products Manufacturer A

I. BACKGROUND

Chemical Products Manufacturer A is a secondary lead smelting and refining company that utilizes scrap automotive and industrial lead-acid batteries to produce highly pure lead for the subsequent manufacture of new batteries.

The plant has a capacity to produce a maximum of 3,000 metric tons of refined lead per month but has a current average production of 2,700 metric tons. It used to import 75% of its feedstock before the Basel Convention took effect in 1995. Since then it has strengthened its infrastructure for its local sourcing raw material but has always been insufficient due to Philippines' export of batteries.

It currently employs a total workforce of 227 that rotates in its 3-shifts per day, seven days a week operation. There are 147 full-time and 80 part-time employees.

Scrap batteries are received and temporarily stored in an open yard within the facility prior to processing. These then undergo a breaking process wherein the different material components of batteries get separated. The lead-bearing materials recovered from this initial processing stage are fed to their furnaces where most of the impurities are removed. The crude bullion that comes out of this process is further purified during the refining process where alloying agents are added to produce the desired lead product. The refined molten lead are then casted to produce 25 kg ingots as their final product which they supply to a sister company, Ramcar Philippines, manufacturer of automotive batteries for local and foreign markets.

Chemical Products Manufacturer A is an ISO 14001-certified company since 1999. The adoption of an EMS in 1996 helped the company address ever tightening environmental regulations and created for them an image of a socially responsible company which they are. Even before the company adopted an EMS, Chemical Products Manufacturer A has been upholding their commitment to an environmentally safe operation as explicitly expressed in their environmental mission statement. To quote, "To actively pursue the preservation of the environment by

promoting the recycling of scrap automotive batteries, in an environmentally acceptable manner, as a viable and environmentally-friendly alternative to the use of primary materials.” Chemical Products Manufacturer A is the only secondary lead smelting company certified to ISO 14001 in the whole of Asia and among the four throughout the world.

II. PROCESS DESCRIPTION

Receiving/Storage

Scrap batteries received at the facility are temporarily stored in an open yard before processing. The plant receives a monthly average of 4,300 metric tons of scrap batteries around 40% of which come from local sources. Broken wooden pallets, expanded polystyrene (styropore) and soiled plastic wrap are the wastes produced from this process step. They currently utilize the wooden pallets as fuel for their blast furnace while the plastic wrap and styropore await takers. To eliminate the styropore waste, they ordered their suppliers to stop using it totally.

Breaking

Scrap batteries initially undergo a crushing/grinding process in a battery breaking equipment where material components of batteries get classified and separated. Here, lead-bearing components (grids/paste) get separated from non lead-bearing ones (plastic separators/ebonite chips/casings) through a media separation process. A typical battery is generally composed of 87% scrap plates, 4% hard rubber (ebonite), 6% plastic (PP/PE/PVC), and 3% spent acid. The acid content of batteries mixes with the water that serves as the separating medium. A step to convert lead sulfates to lead carbonates termed as desulphurization has been integrated in this process to avoid the production of SO₂ during smelting. After this process, the lead-bearing materials are fed to their furnaces (blast furnace and reverberatory furnace) for smelting.

Wastes from this step are the wastewater, ebonite chips, plastic casings and the plastic separators. Wastewater is being treated onsite and final effluent released to the nearby river. Plastic casings are recycled by their sister company. while the plastic separators (PE/PVC) and ebonites (3% rubber, 97% carbon) are stored on-site. An option being studied is the use of the ebonites as fuel additive to their furnace. They are also considering contracting the final disposal of ebonites to a cement manufacturing company that will feed it to their kilns. The plastic separators are being offered to interested buyers.

Smelting

The lead-bearing materials from the battery breaking and desulphurization processes are fed to their reverberatory and blast furnaces. The reverberatory furnace operates in an oxidizing atmosphere where unwanted elements are removed to produce molten lead with low antimony content (soft lead). The blast furnace on the other hand has a reducing atmosphere where metallurgical coke and fluxing agents are fed together with the lead-bearing feed materials. Product coming out of the blast furnace is a molten lead with high antimony content (hard lead).

Smelting produces gas emissions but are kept within the system as they are fed back to the furnaces. The particulate matters that go with the flue gases are removed by the 15,000 cfm baghouses while fugitive emissions are captured by a non-metallurgical baghouse. The final slag that comes out of the blast furnace is stored in a storage pit

within the facility that allows leachate and drainage water to go to the wastewater treatment plant. Options that have been studied for the final treatment of the slag include: 1) recovery of metal through leaching; 2) encapsulation; and, 3) reprocessing to render the metals non-leachable. The sludge from the wastewater treatment plant is fed to the furnace again.

Refining

The crude bullion coming from the furnaces are refined in 60 and 90 metric ton kettles. In this final process, impurities are removed by the addition of alloying agents to produce the final lead product with the desired purity.

By-product produced during the refining process is the lead dross which is the impurities that adhere to the surface of the refining kettles. The lead dross is fed back to the blast furnace to further recover the lead.

Casting

The molten lead from the refining process is pumped into automatic casting machines and molded into 25 kg ingots which are then labeled for easy identification.

Input	Process	Output	Current Waste Management Practice
Packed Scrap Batteries	Receiving / Temporary Storage	1) Scrap Batteries 2) Waste: Styropore, broken wooden pallets, plastic wraps	- Styropores are stored on site - Broken wooden pallets are fed to the furnaces as fuel - Plastic wraps are stored on site
Unpacked Scrap Batteries	Breaking	1) Lead-bearing components 2) Non-lead bearing components (casings, separators, ebonites) 3) Wastewater	- Plastic casings are recycled by sister company - Plastic separators (PE/PVC) are stored on site - Ebonites (carbon/rubber) are also stored on site - Wastewater is treated on site
Lead-bearing components (Grids/paste/flue dusts/slag)	Smelting	1) Molten lead (hard and soft) 2) Particulates 3) Flue gases 4) Final slag	- Particulates are captured by baghouses and fed back to the furnaces - Flue gases are also fed back to the furnaces - Final slag is temporarily stored in a landfill on site
Molten Lead	Refining	1) Pure lead/ lead alloys 2) Lead Dross	- Lead dross is fed back to the furnace
Refined Molten Lead	Casting	1) 25 kg Ingots	

III. IEM MEASURES

Prior to IEMP

Even before the company's participation to USAID's Industrial Environmental Management Program (IEMP) in 1994, Chemical Products Manufacturer A has always been keen about improving productivity performance through application of new innovations. They have started to conduct research and development activities beginning in 1993 that included studies on cleaner technology options. Chemical Products Manufacturer A has started implementing a waste minimization program

even before a Pollution Management Appraisal (PMA) was conducted through their Total Quality Commitment Program (TQC). Quality circles worked with the R & D staff and management to adopt options to recycle and minimize waste to improve productivity and protect the environment at the same time.

During IEMP

The options recommended by IEMP intended to improve and strengthen what PRI management has started. The following table summarizes the options and indicates the action taken by the company.

NO.	WASTE MINIMIZATION OPTION	EXPECTED IMPACT	ACTION BY THE COMPANY	ACTUAL DERIVED INCURRES	BENEFITS AND COST
S-1	Establish a monitoring Program for tracking material use and waste generation	Enhance process efficiency Help track costs and implement savings	Existing program was enhanced	Helped track production cost and derived savings. Improved Process efficiency. Problem areas on excessive material use and waste generation were highlighted thus countermeasures were implemented. Waste minimization options were evaluated for effectiveness through data provided by the monitoring program	
S-2	Institute procedure on proper storage and handling of raw material inputs by designating specific areas for specific raw materials and sorting.	Maximize the use of the area Enhance efficiency of material handling Improve working condition	Implemented	All the expected benefits were realized. Projected to be a no cost option, this actually incurred a major cost to the company due the construction of a warehouse.	
S-3	Secure open storage of temporarily generated flue dust by installing a roof and enclosing all sides with walls.	Reduce material losses at the storage by 10% Prevent material losses since it still contains significant amount of lead Prevent leaching out of lead to groundwater and suraface water due to run off Protect community worker's health	Implemented	Increased material recovery by 5%. Generated additional income.	
H-1	Change working clothes before leaving the facility	Prevent occupational illness Reduce lead contamination and	This was already practiced by the company even before. They even provide a		

NO.	WASTE MINIMIZATION OPTION	EXPECTED IMPACT	ACTION BY THE COMPANY	ACTUAL DERIVED INCURRES	BENEFITS AND COST
		acumulation in the body Improve worker's safety	laundry service inside the facility.		
T-1	Institute an employee awareness campaign to instill the importance of waste minimization and improved process controls by posting company's environmental policy, waste minimization goals and training.	Enhance employee morale and awareness on environmental policy Solicit employee participation in waste minimization program Improve quality of the product	Implemented		All the expected benefits were realized. This become a major cost for the company due to the consultants hired and employee time spent on the training.
T-2	Institute a training program to promote occupational health and safety in the workplace	Prevent occupational illness and workplace accidents occurring. Improve worker's safety	Has been implemented even before this program.		

Legend: S-source T-training

After IEMP

IEMP noted Chemical Products Manufacturer A's strong research and development unit wherein various research projects prior to the conduct of on-site PMA were identified. All these projects that they intended to implement then all uphold waste minimization concepts and are sufficient to improve the facility's waste management system. These are capital-intensive options that are now all in place in the facility. These are:

- Scrap Battery Reclamation and Classification System. This fully-automated system segregated the various material components of scrap batteries. This was able to free around fifty workers who used to do this operation manually. The only manual part in this process step is the initial loading of the batteries to the conveyor.
- Desulphurization System. This is the step where the lead sulfate in the material will be converted to lead carbonate. This eliminates the sulfur dioxide emissions during the smelting operation.
- Expanded Neutralization System. This treats all effluent coming from the filter presses, scrap battery reclamation and classification system and the desulphurization system. Unlike the neutralization system that was operated in conjunction with the battery cutting machines, the effluent treated is basic. Sulfuric acid is added to the desired range of 6.5 to 7.5.
- Agglomerating Furnace. This improved the handling and feeding of the flue dusts

to the furnace since the flue dusts will now be melted into a slag form that can be easily charged into the furnace.

- Development of an Environmental Monitoring Program. A very good program is in place as an important component of their EMS.

Motivations:

The company, as its corporate vision and mission states, believes that it is morally responsible for the well being of its employees and the larger community to which it belongs. It has always taken environmental performance very seriously as proven by their heavy investments on pollution control equipment and environmental protection systems. As proof to external parties, they even implemented an environmental management system (EMS) that is certified to ISO 14001 to show that they want to fully comply with the stringent regulations of the DENR.

IV. DRIVING AND RESTRAINING FORCES

Driving Forces: (first being the strongest)

- *Has a strong sense of social responsibility.* Dealing with a product that poses both as a health and environmental hazard, the company makes it a priority to look after the welfare of its workers and the community where it is a part of through a sound health, safety and environmental management program. As a result, workers feel protected thus become more motivated in their work.
- *Willingness to fully comply with the legal requirements.* As a proof of its corporate social responsibility, Chemical Products Manufacturer A established an ISO 14001 certified-EMS that also allows them to fully comply with all the regulatory requirements. This eliminated problems with external parties who were previously raising concerns about the environmental-soundness and safety of their operations.
- *Desire to improve productivity.* To cite an example, in their automation of the material segregation step, fifty workers had been freed from directly handling batteries, a rather hazardous process, while at the same time efficiency was also greatly improved. It is rather clear that managing environmental issues result to productivity improvements as well.
- *Desire to reduce cost due to efficient use of resources.* Initial environmental programs of Chemical Products Manufacturer A involved tracking of material flow thus process innovations primarily dealt with resource use optimization. In their aim to reduce wastes and emissions, raw material to product conversion was greatly improved as well. This then resulted to reduced production cost thus an increased bottomline.
- *Desire to enhance public image.* Being an environmentally-critical operation, keeping a good public image is important to keeping in business. An ISO 14001 certification helped them demonstrate to the public that they are indeed operating in an environmentally-sound manner.

Restraining Forces: (first being the strongest)

- *Lack of information and know-how about cost-effective measures to improve environmental performance.* Access to information regarding more efficient and cost effective technologies that are also more environment-friendly is right now an obstacle to improving environmental performance.
- *Lack of financial resources to implement necessary measures.* Due to the implementation of the Basel Convention, supply of scrap batteries has decreased, greatly affecting the company's overall business performance. Investments on major environmental measures are then on hold.

V. FUTURE PLANS AND PROGRAMS

- Continuously improve environmental performance thru EMS;
- Adoption of a cleaner and more efficient technology however investment is on hold since it is not financially viable given the current business situation.
- Continue the Bantay Baterya program with EMB-DENR and Bantay Kalikasan on promoting public awareness on proper management of scrap automotive and industrial batteries.

VI. MAJOR ISSUES AND CONCERN

Recyclers in developing countries, such as Chemical Products Manufacturer A rely on imported feedstock to supplement the domestic sourcing of scrap batteries. With the Basel restriction in effect, the result is a tight supply and consequent increase in price to the great disadvantage of these recyclers.

However the proposed approach of a Basel Environmentally-sound Management (ESM) based on ISO system and the opportunity for opening of trade with Basel ESM certified companies in developing countries is such a welcome development to these recyclers. The experience of Chemical Products Manufacturer A in ISO 14001 certification points that it is possible for a recycling company in a developing country to approach compliance to the Basel ESM thus gain exemption to the trade restrictions.

VII. CONCLUSUION/EVALUATION SUMMARY

Chemical Products Manufacturer A has demonstrated a proactive IEM by going beyond simple waste reduction programs to a full implementation of an ISO 14001-certified EMS. This helped them address important issues such as regulatory compliance and enhancing company image. Now Chemical Products Manufacturer A is also counting on their ISO 14001 certification to help them gain exemption to the Basel Convention.

2.2.6 Coconut-based Industry A

I. PLANT BACKGROUND

Coconut-based Industry A is a dessicated coconut manufacturing facility.

The company participated in IEMP-PMA program. The on site PMA was conducted at its plant on July 3 and 4, 1995. The PMA focus areas were the shelling, paring, washing, drying and packing areas. The objective of the PMA which were aimed to be achieved within a year's time included the following: (1) reduce water use and wastewater generation by 20%, (2) reduce production losses by 50%.

There was no production of dessicated coconut during the visit. Per information gathered from the manager, the plant had been inoperative for a long time due to bad economy. Only the crude coconut oil facility is being operated intermittently, at the most once in two months due to raw material (coconuts) shortage. Even this facility was shutdown during the visit.

II. PROCESS DESCRIPTION

The following processes are involved in the production of dessicated coconut:

1. receiving and storage of coconut
2. shelling and paring
3. washing, decapping and grinding
4. chemical treatment, blanching and drying
5. screening and packing

Input	Process/ Operation	Output	Current Management Practice	Waste
Coconut, water	Shelling/paring	Coconut shell	Fuel to boiler	
		Coconut water Wash water	To WTP	
	Washing/Decapping	Coconut water	To WTP	
Coconut meat, water, chemical	Chemical treatment	Wastewater	To WTP	

(The above processes are the basic processes, however, the company has ceased operating this facility because of poor economy and other operational problems).

On the other hand, the manufacture of crude coconut oil makes use of copra meal as the raw material. The processes involved are:

1. mechanical pressing of the copra meal
2. filtering
3. packing into containers

III. IEM MEASURES

Listed below are IEM measures undertaken by Coconut-based Industry A prior to, during and after the IEMP Project.

IEM Measures Taken before IEMP

- Parings, reject coconut meat and spilled dessicated coconut go to the oil meal for processing
- Coconut shell are used as fuel to the boiler
- Solid waste generated from the boiler such as ash and coir dust are disposed in municipal garbage dump site.

- Liquid discharges from the operation consisting of coconut water and process washings are sent to the WTP

IEM Measures Proposed by IEMP

- Repair faucets in the shelling and paring areas to avoid leaks
- Reduce thickness of pairings
- Repair conveyor belts and leaks at washing and sorting areas
- Implementing strict quality control/sorting of incoming coconuts
- Repair steam leaks
- Repair rotary screen to minimize solids leading to WTP
- Repair shelling and paring areas

(Note: While some of these options are claimed to have been implemented, the fact that this facility has not been operated for a long time negates verification.)

IEM Measures Taken after IEMP

The manager did not disclose any except that the plant was shutdown for a long time. There was no way also to evaluate such measures, if any because the plant was shutdown for a long time.

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

The management did not elaborate the benefits they derived from the previous IEMP Project except that their company sustained losses resulting in reduction of manpower and in production.

During the IEMP program, the following were the driving and restraining forces on record.

Driving forces:

- Improve regulatory compliance
- Increase production
- Enhance community image

Participation of the management to IEMP was prompted by the management's primary concern to meet the Laguna Lake Development Authority (LLDA) requirements because of the very nature of its operation which generates water pollution having been subjected to complaints before.

Restrains:

- Financial constraints
- Worker's resistance to change
- Lack of management support
- Lack of environmental consciousness
- Lack of incentives to workers

The PMA team in their report has already identified the above restraining forces with financial constraints at the top but also considered lack of management support as a critical factor in this program. The company was greatly affected by the economic slowdown in the 90s.

V. FUTURE PLANS

No definite future plans were obtained during the interview.

VI. CONCLUSION/EVALUATION SUMMARY

The site visit indicates that the efforts during the previous IEMP was not sustained resulting in the unsuccessful implementation of waste minimization measures which can be attributed to factors such as problems encountered due to economic slowdown and raw material shortage and partly because right from the start, lack of full support from the management, as identified in the restraining forces by the previous team involved. Because of the present company status, the company no longer employs the services of a PCO.

2.2.7 Coconut-based Industry B

I. PLANT BACKGROUND

Coconut-based Industry B started its alcohol production in 1968. The present management however acquired the company in 1987.

Coconut-based Industry B is an alcohol fermentation facility which produces alcohol from molasses as the raw material. Molasses requirement is supplied by the various sugar plantations in Luzon and also from the Visayas region. The product is rectified ethyl alcohol while the by product is aldehyde. The following processes are involved in alcohol production: Molasses receiving, yeast preparation, mash preparation and propagation, pre-fermentation, beer heating, beer distillation, purification and alcohol rectification.

Coconut-based Industry B participated in the PMA to obtain technical assistance from IEMP on waste minimization technologies. Through this program, the company was expecting to meet DENR regulations, increase revenue and improve public image. At that time, the company lacked personnel with technical expertise but the management was committed to support any waste minimization effort. The PMA focused on reducing water usage and wastewater generation by at least 50% and complying fully with DENR effluent quality standards for color.

II. PROCESS DESCRIPTION

The processes involved in the alcohol manufacture are as follows:

1. molasses receiving
2. yeast culture and preparation
3. mash preparation
4. propagation and pre-fermentation
5. fermentation
6. beer heating
7. beer distillation
8. alcohol purification and aldehyde recovery
9. alcohol rectification, cooling and storage

Input	Process/Operation	Output	Current Management Practices	Waste
Molasses, yeast, Cooling water	Fermentation	Cooling water	To drainage canal	
Pre-heated beer	Beer distillation	Slops/stillage	To WTP	
Alcohol bearing vapors	Alcohol rectification	Liquid residues	To WTP	

III. IEM MEASURES

Listed below are IEM measures undertaken by Coconut-based Industry B prior to, during and after IEMP project.

IEM Measures Taken before IEMP

Measures	Benefits	Cost/Input	Motives for Implementation
Monitoring water usage	Reduced water consumption	N/A	Cost cutting
Operating WTP	Pollution prevention	N/A	Compliance to regulations

IEM Measures Proposed by IEMP

Measures	Benefits	Remarks
Repair of leaks and spills	Water conservation	Implemented
Reduction of cooling water at fermentation tank	Reduced water usage	Implemented
Re-use of cooling water in compressor as fermentor coolant	Reduced water usage	Implemented
Re-use of spent steam condensate as boiler feed water	Energy savings	Implemented
Reuse part of effluent as irrigation water	Reduced effluent discharge	Implemented
Reduce auxiliary wastewater flow by 70%	Reduced wastewater volume	Implemented
Planting of trees at WTP area	Aesthetic reason	Implemented

IEM Measures Taken after IEMP

Measures	Benefits	Motives for Implementation
Installation of water softener for boiler	Reduced consumption of fuel	To reduce boiler tube scaling/minimize downtime
Use of effluent as irrigation water for sugar plantation	Reduced volume of Discharged effluent	Pollution load reduction
Upgrading of WTP	Improved efficiency of WTP	Meeting DENR limits
Monitoring water usage	Reduced water consumption	Reduce load of WTP

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

The management has cited the following as benefits derived from practicing IEM:

- Reduced operating costs

- Enhancing company image especially to sugar plantation worker because of free irrigation water from its effluent
- Increased productivity

Driving forces:

- Public complaints regarding effluent odor - complaints affect the public image of the company aside from damaged company reputation in the community
- Compliance with DENR effluent standards - a must for the company to prevent issuance of cease and desist order (CDO)
- Free technical assistance from IEMP on waste minimization and color reduction technologies
- Management support and strong commitment toward waste minimization
- Desire to institutionalize waste minimization in the plant
- Smaller workforce and good organizational climate. The management and IEMP consider this a key factor in the success of any waste minimization effort.

Overall, it is the management support that leads the company to implement waste minimization measures, and thus maintain the integrity of the company. The management has invested a lot in terms of time and finances in meeting its environmental obligations. (A similar industry adjacent to the company had already been closed because of pressure from the community arising from odor complaint).

Restraining Forces

- Limited in-house technical expertise
- Disruption in production
- Low supply of molasses which might affect production schedule and the associated waste minimization projects

The limited technical know-how of the company staff is off-set by attendance to more awareness training/seminars on related subjects on cleaner production and pollution prevention with management support.

V. FUTURE PLANS

- The management has considered changing the present beer distillation column with a vacuum distillation column. This will involve less cleaning and reduced water consumption. Said option is to be implemented sometime late this year.
- On the wastewater treatment plant, the sedimentation ponds are being reconstructed/modified to increase WTP efficiency.
- The effluent from the treatment plant are presently hauled and delivered free of charge to sugar farmers. Studies are being conducted to check viability of effluent as fertilizer to sugar plantation.

VI. CONCLUSION/EVALUATION SUMMARY

The management has successfully implemented waste minimization options as recommended by the IEMP consultants. The on-going study on the use of WTP effluent as irrigation water for sugar farmlands is something that the management is hoping to generate success in view of the beneficial impact on the company in terms of reduced volume of effluent discharge.

2.2.8 Coconut-based Industry C

I. PLANT BACKGROUND

Coconut-based Industry C started the production of coconut oil in 1983 with only the oil expellers (mechanical). In 1989, it was upgraded to include the oil refinery plant. The plant is highly mechanized with a minimal workforce of 23 workers. No figures were provided though it appears business remains healthy despite stiff competition and rising production costs.

Today Coconut-based Industry C produces both bleached and refined coconut oil using the mechanical process. Coconut-based Industry C mainly uses its bleached coconut oil for its soap making facility while the refined oil goes to the market.

Bleached oil production involves: milling, neutralization and bleaching by bleach earth method. Further Deodorization of the bleached oil produces refined coconut oil.

Coconut-based Industry C volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1994. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Management Practices	Waste
➤ Copra	Extraction/milling	➤ Copra cake	➤ Sold as fish meal	
➤ NaOH	Neutralization	➤ Soap stock	➤ To acidulation (coco fatty acid recovery)	
➤ Soapstock ➤ Sulfuric acid	Acidulation	➤ Acid water ➤ Fatty acids (FFA) ➤ Bottoms (contains glycerine)	➤ Diluted (to drain) ➤ Sold as feed supplement ➤ WTP (at soap plant) or to waste treater (at P1000/truck)	
➤ Bleach earth	Bleaching, filtration	➤ Filter cake	➤ Offsite dump	
➤ Steam ➤ Water – pressurized	Steam Deodorization	➤ Cooling water ➤ Minor water bleed off	➤ Cooling tower (recycle)	
	Final inspection			

Note: Coconut-based Industry B never processed black soap (soapstock) for soap making because of dirt and associated waste problems associated with the process. Instead they maximized production of coco fatty acids (CFA) which is more expensive.

III. IEM MEASURES

Prior to Previous Project(s)

Measures	Benefits	Implementation Costs	Remarks
Shifting from batch to continuous refinery process in 1993-94	Improved productivity, reduced waste generation	No data	Good

Proposed by Previous Project(s)

Measures	Benefits	Implementation costs	Remarks
1. Insulation of all pipes	• Energy savings	-	Good
2. Planting of trees along plant perimeter fence	• Reduced odor (neighbor complaints)	-	Good
3. Installation of water meters to monitor flow rates/consumption patterns	-	-	Not implemented: IPI has used deep well water Note: They don't put a price value to well water

Measures Taken After the Previous Project(s)

Measures	Benefits	Implementation Costs	Remarks
1. Installation of wet scrubbers at refinery to reduce odor problems at leaf filter area during cleaning of filters (complaint from neighbors)	• Reduced foul odors	ND (local expertise, internal staff)	Still working well
2. Installation of dust collectors (cyclone) at copra meal area in 1996	• Reduced odor complaint	Minimal, locally done	Still working well
3. Replaced bunker oil with special fuel oil (SFO)	• Improved regulatory compliance	None	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

Among the benefits gained by Coconut-based Industry C from implementing waste minimization include the following:

- Improved public health/worker safety
- Reduced liability (penalties/fines)
- Reduced operating costs
- Improved productivity

Driving factors:

- Regulatory compliance
- A strongly motivated workforce
- Management commitment/directive
- Benefits can readily be realized

Coconut-based Industry C is driven principally by regulatory compliance issues in instituting IEM or even related programs. There is an apparent lack of management commitment towards IEM mainly because of the fact that they are a relatively new plant (10 years). However, its PCO/environmental officer has been observed to be highly enthusiastic/motivated in his work despite the fact that he also concurrently attends to the environmental matters of two other sister plants. The same person still has other assigned production functions/tasks.

Restraints:

- Financial
- Economic
- Organizational issues
- Technical expertise limitations

Financial/economic and multi-tasking PCO are major issues that could deter IEM pursuits in this organization. Other factors include organizational and limited technical staff/expertise especially in light of the tight budgets/financial status of the company. Also because of the poor market demand for coconut oil and the bad economic conditions of the coconut industry.

V. FUTURE PLANS

- Energy conservation – Plans to connect/buy power directly from generator
- Water conservation – Use of rainwater for irrigation
- Effluent – consistency in meeting effluent standards
- Hazardous wastes – Better treatment / recovery options for acid oil (acidulation bottoms)

VI. EVALUATION SUMMARY

Coconut-based Industry C in general is not quite successful in IEM implementation. Some of the factors affecting its relative failure are the following:

- Limited workforce particularly technical staff
- Relatively new and a bit mechanized process

2.2.9 Coconut-based Industry D

I. PLANT BACKGROUND

Coconut-based Industry D started the production of alcoholic beverages in 1969. The company has since been producing the same type of products and is still being pursued by the A group (who took over control of the company in 1987). The plant was worth about P100 million in 1987 when assumed by the new SMC management.

Despite stiff competition, today Coconut-based Industry D manage to maintain its 5 leading brands of alcoholic beverages with a remarkable market share. The new management trimmed its workforce to just around 100 workers and last year's operations reported sales volume of about P100 million.

The process in the production of alcoholic beverages at Coconut-based Industry D involves mixing 95% ethyl alcohol with demineralized water and the addition of various ingredients such as flavors, essences, sugars, caramels among others.

Coconut-based Industry D volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1996. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process/Operation	Output	Waste Management Practice
➤ Ethyl alcohol (189 proof)	1. Receiving, Quality Control, Storage		
➤ DM water ➤ Flavors: essences, sugar, caramel	2. Dilution/ Mixing, and Proportioning	➤ Spills	➤ Recovered where possible/WTP
➤ Bottles from supplier ➤ NaOH ➤ Water	3. Bottle washing	➤ Wash water (alkaline) ➤ Cullets	➤ WTP ➤ Sold
➤ Clean bottle ➤ Labels ➤ Crowns ➤ Cartons ➤ Tapes	4. Bottling, Packing	➤ Scraps/cullets ➤ Empty bottles	➤ Sold ➤ Sold / return to supplier
	5. Storage, Distribution, Market		

III. IEM MEASURES

Prior to Previous Project(s)

Measures	Benefits	Implementation Cost	Remarks
1. Recycling of wash water from bottle washing	<ul style="list-style-type: none"> • Reduced water use/ wash water generation 	No Data (ND)	Still on-going
2. Selling of scraps/trash, and broken bottles (cullets)	<ul style="list-style-type: none"> • Reduced disposal costs • Added revenue 	None	Still on-going
3. Installation of WTP involving chemical process (flocculation, coagulation, settling)	<ul style="list-style-type: none"> • Partially meet regulatory standards 	ND	Upgraded in 1999

Proposed by Previous Project(s)

Measures	Benefits	Implementation Cost	Remarks
1. Repair of leaking pipes at demi-water plant, and check valves of water tank at softener area	<ul style="list-style-type: none"> • Reduced water usage 		Ok
2. Replacement of turbine gasket of deep well pump			Not implemented (Connected to water district in 1997 and deep well no longer used)
3. Prevent mixing of bunker oil spills with softener wash water (cover with canvass)	<ul style="list-style-type: none"> • Recovered waste oil • Reduced wastewater /WTP load 		Improved by providing a covered (roof) structure

Measures	Benefits	Implementation Cost	Remarks
4. Recovery of steel belt conveyor lubricant (realign slope of drip pans)	<ul style="list-style-type: none"> Reduced lubricant usage Lower waste water/WTP load 		Improved by providing a catch basin
5. Increased recovery of wash water from rinses /soaker from 80 to 100%	<ul style="list-style-type: none"> Reduced softened water use Cut treatment cost Cut HCl and NaOH consumption 		Modified by increasing capacity of catch basin

Measures Taken After the Previous Project(s)

Measures	Benefits	Implementation Cost	Remarks
1. Recovery of effluent by filtration	<ul style="list-style-type: none"> Reduced water use Lower WTP load 	ND	To be implemented within 2003
2. Proper disposal/segregation of wastes: glass, cans, cartons, etc.	<ul style="list-style-type: none"> Added revenue Reduced disposal costs 	P40T (in-house training, etc.)	Still on going since 1999
3. Upgrading of WTP from chemical to aeration (activated sludge process)	<ul style="list-style-type: none"> Meet regulatory standards 	P1.2 million	Working well (satisfactory compliance)

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

Among the benefits Coconut-based Industry C gained from implementing waste minimization and even going beyond, include the following:

- Reduced operating costs
- Improved productivity
- Reduced treatment and disposal costs
- Improved company image

Driving factors:

- Management commitment
- A strongly motivated workforce
- Benefits can readily be realized
- Simple and easy to implement IEM programs

The company then under the previous owners, had a record of poor environmental performance. Significant changes only took place when the new owner (corporate food conglomerate subsidiary) took over control of the business for over 10 years now. Strong management commitment coupled with a highly motivated workforce was what made the difference.

The new management soon upgraded its waste water treatment facility to meet regulatory requirements. And with a motivated work force, they have been implementing varied waste/cost reduction programs at the plant level. All these measures are geared to improve not only the company's bottomline but also

environmental performance especially that they are in the highly competitive beverage sector.

Lastly, as part of its belt tightening policy, the company is encouraged to institute low cost/simple IEM measures where feasible.

Restrains:

- Financial
- Economic
- Policy-related issues
- Conceptual/institutional

Based on the surveys, the above-mentioned factors only appear to be minor restraining forces in pursuing IEM at Coconut-based Industry C. There is no indication of major stumbling block for IEM.

V. FUTURE PLANS

- Same as previous survey

VI. EVALUATION SUMMARY

Coconut-based Industry C in general is quite successful in IEM implementation because of the following factors:

- a very committed and supportive management
- a technical and dynamic workforce
- an image to protect (consumer food products business and belongs to a reputable SMC group of companies)
- concerns on continuing improvement: productivity/cost reduction programs

2.2.10 Coconut-based Industry E

I. PLANT BACKGROUND

Coconut-based Industry E is one of the largest manufacturers of dessicated coconut in the Philippines. It has been in this business since 1946.

The plant produces high quality dessicated coconut for export. The by-products consist of crude coconut oil and copra meal.

As volunteer to the IEMP, the company was hoping that the waste minimization techniques which are relatively less costly than waste treatment will support the company's effort to comply with environmental regulations and should be incorporated in the overall waste management program of the facility. The company has identified the PMA goal to reduce water usage and in effect the wastewater volume.

II. PROCESS DESCRIPTION

Dessicated coconut (DCN) is obtained by drying granulated or shredded white meat of the coconut kernels and prepared and packaged suitable for human consumption without further processing.

Input	Process/Operation	Output	Current Waste Management Practice
Husked coconuts, cleaning water	Shelling	Coconut water Cleaning water	To WTP
		Rejected coconut	To copra meal
	Paring	Coconut water	To WTP
		Sprouts Spilled coco meat	Collected, recycled
		Process wash water	To WTP
	Washing	Sprouts Rejected coco meat	Collected/recycled
		Wastewater, cleaning water	To WTP
Coco meat, Water, sodium metabisulfite	Chemical treatment		
Coco meat, steam	Drying	Flue gas	Exhausted via smokestack
		Spilled DCN	Recycled

III. IEM MEASURES

Prior to Previous Project(s)

	Benefits	Cost/Input	Motives for Implementation
Recycling screened solids to oil meal	Zero wastage	N/A	Maximum utilization of material product
Selling skimmed oil and grease from flotation tanks	Added revenue	N/A	Pollution load reduction
Sell packaging materials	Added revenue	N/A	Solid waste reduction
Coconut shells as fuel to boiler	Fuel savings	N/A	Solid waste reduction

Proposed by Previous Project(s)

Measure	Benefits	Remarks
More thorough separation of rejects	Less wastage	Implemented
Strict supervision of shellers and parers	Less wastage of coconut meat	Implemented
Repair of leaks from faucets	Reduced water usage	Implemented
Installation of nozzles with flow control valves	Reduce water usage	Implemented
Investigate opportunity for recycling coco water	Reduce pollution load	Implemented

Measures Taken After the Previous Project(s)

Measure	Benefits	Remarks
Implementation of recommended waste minimization options	Reduced operating costs	Productivity improvement/waste reduction
Selling coco water to Taiwanese Company	Added revenue, reduced pollution load	Pollution reduction

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Benefits derived by the company from implementing IEM measures include: Increased productivity, reduced operating costs, reduced pollution load from of coconut water to Taiwan. This however, came to a halt last year because of financial problem by the Taiwanese client.

Driving Forces

- Compliance with environmental regulations
- Increased profits
- Management support
- Improvement of public image
- Reduction in impact of power shortage
- Reduction in impact of water shortage

The management is the most vital force. It has fully supported waste minimization opportunities in the plant and participated in training and programs involving waste management and cost reduction measures in line with company direction of being the pioneer in this industry category. According to the PCO, the WTP effluent is meeting LLDA standards so far.

Restraining forces:

- Lack of environmental consciousness among workers
- Resistance to change by some workers
- Lack of waste minimization knowledge and experiences

The management has done its share of ensuring workers are made aware on all waste minimization programs in the plant to address lack of environmental consciousness among its workers.

V. FUTURE PLANS

- The management is looking for an alternative method of disposal and/or recycling of coconut husk powder since this are already piling up.
- Improvement of the WTP by possible incorporation of an Upflow Anaerobic Sludge Blanket to increase efficiency of the wastewater treatment plant.
- To look for prospective clients for their coconut water.

VI. CONCLUSION/EVALUATION SUMMARY

The management has addressed and implemented successfully the waste minimization recommendations before. They have also upgraded its air pollution control device serving the boilers to lessen their air emission. However, with coconut water being channeled again to the WTP (because the Taiwanese company has

stopped buying it) this has another concern which is yet to be addressed for reason they are planning to upgrade the WTP.

2.2.11 Coconut-based Industry E

I. PLANT BACKGROUND

Coconut-based Industry E is engaged in the manufacture of coconut milk powder and low fat desiccated coconut since 1995. Its plant is located in San Pablo city, Laguna and is presently complemented with around 50 employees.

The company participated in the IEMP program. The on-site PMA was conducted on July 3 and 4, 1995. The PMA focus areas are the sections at: receiving and storage, shelling, paring, washing and milk extraction. Among the PMA goals considered at that time include the following:

- Reduce wastewater generation by 20% within 5 months
- Reduce the discharge of coconut water by 50% within 5 months
- Enhance worker's knowledge about waste minimization
- Improve the aesthetic and sanitary condition of the facility

II. PROCESS DESCRIPTION

The production of coconut milk powder and low fat desiccated coconut involves the following processes namely:

1. receiving and storage
2. shelling
3. paring and washing
4. grinding and milk extraction
5. filtration, homogenization, stabilization and pasteurization
6. drying and packaging of coconut milk powder
7. blanching and drying of coconut meat
8. packaging and storing of low fat desiccated coconut
9. drying of parings

Input	Process/Operation	Output	Current Waste Management Practice
Husked coconuts	Shelling	Coconut water	Discharged to canal
		Coconut shell	Fuel for boiler
	Paring/washing	Coconut water/ Wash water	Discharged to canal
	Grinding/milk extraction	Coconut meat residue	Collected and disposed

III. IEM MEASURES

Listed below are IEM Measures undertaken by Coconut-based Industry E prior to, during and after the IEMP project.

IEM Measures Taken before IEMP

Measures	Benefits	Cost/Input	Motives for Implementation
Return reject coconuts to suppliers	Reduce wastage	N/A	Minimize waste
Use coconut shell/coir dust as fuel to boiler	Fuel savings	N/A	Solid waste reduction
Pairings to copra dryer	Reduce product wastage	N/A	Maximum product utilization

IEM Measures Proposed by IEMP

Measures	Benefits	Remarks
Control discharge of parings	Reduce spillage	Implemented
Install rotary screen to canal	Reduce solids discharge	Implemented
Observe good housekeeping practices	Reduced pollution load	Implemented
Provide container for collecting coconut water	Reduced pollution load	Implemented
Use coconut water for beverage production	Reduced pollution load	Partially implemented/demand-driven

IEM Measures Taken after IEMP

Measures	Benefits	Motives for Implementation
Manual collection of spilled coconut meat	Reduced solid waste	Solid waste reduction
Using coconut shell as fuel for boiler	Fuel savings	Solid waste reduction

Note: It was gathered during the interview that there are plans to put up a WTP to handle the wastewater.

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

The management did not fully disclose the benefits derived from the waste minimization programs during the IEMP. During the interview, the manager reiterated the losses the company sustained because of poor economy.

Driving forces:

- Environmental commitment
- Top management support
- Desire to promote good community relations

The primary driving force was environmental commitment because of the pressure to meet LLDA/DENR requirements. However, because of the economic crisis, this was not sustained and priorities appeared to shift to other company concerns.

Restraints:

- Financial constraints
- Employees attitude
- Lack of manpower
- Lack of technical capability
- LLDA's lack of capability in enforcing environmental regulations

The financial constraints appear to be a big factor than the other forces. The company does not have a PCO at present who is supposed to address environmental concerns.

V. FUTURE PLANS

Except for the proposed WTP, no other immediate plan related to the environmental management was noted during the interview.

VI. CONCLUSION/EVALUATION SUMMARY

The company appears to have implemented some simple and basic waste minimization options. The absence of a PCO (which according to the staff has resigned) will contribute to the restraining forces on the part of management in meeting its environmental objectives. With the present status of the company and the mentioned raw material shortage (raw coconuts), it appears the company will focus more on meeting production schedule.

2.2.12 Electroplating and Metal Finishing Company A

I. PLANT BACKGROUND

Electroplating and Metal Finishing Company A was established in April 1962 with a capitalization of ₱ 2,000,000. Its metal finishing services include copper, nickel, chromium and zinc electroplating and electrostatic powder coating.

Electroplating and Metal Finishing Company A participated in the World Bank Metropolitan Environmental Management Project (MEIP) in 1994. The company also actively participated in the Electroplating Effluents Study of the International Development and Research Centre of Canada and the Industrial Technology Development Institute (ITDI) in 1990 to 1993.

II. PROCESS DESCRIPTION

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices, at Electroplating and Metal Finishing Company A.

Input	Process/Operation	Output	Current Waste Management Practice
Water, detergent, stripper	Electroclean	Wastewater (acidic and with heavy metals)	To wastewater treatment plant (but according to interviewee, it was not operational)
Water	Rinsing		
Water, sulfuric acid	Acid Dip		
Water	Rinsing		
Water, plating chemicals	Cu-Ni-Cr Plating		
Water	Rinsing		
Water	Spray Rinse		

III. IEM MEASURES

Listed below are IEM measures undertaken by Electroplating and Metal Finishing Company A prior to, during and after the MEIP Projects.

Prior to Previous Project(s)

Measures	Benefits	Costs/Inputs	Motives for Implementation
Spray rinsing	Reduced water	N.A.	Cost savings

Measures	Benefits	Costs/Inputs	Motives for Implementation
	consumption		
Use of hoist lifter	Reduced strain to workers	N.A.	Workers' health and safety

Proposed by Previous Project(s)

Measure	Benefits	Remarks
Increase frequency of rack cleaning	Reduced chemical consumption	
Fabrication of more customized racks	Reduced chemical consumption	
Use of drip boards or drain bars	Reduced drag-out losses	
Use of ion exchange and evaporator for chromium recovery		Not implemented due to financial constraints
Use of intra-process reactive rinsing		Not implemented due to technical problems

Measures Taken After the Previous Project(s)

Measures	Benefits	Motives for Implementation
Formulation of new baths	Faster production	Productivity
Installation of wet scrubber	Improved health and safety	Workers' health and safety
Installation of dust collection system		
Purchase of proprietary solutions	No need for storage	Disposal problems

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Electroplating and Metal Finishing Company A cited the following benefits of practicing IEM:

- Increased productivity
- Reduced operating costs
- Improved public health and environmental benefits
- Improved worker health and safety

Driving forces for implementing IEM at Electroplating and Metal Finishing Company A includes the following:

- Top management commitment
- Immediate realization of benefits
- Waste assessment by trained and unbiased personnel to identify waste sources and waste minimization options

Electroplating and Metal Finishing Company A top management was also the leader in the electroplating industry in the late 80s and early 90s. As such, he saw to it that his company was also the leader in terms of newer (and cleaner) technologies and environmental protection. Electroplating and Metal Finishing Company A was the first to install a non-cyanide copper plating line among members of the Philippine Electroplaters Association (PEA). Electroplating and Metal Finishing Company A saw the expertise in the both local and international consultants that the MEIP provided. The international consultant was a lecturer of the American Electroplater-Surface Finisher Society. He demonstrated his skills to Electroplating and Metal Finishing Company A management. The president of Electroplating and Metal

Finishing Company A saw the potential wealth of information that they can gather from the consultant. Unfortunately, Electroplating and Metal Finishing Company A invested and expanded their operations immediately prior to the Asian financial crisis. They eventually discontinued their expansion and even had to downgrade their previous operations.

Restraints:

- Financial
- Technical

V. FUTURE PLANS

Electroplating and Metal Finishing Company A intends to implement a water conservation program and improve its existing wastewater treatment plant in the future. The company noted the very high amount of water consumed in their operations. The company chemist intends to conduct research and development work on stripping solutions that are less hazardous in nature.

VI. CONCLUSION/EVALUATION SUMMARY

It had been observed that Electroplating and Metal Finishing Company A had not been effectively operating its wastewater treatment plant. Its current location is classified as a residential area, as such they will have to relocate in the next 10 years.

The company was hard hit by economic crisis of the mid-1990s. In fact, the company used to fabricate and plate metallic components of the water heater product of its sister company before. Currently, the company buys most of the components (fabricated and ready to install) from outside sources. From an employment of 259 in 1994, the company now employs only 78.

2.2.13 Electroplating and Metal Finishing Company B

I. PLANT BACKGROUND

Established in 1989, Electroplating and Metal Finishing Company B has since been in the business of providing powder pre-coating services to its customers. Most of its customers are manufacturers of leading home and office appliances including bicycle parts, and pieces of other equipment.

Plant started operations with an initial capital of about P5 million and merely 5 as a small business. Initial launching sales in 1989 was about P10 million and had peaked a high of P50 – P60 million in the nineties.

Due to the financial crisis in the late nineties coupled with cheap imports from neighboring Asian capitals up to present, sales had been hovering to just about P10 million with a very minimal net earnings. Electroplating and Metal Finishing Company B at present maintains a regular workforce of about 35.

Electroplating and Metal Finishing Company B volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in March 1993. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process/Operation	Output	Waste Management Practice
➤ Assorted metal parts ➤ HCl	1. Pickling	➤ Spent acid (pickling solution)	➤ Sump/WTP (neutralization)
➤ Conditioners ➤ Phosphates	2. Conditioning/ phosphating	➤ Spent solution/ sludge	➤ Sump/WTP
➤ Chromic acid ➤ Water	3. Chromic acid rinse	➤ Acidic waste water	➤ WTP (neutralization)
➤ Water	4. Rinsing	➤ Wastewater	➤ WTP
➤ Air	5. Drying		
➤ Powder coating	6. Powder coating – spray booths	➤ Spent paint powder/ emissions	➤ Cartridge filters (collected and sent to dump)
➤ Diesel fuel	7. Oven (cooking)	➤ Hot air emissions	➤ Vent/stack
➤ Air	5. Air drying		
➤ Packing materials	6. Warehouse storage	➤ Reject packaging materials	➤ Sold

III. IEM MEASURES

IEM Measures Taken before IEMP

IEM Measures	Benefits	Implementation Cost	Remarks
1. Simple housekeeping	• Reduced solid waste	None	Still on-going
2. Shutting off lights and air-conditioners during break times, after use	• Reduced electricity usage • Lower operating costs	None	Still on-going

IEM Measures Proposed by IEMP

IEM Measures	Benefits	Implementation Cost	Remarks
1. Drag-out reduction measures	-	-	Not implemented: existing tanks/ equipment already old/dilapidated and due for replacement
2. Drag-out recovery by installing drain boards	-	-	
3. Decrease rinse water usage	• Reduced water use • Lower Wastewater generation	ND	Still on-going
4. Improving spraying operations (spray guns) to increase powder coat transfer efficiency	• Reduced powder paint usage • Reduced waste generation • Improved product quality	ND	A continuing program
5. Improving collection/ recovery of spent powder from spray booths	• Improved emissions	P1 million	Replaced cyclones with cartridge filters

IEM Measures Taken after IEMP

IEM Measures	Benefits	Implementation Cost	Remarks
1. Replaced dipping with spray process for metal preparation process except water rinsing.	<ul style="list-style-type: none"> • Reduced chemical use • Lower wastewater generation • Improved product quality 	P300T	Still on-going since 1997
2. Eliminated alkaline degreasing processes since raw material inputs are now much cleaner	<ul style="list-style-type: none"> • Reduced wastewater generation • Increased revenue 	None	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

Electroplating and Metal Finishing Company B was at first hesitant to take part in the IEMP project. They took part due to the efforts exerted by the project proponent, the DENR and also because their operations generate wastewater that needs to be properly managed. They were also hoping for any potential technical or financial assistance the project could offer them.

Now looking back, management realized that joining the program in fact enabled them even do more than what the project has recommended. Among the benefits Electroplating and Metal Finishing Company B gained are the following:

- Improved health/safety of workers and community
- Reduced waste treatment/disposal costs
- Reduced operating costs
- Increased productivity

Driving factors:

- Management commitment
- A motivated workforce
- Benefits can readily be realized
- Simple and easy to implement IEM programs

The CEO of Electroplating and Metal Finishing Company B has always been one of the advocates of environmental programs in the industry despite being a relatively small company. He participates actively in the industry association (of electroplaters). In an effort to address its pollution-waste problems vis a vis regulatory compliance, it started pursuing waste minimization efforts in the mid-nineties and had some modest gains. It has likewise improved environmental regulatory compliance status and has since then recognized IEM as one way of improving productivity. This is an indication that management commitment is the main driver for Electroplating and Metal Finishing Company B to pursue IEM programs. There is also a relatively good work climate in this company as noted in the survey, and this has some influence in Electroplating and Metal Finishing Company B's pursuits of IEM.

As a small company, top management is keen on simple, low-cost/no cost and readily realizable IEM programs.

Restraints:

- Economic

- Financial
- Limited technical expertise

The uncertain market conditions and poor prevailing economic climate - e.g. low local market demand and increasing flow of cheaper imports from neighboring Asian countries affected the company to further pursue IEM and related productivity improvement programs. The limited technical expertise both for environmental and technical also are deterring factors for IEM and related technology programs/issues.

V. FUTURE PLAN

- Emissions control – recovery of spent powder (mixed mostly) from the filter cartridges.

VI. CONCLUSIONS/EVALUATION SUMMARY

IEM implementation at Electroplating and Metal Finishing Company B can be considered a little bit successful. Providing external support (technical and financial) is an important issue which could lead to a more successful IEM implementation at Electroplating and Metal Finishing Company B. Electroplating and Metal Finishing Company B is a small family-owned business and CEO/owner appears convinced of economic and environmental benefits of IEM.

2.2.14 Electroplating and Metal Finishing Company C

I. PLANT BACKGROUND

Electroplating and Metal Finishing Company C was established in 1971 with a capitalization of ₱ 2,000,000. Electroplating and Metal Finishing Company C is jobber, *i.e.* accepts walk-in clients. Its metal finishing services include copper, nickel, chromium and zinc electroplating. In 1984, Electroplating and Metal Finishing Company C introduced electrostatic powder coating.

Electroplating and Metal Finishing Company C participated in the World Bank Metropolitan Environmental Management Project (MEIP) in 1994. The company also actively participated in the Electroplating Effluents Study of the International Development and Research Centre of Canada and the Industrial Technology Development Institute (ITDI) in 1990 to 1993. Aside from this, the owner also availed of study tour grants from the Japan Export Trade Organization (JETRO) and the US-ASEAN Environment Partnership (US-AEP).

It currently employs 23 full-time and 2 part-time employees. In 1987, during the height of its operations, Electroplating and Metal Finishing Company C had more than 80 people in its pay roll.

II. PROCESS DESCRIPTION

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices, at Electroplating and Metal Finishing Company C.

Input	Process/Operation	Output	Current Waste Management Practice
Detergent, water	Degreasing	Wastewater (acidic and with heavy metals)	To wastewater treatment plant (but actual observation reveal that it is not operational)
Acid, water	Pickling		
Detergent, water	Electrocleaning		
Chemicals, anodes, water	Plating/Coating		
	Drying		
Water	Rinsing		
		Dust for coating operations	For powder coating, cyclone dust collector (this is operational)

III. IEM MEASURES

Listed below are IEM measures undertaken by Chrome Dazzler prior to, during and after the MEIP Projects.

Prior to Previous Project(s)

Measures	Benefits	Costs/Inputs	Motives for Implementation	Remarks
NONE				

Proposed by Previous Project(s)

Measure	Benefits	Remarks
Countercurrent rinsing	Reduced water consumption	
Re-lay out	Reduced water consumption	
Wastewater treatment	Compliance	
Non-cyanide plating	No hazardous waste disposal and reporting	
Relocation because of topography		Not implemented due to lack of funds
Chromium recovery		Not implemented due to cost of resin

Measures Taken After the Previous Project(s)

Measures	Benefits	Motives for Implementation
NONE		

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Electroplating and Metal Finishing Company C cited the following benefits of practicing IEM:

- Increased productivity
- Reduced operating costs
- Reduced waste treatment and disposal costs
- Improved worker health and safety

Driving forces for implementing IEM at Chrome Dazzler includes the following:

- Top management commitment
- Immediate realization of benefits
- Technologies are simple and easy to implement

- Immediate realization of benefits
- Waste assessment by trained and unbiased personnel to identify waste sources and waste minimization options

DENR issued a cease-and-desist order (CDO) to Electroplating and Metal Finishing Company C for violation of effluent discharge standards during the 1990s. During that time, business was also thriving for Electroplating and Metal Finishing Company C. The owner of Electroplating and Metal Finishing Company C, in the 1990s, was an active member of the Philippine Electroplaters Association (PEA). He also had a degree in engineering, thus, he was familiar with improving operations meant reducing pollution. His active membership in PEA also brought some peer pressure upon him to practice IEM. He was also exposed to various good practices and clean technologies through study tours in Japan and the United States. Electroplating and Metal Finishing Company C shifted to non-cyanide copper plating as brought about by the inclusion of cyanide in the chemical control order of DENR's Implementing Rules and Regulation of the Toxic Substances and Hazardous and Nuclear Wastes Act of 1990.

On the other hand, restraining force for Electroplating and Metal Finishing Company C for pursuing IEM is primarily financial (including the current economic crisis)

V. FUTURE PLANS

Electroplating and Metal Finishing Company C has no future plans for IEM and for expansion. The owner intends to close down operations at Electroplating and Metal Finishing Company C upon his retirement.

VI. CONCLUSION/EVALUATION SUMMARY

Operations at Electroplating and Metal Finishing Company C had drastically been reduced as compared to its previous scale when it participated in various IEM projects. Being a family corporation, the owner originally intended his son to take over its operation upon his retirement. However, with the current economic situation, he had discouraged his son from going into electroplating. He had, in fact, persuaded his son to venture into marketing instead. This situation had made Electroplating and Metal Finishing Company C management to reduce IEM as his last priority.

2.2.15 Electroplating and Metal Finishing Company D

I. PLANT BACKGROUND

Electroplating and Metal Finishing Company D started in 1962 merely as a small trading business with only about 5 imported motorcycles (motorbikes) for sale and 10 employees. Since then, it has grown into one of the country's leading manufacturers of motorbikes producing about 45,000 units/year (or gross sales of about P2.8 billion for 2002).

The company has also been providing employment to over 700 workers since the early nineties 2002. It has reported modest net earnings in 2002 amidst competition and the financial crisis in the last few years.

Electroplating and Metal Finishing Company D today manufactures/fabricates and assembles the various parts of motorcycles. Most of the parts are locally fabricated except the engine and few other parts that are imported directly from Japan. There are 2 facilities – the metal preparation facility and the finishing and assembly facility.

The company's metal finishing facility has been adopting an efficient electrostatic painting process since 1999 at over P50 million investment, an investment they readily recovered due to the significant reduction in material wastage from the old spray painting process.

Electroplating and Metal Finishing Company D volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1994. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II PROCESS DESCRIPTION

Input	Process/Operation	Output	Waste Management Practice
➤ Metal/steel plate	1. Blanking (press machine)	➤ Scraps	➤ Sold
	2. Boring, Trimming	➤ Scraps	➤ Sold
➤ Electricity ➤ Welding rod	3. Sub-assembly	➤ Slags, waste rod ends	➤ Municipal dumpsite
➤ Chemicals ➤ Brush, cloth	4. Buffing, Anti-rust application	➤ Spent solution ➤ Dust/fines	➤ Recycled / WTP ➤ Collectors/dumpsite
➤ Degreasers, phosphates ➤ RO water ➤ Fuel	5. Degreasing, phosphating, rinsing, drying	➤ Spent chemicals ➤ Wash water	➤ WTP ➤ Drain canal/sewer
➤ Reducers ➤ Acrylic paint	6. Electrostatic painting	➤ Sludge/spent paint ➤ Empty cans	➤ Accumulated/ contained ➤ Sold
➤ Fuel	7. Baking oven	➤ Hot air emissions	➤ Vent/stack
➤ Engine oil ➤ Labels	8. QC, Final assembly, storage	➤ Empty cans ➤ Rejects/waste	➤ Sold ➤ Municipal dumpsite

III IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Simple housekeeping (5S)	• Reduced waste generation	Minimal	Still on-going
2. Selling of scraps, trimmings, empty containers, crates, etc.	• Reduced disposal costs • Added revenue	None	Still on-going
3. ENERCON programs in the early nineties in response to the energy crisis	• Reduced electricity usage	None	Still on-going

IEM Measures Proposed by IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Replace atomized spray with electrostatic painting process	• Lower paint usage • Lower waste generation • Added revenue	>P50 M	Very good results (investment readily recovered)
2. Improve handling/ storage to reduce dents	• Reduced reprocessing cost	None	On-going
3. Reduce inventory of parts	-	-	Not

Measures	Benefits	Implementation Cost	Remarks
from 1 mo to 2 weeks			implemented (production/supply issue)
4. Use of cathodic protection technique instead of chemical for rust control	<ul style="list-style-type: none"> Reduced chemical use Reduced waste generation/disposal 	N.D.	Use RO rinsing to reduce rust formation on parts
5. Use silica gel for moisture control in parts storage area	-	-	Not implemented (uneconomical)
6. Use counter current rinsing process	<ul style="list-style-type: none"> Lower water use Reduced wastewater 	N.D.	On-going
7. Drag-out reduction	<ul style="list-style-type: none"> Chemical savings Reduced wastewater 	N.D.	On-going
8. Bulk ordering of paint, chemicals, etc.	-	-	Not implemented (supply issue)
9. Paint light-colored parts before dark-colored ones	<ul style="list-style-type: none"> Reduced water use/wash water volume 	None	On-going
10. Use teflon lined paint booths against steel lined	-	-	Not implemented (requires new tank)
11. Filter the degreasing and phosphating solutions	-	-	Not implemented (filter disposal, uneconomical)
12. Recycling portions of used degreasing, phosphating solutions	<ul style="list-style-type: none"> Reduced chemical use/waste generation 	None	On-going
13. Reuse final rinsing water in preparation of new chemical solutions	<ul style="list-style-type: none"> Reduced chemical use/waste generation 	None	On-going
14. Collection/recovery of VOCs from vents	-	-	Not implemented (uneconomical, too technical/costly)

IEM Measures Taken after IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Replacement of atomized paint spray process to electrostatic painting	<ul style="list-style-type: none"> Waste/cost reduction 	>P50 M	Very good (high return in investment)
2. Upgrading of WTP in 2001 (clarifier, aeration, filtration) instead of just settling	<ul style="list-style-type: none"> Improved regulatory compliance Improved company image 	P700T plus P300T/mo.chemical costs	Meets regulatory compliance most of the time
3. Massive cost/waste reduction program (paper recycling, etc.)	<ul style="list-style-type: none"> Reduced solid waste generation Added revenue 	None	On-going

BENEFITS, DRIVING AND RESTRAINING FORCES

➤ NTI has gained the following benefits, among others:

- Improved productivity
- Reduced operating costs
- Improved public health/environmental benefits
- Improved company image

➤ Driving factors:

- Management commitment
- Benefits can readily be realized
- A motivated workforce
- Simple and easy to implement IEM programs

Norkis Trading, Inc. started simply as a small trading store with an initial 5 motorcycle vehicles. For over 4 decades it has grown into a sole trader of one brand of motorcycle nationwide. The strong commitment of top management to pursue continuous improvement in all facets of its operations (such as productivity and cost efficiency measures).

Its pro-environment advocacy started in the mid nineties when IEMP introduced them to the concept of waste minimization at the time when they were faced with substantial wastage of oversprays plus the subsequent disposal of the associated hazardous wastes. At that time they were still using the atomized paint spray method in finishing/painting the metal parts. Because of IEMP, they were convinced of the benefits of waste minimization programs - reduction in operating costs and at the same time reduction in waste/compliance problems. As a result they invested heavily to replace their old spray painting process with electrostatic painting method. Investments were recovered very quickly and they are now reaping the full benefits.

Also, the good corporate climate prevailing and the benefits provided by the company enable the workers to do hard work. It also encourages them to continue working on continuous improvement and waste reduction programs.

Lastly, the company prioritizes simple, low cost IEM measures whose benefits can readily be recovered.

➤ Restraints:

- Financial
- Economic
- Organizational problems/conflicts

These appear to be only minor issues against IEM. There seems to be no major restraining factors in pursuing IEM at Norkis. This company is quite convinced for as long as the IEM measures can pay off and improve their bottomline.

FUTURE PLANS

- Effluent control – plant experiences high effluent COD level on few occasions. They are now looking at better treatment alternatives.

- Hazardous waste management – temporary storage of spent paint/sludge will soon be full (in about 7 years). Plant is now looking for feasible waste paint treatment options/waste treaters.
- Noise – plans to relocate press machine operations to another area

CONCLUSIONS/EVALUATION SUMMARY

NTI's implementation of IEM programs may best be classified as successful. Factors that contributed to the company's success in IEM are as follows:

- To remain competitive in the industry amidst very stiff competition. Continuous drive for productivity improvements by reducing operating costs. Incidentally, most of these cost reduction/productivity improvement measures involved reduction in waste generation as they themselves experienced.
- Projects should be able to recover quickly its investments (like their electrostatic painting process)
- Meeting regulatory standards appears secondary/minor for NTI.

2.2.16 Food Processing Company A

I. PLANT BACKGROUND

Food Processing Company A has been in the manufacture of carageenan from sea weeds since 1978. Valued at P1 Billion in 1993, it now has about 460 workers (40% are regulars). Last years estimated sales output was placed at 6 tons/day or some P700 million and all products are for export.

Food Processing Company A currently produces semi-refined and refined carageenan. The process employed by this plant are as follows: sorting and KOH washing of sea weeds, chopping, extraction, filtration, gelation, filtration, palletizing, drying and finally blending to the desired customer specifications.

The company volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1994. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Waste Management Practices
➤ Sea weeds	Sorting (manual)	➤ Trash/foreign waste matter	➤ Municipal dumpsite
➤ KOH ➤ Water	Washing (counter flow), chopping	➤ Spent alkali	➤ WTP (equalization, Act Sludge, settling)
➤ Air ➤ Steam	Air blowing Extraction tank (90 C)		
➤ Decalite	Leaf filtration	➤ Filter cake	➤ Waste pit onsite
➤ Ammonia refrigerant	Gelation (90 to 30 C) (Heat exchanger)	➤ Ammonia recycle	
	Filter press, Pelletizing	➤ Filtrate (mainly water)	➤ WTP

Input	Process Flow Diagram	Output	Current Waste Management Practices
➤ Steam	Fluidized Drying		
	Milling/Blending, bagging	➤ Spills/fines	➤ Filters – vent
	Export market		

III. IEM MEASURES

Prior to Previous Project(s)

Measures	Benefits	Costs/Inputs	Remarks
1. GMP practices (installed screens on windows, etc.)	<ul style="list-style-type: none"> Improved product quality Reduced rejection 	Minimal	Still working
2. Put up emergency response team - 1994	<ul style="list-style-type: none"> Emergency preparedness 	ND	Still working/ in place
3. Basic housekeeping practices (e.g. use of squeegees or dry cleaning as much as possible or prior to wet cleaning)	<ul style="list-style-type: none"> Water use reduction Waste reduction 	Minimal	Still on going
4. Installation of WTP (simple aeration)	<ul style="list-style-type: none"> Regulatory compliance 	ND	Upgraded already
5. Shifting from batch to continuous refinery process in 1993-94	<ul style="list-style-type: none"> Improved productivity, reduced waste generation 	No data	Good

Proposed by Previous Project(s)

Measures	Benefits	Costs	Remarks
1. Provide platforms at sea weed storage to improve cooling	-	-	Accepted pre-dried sea weeds from suppliers
2. Removal of sand/silt from sea weeds (manual shaking)	<ul style="list-style-type: none"> Reduced solid wastes 	-	- Used instead perforated drums
3. Employing more manual labor for sorting (community commitment)	<ul style="list-style-type: none"> Reduced solid wastes 	Added labor	-
4. Giving incentives to suppliers with clean sea weeds	<ul style="list-style-type: none"> Reduced solid wastes 	-	-
5. Reorient makeup water pipe directly to seaweeds being washed	-	-	Process had been changed
6. Provide tarpaulin cover to protect KOH bags (storage yard)	<ul style="list-style-type: none"> Reduced chemical loss 	ND	-
7. Provide cover to KOH solution tank to avoid evaporation loss	<ul style="list-style-type: none"> Reduced KOH use 	ND	-
8. Monitor KOH in final washing if it can be reused	<ul style="list-style-type: none"> Cut KOH use 	ND	-
9. Dry cleaning before any wet cleaning operations	<ul style="list-style-type: none"> Cut water use 	None	-
10. Transfer seaweed cutting before alkali washing	-	-	Possible carageenan loss

Measures Taken After the Previous Project(s)

Measures	Benefits	Costs	Remarks
1. Secured the ECC	<ul style="list-style-type: none"> Regulatory compliance 	ND	Accomplished 1997
2. Sponsorship for coastal clean-up, tree planting off-site	<ul style="list-style-type: none"> Corporate image Community commitment Regulatory compliance 	ND	Still on-going
3. Joined efforts with the Coastal Resource Mgt Project (CRMP) as sponsor for IEC activities	<ul style="list-style-type: none"> Corporate image 	ND (substantial)	CRMP ended 2002
4. Collection of rainwater for irrigation	<ul style="list-style-type: none"> Reduced water use 	Minimal	On-going
5. Reuse of filter cake as soil conditioner (delivered/given free to farmers)	<ul style="list-style-type: none"> Reduced waste disposal Improved image 	Minimal	On-going
6. Provision of PPE for workers in noisy and at KOH treatment areas	<ul style="list-style-type: none"> Corporate image Worker health/safety 	ND	On-going
7. On-going training on EMS (ISO 14001)	<ul style="list-style-type: none"> Corporate image/market competitiveness 	ND	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

Among the benefits gained by Food Processing Company A from implementing waste minimization and related IEM include the following:

- Reduced liability (penalties/fines)
- Improved public health/worker safety
- Improved corporate image
- Reduced waste treatment/disposal costs

Driving factors:

- Management commitment/directive
- Easy to implement waste minimization/IEM options
- Benefits can readily be realized

Food Processing Company A is now owned by a multi-national corporation. Top management/corporate directive from its headquarters overseas compels them to pursue IEM. For more than a decade now since the new management took-over, they have been staunch supporters of marine water clean-up in the locality. Realizing the fact that their main input raw materials come from the sea, they have been a supporter/donor of a nearby marine sanctuary and had also taken an active role in the Coastal Resource Management Project of the USAID from 1996 to 2000.

Food Processing Company A has its own form of EMS. They take part in various community development projects in response to its corporate social obligations policy.

Lastly, they are mostly encouraged to implement IEM options whose benefits can be readily realized.

Restraints:

- Financial
- Economic
- Organizational issues
- Conceptual/Institutional issues

Financial, economic as well as organizational issues appear to be stumbling blocks in pursuing IEM. Most of the IEM measures implemented involved low-cost and easy to implement measures. Most of these measures involved local labor as well. This is their contribution to their commitment to provide jobs to the local residents.

Institutional is another factor as indicated in the surveys. The PCO holds a low-key, non-supervisory position in the organization yet he is the only person handling environmental and community development-related matters. Quite clearly, the PCO is not so comfortable with his present position.

V. FUTURE PLANS

- Energy conservation – Plans to cut costs in its aeration systems (process and treatment systems)
- Effluent – consistency in meeting TSS in effluent e.g. installing screens before activated sludge)
- Non-Hazardous wastes – Commercial applications of filter cake as commercial soil conditioner

VI. EVALUATION SUMMARY

Food Processing Company A as observed during the recent evaluation assessment shows that it has implemented most (70%) of the IEMP suggested waste minimization measures. In fact, it has gone beyond waste minimization. Food Processing Company A has become more and more environmentally aware of the value nature has given them – their material inputs sea weeds.

Food Processing Company A has been in recent years very supportive of marine water clean up, and has even provided funds for a nearby marine sanctuary. It has also taken part in the Coastal Resource management Project (CRMP) in 1996 – 2000.

2.2.16 Food Processing Company B

I. PLANT BACKGROUND

Food Processing Company B is engaged in biscuits manufacture. The plant is complemented with a workforce of 90 regular employees and 85 part time employees.

The management participated in MEIP program with the objective of learning additional options to minimize wastes and to reduce pollution load to the environment. The focus area is in production where most liquid wastes are generated.

As participant to the EMPOWER waste minimization assessment, site visit in the plant located at Mambunga, Antipolo City was conducted on February 17, 2003. The responsible persons contacted were Engr. A, Plant Engineer and Mr. E, the PCO.

II. PROCESS DESCRIPTION

The raw materials used in the manufacture include flour, vegetable shortening, edible oil, sugar and water. The manufacturing process includes:

1. mixing of the ingredients or raw materials
2. preparation of base or dough
3. cooking in the oven
4. quality control of the product
5. packaging

The table below outlines the general processes, flow diagrams and current waste management practices at Food Processing Company B

Input	Process/Operation	Output	Current Waste Management Practice
Flour, sugar, Vegetable oil, Butter	Raw material Preparation	Packaging materials	Collected and sold to Scrap buyers
	Mixing	Spilled ingredients	Floors cleaned using tissue paper and mops.
-do-	Cooking in oven	Exhaust fumes	The ovens use LPG, fumes vented to atmosphere
Water, left-over mixed residue	Cleaning of mixing vats	Wastewater	To WTP

III. IEM MEASURES

Listed below are IEM measures undertaken by Food Processing Company B prior to, during and after the MEIP project.

Prior to Previous Project(s)

Measures	Benefits	Cost/Input	Motives for Implementation
Flushing down raw materials using water	Easy cleaning of floors		Housekeeping practices
Recycling packaging materials	Added revenue when sold		Solid waste reduction
Operation of WTP	Environmental protection		Regulatory compliance

Proposed by Previous Project(s)

Measures	Benefits	Remarks
Water conservation	Reduced water usage/cost	Implemented
Screen installation at canals in production area	Reduced pollution load	Implemented
Using brooms to remove raw material spills and product rejects	Reduced load to WTP	Implemented
Awareness training of personnel on waste minimization	Increased productivity	Implemented

Measures Taken After the Previous Project(s)

Measures	Benefits	Motives for implementation
Adoption of good house keeping practices	Reduced waste generated	Cleanliness/waste reduction
Selling used edible oil	Added revenue, less load to WTP	Pollution prevention
Selling used packaging materials	Added revenue	Solid waste reduction
Regular cleaning of canal screens	Reduced load to WTP	Solid waste reduction

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

The benefits derived the management in practicing waste minimization include increased productivity, reduced costs in production operation, and compliance to DENR regulations by meeting effluent standards.

Driving forces:

- Management support
- Technologies are simple and easy to implement
- Compliance to LLDA/DENR regulations in view of strict monitoring of companies near the Laguna Lake area

The program has the full support of the management especially in the areas where costs can be reduced and quality of products can be improved. Attendance to awareness seminars by the management or his representative is encouraged to further exchange technical information on cleaner production and good manufacturing practices. The PCO claims their effluent meets LLDA/DENR limits.

Restraints:

- Technical limitation of the personnel/staff
- Typical worker's culture which takes sometime to adopt to change

The technical limitation of the staff appears to be a minor issue since according to the PCO, the management is doing its best to make people aware of the program through re-echo training on waste minimization.

V. FUTURE PLANS

The plant engineer has proposed to improve the flooring of the production area by replacing them with materials which are easy to clean. Other areas where wastes can be reduced are still being looked into.

VI. CONCLUSION/EVALUATION SUMMARY

The company management has shown great interest to minimize waste in the plant and to increasing plant productivity. The company has implemented options to further cut costs and reduce wastes in the production area and is still open to other recommendations in this aspect.

2.2.17 Food Processing Company C

I. PLANT BACKGROUND

Food Processing Company C started its flour milling factory in Lapu-lapu City in 1965. The plant's initial value then was approximately P50 million and had a workforce of 100. As a food factory, Food Processing Company C's operations had gradually expanded through the years as the country's population also had its upward trend. Present operating workforce is 800, mostly regular workers.

During the last 10 years, GFood Processing Company C added to its flour business, the following products: animal feeds, and then later added snack foods, yeast, and noodles in its product lines. In 2002, Food Processing Company C had a sale of over P1 billion and modest net earnings as reported.

Food Processing Company C took part in the waste minimization project of IEMP (Industrial Environmental Management Project). IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process/Operation	Output	Waste Management Practice
	<i>(Flour milling)</i>		
➤ Wheat grains (imported)	1. Receiving/ Inspection		
➤ Energy/ electricity	2. Milling (series)	➤ Empty bags ➤ Dust/fines	➤ Sold ➤ Recovered (for animal feed plant)
➤ Additives ➤ Cloth bags	3. Packing (warehouse)	➤ Dust/fine ➤ Rejects	➤ Collected in bag/cyclone filters and sent to feed mill
	4. Warehouse/ storage		
<i>Note: For specialty flour like cake flour, bleaching process (by Fluorine method) follows after milling and before packing.</i>			
	<i>(Snack food line)</i>		
➤ Corn (raw material)	1. Receiving		
➤ Steam/fuel	2. Cooking	➤ Condensate ➤ Air emissions	➤ Recovered to boiler ➤ Stack
	3. Grinding, forming/sheeting	➤ Rejects/fines	➤ Sent to feed mill
➤ Vegetable Oil ➤ Fuel ➤ Additives	4. Frying	➤ Used oil (minimal) ➤ Air emissions	➤ Sold ➤ Stack
	5. Air cooling		
➤ Alum. Foil	6. Packing/ storage	➤ Packing rejects	➤ Accumulated on-site
	<i>Yeast production</i>		
➤ Yeast culture	1. Fermentation		
➤ Cooling water	2. Cooling	➤ Spent coolant	➤ Cooling tower(recycle)
	3. Liquid separation	➤ Filtrate (wastewater)	➤ WTP
	4. Filtration (press)	➤ Filtrate (minimal)	➤ WTP
	5. Extrusion	➤ Fines/spills	➤ Sent to feed mill
	6. Drying/grinding	➤ Fines/spills	➤ Sent to feed mill
➤ Packaging materials	7. Packing/storage	➤ Reject bags	➤ Sold
	<i>Noodles line</i>		

Input	Process/Operation	Output	Waste Management Practice
➤ Flour ➤ Other additives	1. Mixing	➤ Empty bags	➤ Sold
➤ Steam	2. Cooking	Condensate	➤ Recycle
	3. Forming	➤ Spills	➤ Sent to feed mill
➤ Bags	4. Packing/ storage	➤ Reject bags	➤ Sold

III. IEM MEASURES

IEM Measures Taken before IEMP

IEM Measures	Benefits	Implementation Costs	Remarks
1. Old WTP (Anaerobic digestion followed by aerobic aeration, final clarification)	• Reduced effluent BOD, other parameters	P50 million	Color failed DENR standards
2. Basic housekeeping practices, 5 S	• Reduced waste generation	None	Still on-going
3. Use of biogas from digester as boiler fuel	• Reduced waste generation • Lower fuel cost/operating cost	N.D.	Still on-going

IEM Measures Proposed by IEMP

IEM Measures	Benefits	Implementation Costs	Remarks
1. Enhanced recycling/reprocessing all rejects to feed mill as much as possible	• Reduced waste generation/disposal • Added production of animal feeds	None	Very good
2. Selling of empty drums, carboys, trash, cartons, scraps, other containers	• Reduced disposal • Added revenue	None	On-going
3. Returning to suppliers empty containers of chemicals (for RO maintenance)	• Eliminated disposal costs	None	On-going
4. Giving the reject foils (packaging) to barangays for livelihood project (making pillows, other ventures)	• Reduced disposal/waste storage problems	None	On-going

IEM Measures Taken after IEMP

IEM Measures	Benefits	Implementation Costs	Remarks
1. Upgrading of WTP in 1999	• Improved/meets DENR standards	P1 million	Still on-going
2. Replaced solid fuel with bunker oil in boiler in late 1995	• Improved compliance to air standards	P1 million	Still on going
3. Reprocess all rejects from yeast, noodles, snack food lines to feed mill	• Added revenue • Reduced waste generation/disposal	N.D.	Still on going
4. Modification from single to countercurrent flow in yeast separation	• Reduced waste generation/disposal	P3 million	Still on going, very good
5. Collection of rain water (for irrigation)	• Reduced water use	N.D.	Still on going (rainy season)
6. Started implementation of ISO 9001 in 2000		<P1 million	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

- Among the benefits and lessons GMC learned from waste minimization efforts include the following:
 - Reduced operating costs
 - Reduced waste treatment/disposal costs
 - Increased productivity
 - Reduced risks of liability (DENR fines)

- Driving factors
 - Management commitment
 - Simple and easy to implement IEM programs
 - They have a technically inclined PCO

The top management commitment of this company is the main driver in pursuing IEM. Food Processing Company C has been the leader in the flour milling industry. To maintain its dominance in the market and continued business operations, plant management commits to comply with the environmental regulatory requirements. However, most of these programs involved end-of-pipe treatment. In fact it has invested much in the upgrading of its wastewater treatment plant because for fear of regulatory non-compliance.

The company's motivated and technically competent PCO/environmental officer is also a big factor in its IEM programs. He participates actively in PCO and other related technical forums in the area.

Recently, the plant has embarked on implementing an EMS based on ISO 14001 standard. In fact it has already started looking for external local consultants who could train their staff in implementing the EMS.

The plant management is very willing only to adopt simple, low cost IEM measures. Also they are not so focused on waste minimization/reduction strategies such as recycling because of apprehensions that these might affect product quality.

- Restraints
 - Organizational (PCO has multi-tasks)
 - Policy-related
 - Conceptual/institutional

The PCO and environmental officer of the plant holds a supervisory position. However, the position is multi-tasking and may not well compensated. He appears the only environmental advocate (cause champion) in the organization. Clearly this mess looks like some form of organizational/conceptual/ institutional or policy in nature.

V. FUTURE PLANS

- Energy – to meet the new energy baseline target based on 2002 energy audit done by external consultant, Food Processing Company C plans to install/replace old equipment with more efficient ones, use smaller and efficient motors, and possibly modification of some processes as well.

- Effluent – currently facing some problems with high TSS in effluent, Food Processing Company C plans to install an efficient final clarifier to replace the ordinary settling tank.
- Emissions control – the old power plants/boilers have poor emissions (TSP). Food Processing Company C now plans to rehabilitate these units to meet the Clean Air Act standards.

VI. CONCLUSION/EVALUATION SUMMARY

Based on the survey assessment done, it is concluded that Food Processing Company C has not done sufficient waste minimization programs before, during and even after participating in past IEM programs. The main reason could be Food Processing Company C's fear that doing so may affect the product quality, an image they greatly value as a leader in the flour milling business.

Food Processing Company C's focus is more on end-of- pipe treatment rather than on preventive strategy.

2.2.18 Food Processing Company D

I. PLANT BACKGROUND

The company is engaged in the manufacture of food noodles from corn starch. It started operation in 1991 from an initial capital of about P40 million. The plant facility, located at Tanay, Rizal operates in 2 shifts and is complemented with a workforce of around 100 employees.

The company participated in ECOP cleaner production/waste minimization program in 1995. Among the objectives include cost reduction from practicing cleaner production in the plant facilities.

As participant to the Empower waste minimization assessment, the plant visit was conducted on February 26, 2003. The responsible person contacted was **Mr. F**, the Engineering Supervisor.

II. PROCESS DESCRIPTION

The manufacturing process involves the following:

1. preparation of the raw material ingredients
2. mixing corn starch with water
3. cooking of the mixed product using steam
4. extrusion process to produce noodle strips
5. washing of the strips
6. draining the water
7. drying
8. packaging

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices at Hoc Bee Manufacturing.

Input	Process/Operation	Output	Current Waste Management Practice
Corn starch Water	Preparation/mixing	Packaging materials	Collected/sold to scrap buyers
		Spilled materials	Collected/stored
	Cooking with steam	Flue gas from boiler	Exhausted thru smokestack
	Washing of noodle strips/draining	Wastewater	To WTP
		Spilled noodle strips	Collected and sold as feeds

III. IEM MEASURES

Listed below are IEM measures undertaken by Hoc Bee Manufacturing prior to, during and after ECOP project.

Prior to Previous Project(s)

Measures	Benefits	Cost/Input	Motives for Implementation
Recycle packaging materials	Reduce solid waste	N/A	Solid waste reduction
Operating WTP	Environmental protection	N/A	Compliance to regulations

Proposed by Previous Project(s)

Measure	Benefits	Remarks
Recover condensate from boiler and use as feed water	Energy savings/recovery	Implemented
Installation of screens to canals leading to WTP	Reduced solids to WTP	Implemented
Recycle cooling water	Water usage minimization	Implemented

Measures Taken After the Previous Project(s)

Measures	Benefits	Motives for Implementation
Expansion of WTP	Accommodate additional load	Compliance to regulations
Condensate recovery	Energy savings	Cost-cutting measures
Monthly productivity meeting/house keeping practices	Reduction in wastes/downtime	Productivity improvement

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

The company's benefits from practicing IEM include increased productivity, compliance to regulations and reduced operating costs.

- Driving forces:
 - Management support
 - Cost reduction
 - Compliance to LLDA/DENR regulations

Participation to the ECOP program was prompted by the company's desire to reduce its operating cost and enhance plant productivity. The company hopes to sustain efforts on waste minimization by realizing gains from previous waste minimization project.

- Restraining Forces
 - Financial constraints
 - Worker's attitudes

- Technical limitation of the staff

The management despite its limited budget is incorporating environmental protection in its business agenda, but welcomes future projects which will help company in reducing impact of its activity to the environment.

V. FUTURE PLANS

The management shall continue maintaining and monitoring the WTP, study other areas in the plant where cost reduction and waste minimization can be applied.

VI. CONCLUSION/EVALUATION SUMMARY

The management has demonstrated its dedication to implement waste minimization options. While they have already sustaining such implementation, they are still open to recommendations and other options to increase further its productivity at the same time reduce wastes.

2.2.19 Food Processing Company E

I. PLANT BACKGROUND

Food Processing Company E is relatively a new player in the carageenan business. It started only in 1994 with a capital outlay of about \$30 million. Food Processing Company E processes locally treated sea weeds (cottoni and spinosom species) and raw (Chilean) mainly for exports.

Plant production is about 4 tons/day of refined carageenan and sales volume last year reached some P260 million. It currently employs 180 workers mostly regularly employed.

The production of refined carageenan involves the following operations: raw material shredding, extraction, filtration, neutralization, ultrafiltration, alcohol precipitation, classification, alcohol distillery, drying, milling and blending.

The company volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1996. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Waste Management Practices
➤ Seaweeds(sorted)	Shredding	➤ Fine sea weed	➤ Municipal dumpsite
➤ KOH, Water	Extraction	➤ Wash water	➤ WTP (Act. Sludge)
➤ Filter aid	Filtration	➤ Filter cake	➤ Soil conditioner
➤ Chemical	Neutralization	➤ Waste water	➤ WTP
	Ultra-filtration	➤ Wastewater	➤ WTP
➤ Alcohol (IPA)	Alcohol precipitation	➤ Alcohol	➤ Distillery (recovery)
	Drying and Milling		

Input	Process Flow Diagram	Output	Current Waste Management Practices
➤ Packing materials	Blending, packaging		
	Refined product		

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Implementation Cost	Remarks
1. GMP practices /housekeeping practices. Not much IEM because they were new then (started operations 1996)	<ul style="list-style-type: none"> Reduced wastes 	Minimal	Still on-going
2. Installation of WTP (complete activated sludge process).	<ul style="list-style-type: none"> Regulatory compliance 	ND	Working well

IEM Measures Proposed by IEMP

Measures	Benefits	Implementation Costs	Remarks
1. Reuse of condensate from dryers, other areas as boiler feed water	<ul style="list-style-type: none"> Water use Fuel savings 	Minimal	Still continuing
2. Recycling filter wash water	-	-	Proven ineffective
3. Reuse permeate and filter wash water for dilution	-	-	Potential quality effects
4. Reuse effluent for irrigation	-	-	No existing piping (requires cost)
5. Using filter cake in cement /hollow blocks making	-	-	They are not so keen on recycling
6. Reuse spent acid and alkali for chemical preparation	-	-	Not interested on recovery
7. Reduction of filter aid dose	<ul style="list-style-type: none"> Material savings Reduced sludge disposal 	None	Still continuing
8. Use tap water instead of softened water for domestic use	Reduced operating costs	None	Yet to be implemented 2003
9. Reuse IPA distillery bottoms and permeate after bleaching	-	-	High chloride content of IPA

IEM Measures Taken after IEMP

Measures	Benefits	Costs	Remarks
1. Replaced plate/frame exchanger with shell and tube for IPA distillery reboiler	<ul style="list-style-type: none"> IPA savings/recovery Fuel savings 	P7 M	Working well
2. Installed new type (bubble) diffusers	<ul style="list-style-type: none"> Reduced power usage 	P1 M	Working well
3. Use lagoon (added) for additional polishing	<ul style="list-style-type: none"> Improved compliance 	P300T	Doing well
4. Reuse waste heat of UF permeate to preheat feedwater to hot tank	<ul style="list-style-type: none"> Fuel savings Cut water usage 	Minimal	Working well
5. Additional heat exchanger for cooling of IPA bottoms and permeate before WTP	<ul style="list-style-type: none"> Improved WTP performance/ compliance 	P200T	Doing very good

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

- Food Processing Company E has gained the following benefits:
 - Improved productivity
 - Reduced operating costs/waste treatment/disposal costs
 - Improved public health/worker safety
 - Improved corporate image

- Driving factors:
 - Management commitment/directive
 - Motivation from workers
 - IEM measures are easy to adopt and benefits can readily be realized

The Food Processing Company E plant is one of the newest manufacturers of refined carageenan in the country and is based about 100 km north of the city of Cebu. There is a strong management commitment and a relatively higher level of motivation from staff to pursue productivity and quality programs. In fact they have been doing a lot of improvements in their facility despite their being relatively new plant (operations started only in 1994). They have been doing productivity/quality programs, but they lack appreciation of the associated environmental benefits that these programs bring about. They perceive environmental or IEM as end-of-pipe or clean up technologies that have no returns on investments.

They will pursue IEM that are easy to adopt and where benefits (monetary or environmental) can readily be realized.

In general working conditions (morale) of the workers is high except perhaps of the PCO job. It was noted that the turnover of PCO among others is very high --- at least about 3-4 turnovers for the last 10 years.

- Restraints:
 - Financial
 - Conceptual/Institutional – there seems to be some hesitation on the part of some staff to initiate their own IEM programs. They seemed focused more on productivity programs and do not generally appreciate the associated environmental benefits of these productivity programs. IEM measures are only thought of when regulatory compliance becomes an issue.

There appears to be no serious hindrance in pursuing productivity improvement programs at his company, except that they most probably need to have proper understanding of environmental or IEM issues (e.g. environmental awareness training/seminars will help).

V. FUTURE PLANS

- Water conservation – Working on a piping line to replace softened water with tap water for domestic plant use

- Hazardous waste management – Plans to sell filter cake to cassava farmers in the locality

- Other

(1) to install reverse osmosis (RO) treatment for purification after ultrafiltration system

(2) to establish ISO 9001 and ISO 14001 soon

VI. CONCLUSIONS/EVALUATION SUMMARY

Food Processing Company E as shown in this recent survey has not implemented most of the waste minimization measures proposed by IEMP. They also had not done much on IEM even before IEMP. However, they did have some programs after IEMP, but most of them focused on productivity/energy with lesser impact on improving environmental performance.

Hence, it can be concluded that IEM implementation at Food Processing Company E has not been so successful. The main factor that might have contributed to this are:

- Hesitation of some technical staff because the plant is relatively new
- Financial issues

2.2.20 Food Processing Company F

I. PLANT BACKGROUND

Food Processing Company F first started as a small trading business of food commodities in 1978. It was only in 1982 that it started to venture into sea weeds processing for the production carageenan. Food Processing Company F is said to be the one of the pioneers in the industry.

When it started its capitalization (total assets) in 1983 was valued at some P10 million. Since then it has become one of the country's major producers carageenan to the world market. Slightly affected by the financial crisis, it managed to produce an average of 300 tons/mo in 2002 valued at about P1.4 Billion.

The company currently has about 500 workers (50% are regulars). The company's carageenan are in 2 grades: semi-refined for many applications and refined grade for a specific customer specification.

The process employed by this plant are as follows:

- a) Semi-refined: sorting, washing, cooking, chopping, drying, fine grinding, mixing, sterilization, and blending with additives
- b) Refined: same as semi-refined up to cooking, then rinsing, extraction, filtration, gelation, dewatering, drying, sterilization, fine grinding and blending.

Input	Process Flow Diagram	Output	Current Waste Management Practices
	<i>For refined product (same process up to post rinsing/chopping)</i>		
Hot water	Extraction		
Filter aid - Decalite	Filtration (plate/frame)	Filter cake	Land disposal/farms
Refrigerant	Gelation	Refrigerant-recycle	

Input	Process Flow Diagram	Output	Current Waste Management Practices
	Dewatering/press, drying	Filtrate (mainly water)	WTP
Steam	Sterilization		
	Grinding, bagging	Spills/fines	Filter-vent
	Export market		

The company volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1994. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Waste Management Practices
➤ Sea weeds	Sorting (manual)	➤ Trash/foreign wastes	➤ Municipal dumpsite
➤ Water	Washing	➤ Washwater	➤ WTP (equalization, Act. Sludge, SBR, settling)
➤ KOH, Steam	Cooking	➤ Spent alkali	
➤ Water	Post rinsing, chopping	➤ Washwater ➤ Solid waste	➤ WTP ➤ Return to process
➤ Steam	Drying <i>(Note: for Semi refined line only)</i>		
	Chopping, fine grinding	➤ Solid chips ➤ Fines	➤ Return process ➤ Baghouse (recovered)
➤ Additives	Mixing, final blending		
	Semi refined product		

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Implementation Cost	Remarks
1. GMP practices /housekeeping practices	<ul style="list-style-type: none"> Improved product quality Reduced rejection 	Minimal	Still on-going
2. Recycling of spilled sea weeds, and use of filter cake as soil conditioner (farms)	<ul style="list-style-type: none"> Added revenue Reduced waste/disposal 	ND	Still on going
3. Installation of WTP (full aeration).	<ul style="list-style-type: none"> Regulatory compliance 	ND	Fined at P9M – for failing class SD std since 1991

IEM Measures Proposed by IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Recycling of wash water from post rinsing operations (3 rinses)	<ul style="list-style-type: none"> Water use/waste water reduction 		
2. Recovery of KCl by collection in a sump tank	-	-	Contamination - dirty floor spills
3. Recycling of bleached wash water (chlorinated water)	-	-	Operational problems

IEM Measures Taken after IEMP

Measures	Benefits	Costs	Remarks
1. Upgrading of WTP (full activated sludge process with SBR)	<ul style="list-style-type: none"> Regulatory compliance 	P35 M	Accomplished 1998-99
2. Enhanced/aggressive screening of waste water before entering WTP	<ul style="list-style-type: none"> SW recovery (1 ton/mo SW recovered and reprocessed) Improved WTP efficiency/compliance 	ND	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

- Food Processing Company F has gained the following incentives:
 - Reduced operating costs
 - Reduced waste treatment/disposal costs
 - Increased productivity
 - Improved public health/worker safety
 - Improved corporate image
- Driving factors:
 - Management commitment/directive
 - Motivation from workers
 - IEM measures are easy to adopt and benefits can readily be realized

There is a high level of commitment from top management in this company mostly resulting from the standpoint of regulatory requirements and business competitiveness. It was also noted that the company has a highly motivated environmental group headed by a competent PCO/environmental officer. Their PCO is a relatively well placed position in this company.

- Restraints:
 - Financial
 - Economic
 - Technical (internal staff) – sea weed industry lacks specialized experts.

It is noted that financial and economic (competition) are main restraints for IEM in this company. Obviously, top management is at present looking for financial assistance in pursuing IEM. They are also in need of assistance for technical expertise on productivity/quality improvement especially on specific projects which have certain environmental benefits. They have in fact requested the IEM study/survey team to provide information on how to get assistance to programs/projects they can possibly take part.

V. FUTURE PLANS

- Energy conservation – Upgrading to use high efficiency motors/equipment
- Water conservation – R & D to work on process modification that does not use KOH in conversion of the sea weeds to facilitate extraction of carageenan.
- Emissions control – Still has to conduct stack sampling (No stack sampling service provider in the region)

- Non-Hazardous wastes – Limited storage available; Needs to have a better disposal option such as commercial applications of filter cake as soil conditioner and also possibly for composting.

VI. CONCLUSIONS/EVALUATION SUMMARY

Food Processing Company F as indicated in this recent survey has not shown much success in IEM implementation. It has only implemented a very limited number of IEM measures before, during, and even after the waste minimization project.

The major factor that might have contributed to its lack luster performance in IEM may be financial and economic issues. In fact it was indicated during interview that they had been looking for financial assistance (in terms of reasonable interest payment terms, etc.) to support future programs.

2.2.21 Metal Foundry A

I. PLANT BACKGROUND

The company was established on March 27, 1991 and began operation in September 1993. The Php 350 million plant is located in Canlubang Industrial Estate, Cabuyao, Laguna and is engaged in the manufacture of stainless steel and mild steel castings such as pump casings and covers, nose rings, grade plates. Its plant manpower complement consist of 149 personnel operating in two shifts.

An IEMP-PMA was conducted in the plant on June 29-30, 1995. The PMA team identified the following goals namely:

- Reduce waste sand generation by 50% in 7 months
- Reduce gouging dross generation by 30% in 6 months
- Reduce pickling, dye penetrant and domestic wastewater generation by 40%
- Recycle gouging dross, machining chips, waste sand, waste paper and other wastes that have high recovery values

II. PROCESS DESCRIPTION

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices at Metal Foundry A.

Input	Process/Operation	Output	Current Waste Management Practice
Wood, resin	Pattern making	Wood waste	To collection bin
Sand, binders	Mold/core making	Waste sand	Collected for succeeding process
Scrap metal, Alloying elements	Melting	Slags, oxides	Collected and stored
Molten product	Shake out	Waste sand	Collected and bagged
Product	Shot blasting/riser cutting	Waste sand and scales/metal cuts/dross	Collected and stored
Cast metal, caustic soda, acid	Pickling	Waste water	Neutralize waste
Cast metal, water, dye	Dye penetrant testing	Waste water	To WTP

III. IEM MEASURES

Prior to Previous Project(s)

Measures	Benefits	Cost/Input	Motives for Implementation
Waste sand reclamation	Waste reduction	N/A	Waste reduction
Selling metal chips and shavings	Added revenue	N/A	Waste reduction
Storing in drums dross and cut parts	Waste reduction	N/A	Waste reduction/Pollution prevention

Proposed by Previous Project(s)

Measure	Benefits	Remarks
Modify mold design per product basis	Reduced cost for molds	Implemented
Improve casting and riser design	Reduced cost on cut parts	Implemented
Control water pressure at source/install butterfly valve	Reduced water consumption	Implemented
Reduce chemical usage	Reduced cost in chemicals	Implemented
Recycle sprayed wastewater in DP testing	Reduced wastewater discharged	Implemented
Replace existing manual lathes with computer numerical control	Reduced downtime	Not implemented, but resorted to other options
Replace existing lamps with energy-efficient ones	Maximized lighting in production area	Implemented

Measures Taken After the Previous Project(s)

Measures	Benefits	Motives for Implementation
Upgrade skills of molders, operators and machinists thru training	Reduced downtime, materials wastage	Productivity improvement
Water conservation	Reduced water usage/cost	Cost cutting measures
Monitoring WTP performance	Meeting standards	Regulatory compliance
Maintaining implementation of waste minimization measures in 3.2	As stated	

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Benefits derived by the management in implementing waste minimization include increased productivity, reduced operating costs, compliance to regulations and improved health and safety of workers in the plant.

➤ Driving forces:

- Higher personnel productivity through better health, which is possible only in a clean environment
- Better community relations
- Preservation of the environment as a requisite for doing business over the long term
- Better profitability through reduced operating costs
- Better compliance with regulations through reduced volume of waste generation and possibly through reduced pollution loads

The PMA team identified the above forces to a successful waste minimization program. High productivity in the plant appears to be the primary objective and is attainable through upgrading of skills of operators and machinists, less raw material

wastage/reduced costs and heightening awareness on safety of the workers are the moving forces prioritized by the management.

➤ Restraints:

- A relative lack of concern among Filipino workers at Metal Foundry A towards preserving the environment
- “Ningas-cogon” (an attitude where people give whole-hearted support to a project at the beginning, but tapers off after a while) mentality of some personnel.

The above factors are normal to a medium-sized company. The management has tried to off-set these forces through awareness seminars in the plant on the importance of environmental protection.

V. FUTURE PLANS

The building up of stockpiled waste fine sand in plastic bags is now a concern of the management. They are looking in other options for additional revenue. Likewise, maintaining compliance to environmental regulations is now a primary concern. The Environmental Management System (EMS) implementation is also being considered by the management.

VI. CONCLUSION/EVALUATION SUMMARY

The management has demonstrated its desire to adopt waste minimization strategies in the plant. They had been successful in most aspects, although the PCO admits the company still has to address the increasing volume of waste sand in the plant. With the company’s intention to implement EMS, all these concerns will definitely be addressed.

2.2.22 Metal Foundry B

I. PLANT BACKGROUND

Metal Foundry B started in 1962 merely as a small trading business with only about 5 imported motorcycles (motorbikes) for sale and 10 employees. Since then, Metal Foundry B has grown into one of the country’s leading manufacturers of motorbikes producing about 45,000 units/year (or gross sales of about P2.8 billion for 2002).

The company has also been providing employment to over 700 workers since the early nineties 2002. It has reported modest net earnings in 2002 amidst competition and the financial crisis in the last few years.

Metal Foundry B today manufactures/fabricates and assembles the various parts of motorcycles. Most of the parts are locally fabricated except the engine and few other parts that are imported directly from Japan. There are 2 facilities of Metal Foundry B at 2 locations in Mandaue City– the metal preparation facility and the finishing and assembly facility.

The company’s metal finishing facility has been adopting an efficient electrostatic painting process since 1999 at over P50 million investment, an investment they readily recovered due to the significant reduction in material wastage from the old spray painting process.

Metal Foundry B volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1994. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process/Operation	Output	Waste Management Practice
➤ Metal/steel plate	1. Blanking (press machine)	➤ Scraps	➤ Sold
	2. Boring, Trimming	➤ Scraps	➤ Sold
➤ Electricity ➤ Welding rod	3. Sub-assembly	➤ Slags, waste rod ends	➤ Municipal dumpsite
➤ Chemicals ➤ Brush, cloth	4. Buffing, Anti-rust application	➤ Spent solution ➤ Dust/fines	➤ Recycled / WTP ➤ Collectors/dumpsite
➤ Degreasers, phosphates ➤ RO water ➤ Fuel	5. Degreasing, phosphating, rinsing, drying	➤ Spent chemicals ➤ Wash water	➤ WTP ➤ Drain canal/sewer
➤ Reducers ➤ Acrylic paint	6. Electrostatic painting	➤ Sludge/spent paint ➤ Empty cans	➤ Accumulated/ contained ➤ Sold
➤ Fuel	7. Baking oven	➤ Hot air emissions	➤ Vent/stack
➤ Engine oil ➤ Labels	8. QC, Final assembly, storage	➤ Empty cans ➤ Rejects/waste	➤ Sold ➤ Municipal dumpsite

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Simple housekeeping (5S)	<ul style="list-style-type: none"> • Reduced waste generation 	Minimal	Still on-going
2. Selling of scraps, trimmings, empty containers, crates, etc.	<ul style="list-style-type: none"> • Reduced disposal costs • Added revenue 	None	Still on-going
3. ENERCON programs in the early nineties in response to the energy crisis	<ul style="list-style-type: none"> • Reduced electricity usage 	None	Still on-going

IEM Measures Proposed by IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Replace atomized spray with electrostatic painting process	<ul style="list-style-type: none"> • Lower paint usage • Lower waste generation • Added revenue 	>P50 M	Very good results (investment readily recovered)
2. Improve handling/storage to reduce dents	<ul style="list-style-type: none"> • Reduced reprocessing cost 	None	On-going
3. Reduce inventory of parts from 1 mo to 2 weeks	-	-	Not implemented (production/ supply issue)
4. Use of cathodic protection technique instead of chemical for rust control	<ul style="list-style-type: none"> • Reduced chemical use • Reduced waste generation/disposal 	N.D.	Use RO rinsing to reduce rust formation on parts
5. Use silica gel for moisture control in parts storage area	-	-	Not implemented (uneconomical)
6. Use counter current rinsing process	<ul style="list-style-type: none"> • Lower water use • Reduced wastewater 	N.D.	On-going
7. Drag-out reduction	<ul style="list-style-type: none"> • Chemical savings • Reduced wastewater 	N.D.	On-going

Measures	Benefits	Implementation Cost	Remarks
8. Bulk ordering of paint, chemicals, etc.	-	-	Not implemented (supply issue)
9. Paint light-colored parts before dark-colored ones	• Reduced water use/wash water volume	None	On-going
10. Use teflon lined paint booths against steel lined	-	-	Not implemented (requires new tank)
11. Filter the degreasing and phosphating solutions	-	-	Not implemented (filter disposal, uneconomical)
12. Recycling portions of used degreasing, phosphating solutions	• Reduced chemical use/waste generation	None	On-going
13. Reuse final rinsing water in preparation of new chemical solutions	• Reduced chemical use/waste generation	None	On-going
14. Collection/recovery of VOCs from vents	-	-	Not implemented (uneconomical, too technical/ costly)

IEM Measures Taken after IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Replacement of atomized paint spray process to electrostatic painting	• Waste/cost reduction	>P50 M	Very good (high return in investment)
2. Upgrading of WTP in 2001 (clarifier, aeration, filtration) instead of just settling	• Improved regulatory compliance • Improved company image	P700T plus P300T/mo.chemical costs	Meets regulatory compliance most of the time
3. Massive cost/waste reduction program (paper recycling, etc.)	• Reduced solid waste generation • Added revenue	None	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

- Metal Foundry B has gained the following benefits, among others:
 - Improved productivity
 - Reduced operating costs
 - Improved public health/environmental benefits
 - Improved company image
- Driving factors:
 - Management commitment
 - Benefits can readily be realized
 - A motivated workforce
 - Simple and easy to implement IEM programs

Metal Foundry B started simply as a small trading store with an initial 5 motorcycle vehicles. For over 4 decades it has grown into a sole trader of one brand of motorcycle nationwide. The strong commitment of top management to pursue continuous improvement in all facets of its operations (such as productivity and cost efficiency measures).

Its pro-environment advocacy started in the mid nineties when IEMP introduced them to the concept of waste minimization at the time when they were faced with substantial wastage of oversprays plus the subsequent disposal of the associated

hazardous wastes. At that time they were still using the atomized paint spray method in finishing/painting the metal parts. Because of IEMP, they were convinced of the benefits of waste minimization programs - reduction in operating costs and at the same time reduction in waste/compliance problems. As a result they invested heavily to replace their old spray painting process with electrostatic painting method. Investments were recovered very quickly and they are now reaping the full benefits.

Also, the good corporate climate prevailing and the benefits provided by the company enable the workers to do hard work. It also encourages them to continue working on continuous improvement and waste reduction programs.

Lastly, the company prioritizes simple, low cost IEM measures whose benefits can readily be recovered.

- Restraints:
 - Financial
 - Economic
 - Organizational problems/conflicts

These appear to be only minor issues against IEM. There seems to be no major restraining factors in pursuing IEM at Metal Foundry B. This company is quite convinced for as long as the IEM measures can pay off and improve their bottomline.

V. FUTURE PLANS

- Effluent control – plant experiences high effluent COD level on few occasions. They are now looking at better treatment alternatives.
- Hazardous waste management – temporary storage of spent paint/sludge will soon be full (in about 7 years). Plant is now looking for feasible waste paint treatment options/waste treaters.
- Noise – plans to relocate press machine operations to another area

VI. CONCLUSIONS/EVALUATION SUMMARY

Metal Foundry B's implementation of IEM programs may best be classified as successful. Factors that contributed to the company's success in IEM are as follows:

- To remain competitive in the industry amidst very stiff competition. Continuous drive for productivity improvements by reducing operating costs. Incidentally, most of these cost reduction/productivity improvement measures involved reduction in waste generation as they themselves experienced.
- Projects should be able to recover quickly its investments (like their electrostatic painting process)
- Meeting regulatory standards appears secondary/minor for Metal Foundry B.

2.2.23 Metal Foundry C

I. PLANT BACKGROUND

Metal Foundry C has been in the business of manufacturing galvanized pipes of nominal sizes 12, 20, 25, 32, 38 and 50 mm diameter and 6 meter length for 23 years.

Plant operations started in 1976 with an initial capitalization of P10 million and 40 employees (75% were regular).

To date, it has a total workforce of 44 workers though operations peaked in the nineties with an average of 50 – 55 workers. Sales in 1992 reached about P45 million with a very minimal net earnings.

Metal Foundry C volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in March 1993. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process/Operation	Output	Waste Management Practice
<ul style="list-style-type: none"> ➤ Hot rolled coils ➤ Cooling water ➤ Lubricants 	1. Pipe Forming ting, recoiling, forming, welding)	<ul style="list-style-type: none"> ➤ Trimming, rejects ➤ Cooling water ➤ Spent lubricants 	<ul style="list-style-type: none"> ➤ Sold ➤ Recirculated ➤ Sold
<ul style="list-style-type: none"> ➤ HCl (35%) 	2. Acid Cleaning (pickling)	<ul style="list-style-type: none"> ➤ Spent pickling solution 	<ul style="list-style-type: none"> ➤ Sold/portions to WTP
<ul style="list-style-type: none"> ➤ Water 	3. Rinsing	<ul style="list-style-type: none"> ➤ Wash water 	<ul style="list-style-type: none"> ➤ WTP (neutralization)
<ul style="list-style-type: none"> ➤ Flux (Zn ammo-nium chloride) 	4. Pre-coating	<ul style="list-style-type: none"> ➤ Wastewater 	<ul style="list-style-type: none"> ➤ WTP
<ul style="list-style-type: none"> ➤ Air 	5. Drying		
<ul style="list-style-type: none"> ➤ Zn ingots ➤ Bunker oil 	6. Galvanizing	<ul style="list-style-type: none"> ➤ Zn dross ➤ Emissions 	<ul style="list-style-type: none"> ➤ Sold ➤ Stack/vent (dark during upsets, start-up, shut down)
<ul style="list-style-type: none"> ➤ Liquid Paint 	7. Finishing	<ul style="list-style-type: none"> ➤ Empty cans 	<ul style="list-style-type: none"> ➤ Sold
	8. Packing/storage		

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Putting off lights, air-conditioners after use and break times	<ul style="list-style-type: none"> • Reduced electricity consumption 	None	Still on-going
2. Simple housekeeping	<ul style="list-style-type: none"> • Reduced wastage 	None	Still on-going

IEM Measures Proposed by IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Drag-out reduction	<ul style="list-style-type: none"> • Reduced waste generation • Lower material use 	N.D.	Still on-going
2. Drag-out recovery	-	-	Small quantities; when spilled on floors it becomes contaminated
3. Material substitution (higher quality input from >98% to 99.9% Zn ingots)	<ul style="list-style-type: none"> • Improved product quality/efficiency • Cost savings • Lower waste (Zn dross) generation 	N.D.	Still on-going

Measures	Benefits	Implementation Cost	Remarks
4. Improved bath maintenance	<ul style="list-style-type: none"> Fuel savings Cleaner air emissions (lesser start-ups/shut downs) Increased revenue 	N.D.	Modified by continuous operations of the galvanizing bath and furnace for 5 days to save fuel and bath solution.

IEM Measures Taken after IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Work schedule change to minimize demand charge from electricity provider	<ul style="list-style-type: none"> Energy savings due to avoided penalty charges 	None	Continuing
2. Finding better market for spent pickling solution	<ul style="list-style-type: none"> Added plant revenue Reduced waste generation/WTP operating cost 	None	To start in 2003
3. Continuous operations of the galvanizing process for 5 days/week to optimize use of furnace and also bath solution (instead of operating only at daytime)	<ul style="list-style-type: none"> Reduced waste-water generation Improved productivity Increased revenue 	None	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

➤ Metal Foundry C by implementing waste minimization has gained the following benefits:

- Reduced liability risks
- Reduced treatment/disposal costs
- Reduced operating costs
- Increased productivity

➤ Driving factors:

- Willing to do when options/technologies are easy to implement
- A motivated workforce
- Benefits can readily be realized
- Management support

Metal Foundry Cs top management only wants to implement low-cost measures or any technology that are easy to implement and whose benefits can be readily realized. It appears that they are contented with the kind of operations they have at present.

They lack motivation to improve performance because of the perception that these are costly. But the plant manager stressed (by ticking management support and motivation in questionnaire) that they are interested to do measures to reduce operating costs wherever possible. He even cited implementing programs like changing working time at certain areas to 24 hours for few days instead 2 shifts/day for several days. The measure saved labor and at same time fuel.

➤ Restraints:

- Economic

- Financial
- Limited technical expertise

It appears that low market demand for construction (economic) and the very tight financial condition of the company are major stumbling blocks in pursuing IEM at this factory. Other factors include: lack of technical staff, and motivation of workers including management.

V. FUTURE PLANS

- Energy – still working on continuing improvement of its operations to cut energy bills.
- Effluent control – hopes to find a good market (higher price) for spent pickling solution than the present market price.

VI. CONCLUSIONS/EVALUATION SUMMARY

Implementation of IEM programs at Metal Foundry C is quite successful because of company's efforts to cut costs at the production area. Most of these cost reduction programs redound to reduction in waste generation.

2.2.24 Plastics and Rubber Manufacture A

I. PLANT BACKGROUND

The Judge Luna plant is one of 8 downstream plastics manufacturing facilities of Plastics and Rubber Manufacture A. It started operations in 1989 with an approximate capital of P10M and 33 employees (including 8 regulars). To date, it has a total of about 107 workers and processes some 400 tons of equivalent raw materials.

Since its establishment, the plant has been into the production of various plastic parts/components using the injection process for specific customer requirements. These plastics products are parts and components of leading home and office appliances that include among others the following:

- Refrigerators
- Televisions
- Washing machines
- Various electronics products

The Judge Luna plant took part in the Cleaner Production Project of International Labor Office (ILO). The project was supported by UNEP and funded by the Norwegian government. It was implemented by the Employers' Confederation of the Philippines (ECOP) in 1998.

II. PROCESS DESCRIPTION

Input	Process/Operation	Output	Waste Management Practice
➤ Assorted pigments ➤ Colorants	1. Raw material storage		
➤ Electricity	2. Mixing and material	➤ Empty bags	➤ Sold

	issuance		
➤ Cooling water ➤ Lubricant	3. Injection	➤ Scraps/mold runners/rejects ➤ Spent cooling water ➤ Spent lubricants	➤ Sold/reprocess ➤ Recirculated ➤ Sold
➤ Scraps/ mold runners	4. Regrinding and Palletizing	➤ Fines/final rejects	➤ Off-site own dump
➤ Paint	5. Finishing, Painting, Labeling	➤ Empty containers	➤ Off-site own dump
➤ Cloth/rags	6. Silk screen Cleaning	➤ Used rags	➤ Off-site own dump
➤ Packing materials	7. Packaging, storage	➤ Reject packing materials/scraps	➤ Sold

III. IEM MEASURES

Prior to Previous Project(s)

Measures	Benefits	Implementation Cost	Remarks
1. Use of robots (pickers) for mold design (1997)	<ul style="list-style-type: none"> Maintained cycle time for production Increased productivity 	P120T each for 7 robots	Stopped in 2000 due to customers specifications
2. Improvement in mold design	<ul style="list-style-type: none"> Eliminated secondary process Reduced wastage 	ND	Still on going

Proposed by Previous Project(s)

Measures	Benefits	Implementation Cost	Remarks
1. Removal of secondary packaging of colorant	-	-	Not implemented (fear of contamination)
2. Installation of dust collectors	<ul style="list-style-type: none"> Reduced wastage, material recovery 	ND	Still on-going
3. Reuse final rinse water for pre-rinsing/pre-wash	-	-	Not implemented (added labor cost)
4. Reduced rejection rates from 4% to 2%	<ul style="list-style-type: none"> Increased productivity, revenue 	ND	Continuing improvement
5. Segregation, reprocessing of rejects/trimmings	<ul style="list-style-type: none"> Reduced wastage, added revenue 	Minimal	Rejects/trimmings sold at higher value than reprocessed
6. Modification of spray painting/nozzle redesign	<ul style="list-style-type: none"> Reduced waste-water generation 	ND	Spray painting process eliminated
7. Replace ODS (freon, etc.)	-	-	Not implemented (RP deadline is by 2010 yet)
8. Improved insulation at injection machines	<ul style="list-style-type: none"> Improved working conditions 	P20T	Installed blowers/fans

Measures Taken After the Previous Project(s)

Measures	Benefits	Implementation Cost	Remarks
1. Installation of dust collectors	<ul style="list-style-type: none"> Improved working conditions 	P100T	Mixed dust not recovered
2. Eliminated spray painting	<ul style="list-style-type: none"> Reduced waste- 	None	No longer required

	water generation		by customers
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IV. BENEFITS, DRIVING AND RESTRAINING FORCES

- Plastics and Rubber Manufacture A derived the following benefits:
 - Increased productivity
 - Reduced operating costs
 - Corporate image
 - Improved worker health/safety
- Driving factors:
 - Management commitment (corporate)
 - Immediate realization benefits
 - Motivation of operating personnel

The company's Judge Luna plant is the oldest of eight factories the company operates and has been in operation for over a decade now. The company has already been certified to ISO 9001 and is now contemplating in pursuing EMS as well.

The plant is mainly driven by top management commitment to pursue IEM. It is principally concerned with those that are easy to implement benefits readily realized. The good motivation of its workers (the supervisory/middle level only) position reinforces management to pursue IEM and productivity programs.

As one of the major plastic (injection molding) manufacturers in the country, management commitment has been in the forefront of quality management to stay alive in business competition. The company has also likewise subscribed to the idea that environmental management programs (IEM) are now becoming part of the business operations. That IEM measures also improves the bottomline.

- Restraints:
 - Financial
 - Economic
 - Institutional

Tight finance/budgets resulting from poor economic climate (e.g. low market demand and competition from cheap imports) plus labor issues are potential barriers in pursuing IEM and related measures at this plant. The plant had in very recent years been temporary shut down due to labor problems (e.g. collective bargaining agreement).

V. FUTURE PLANS

- Energy – working on best effort to establish energy baseline (e.g. output/KWH). At present energy usage is perceived to be high.
- Effluent control – plans to set up a settling pond to allow presettling of TSS for their minor wastewater generated from mixer washing.

VI. CONCLUSIONS/EVALUATION SUMMARY

IEM program implementation at Plastics and Rubber Manufacture A (Judge Luna plant) can be considered successful principally because of strong management drive towards the following:

- Continuing improvement in productivity/cost reduction efforts
- An ISO 9001 certified corporation and planning to implement ISO 14001 soon
- Improving work area conditions/creating a safe work place for optimum employee performance

2.2.25 Pulp and Paper Mill A

I. BACKGROUND

Pulp and Paper Mill A is the country's largest paper mill that uses 100% waste paper as raw material. Pulp and Paper Mill A is currently the number one supplier of newsprint to publishers of daily newspapers nationwide. Its plant is located in a 60-hectare land in Bo. Bundagul, Mabalacat, Pampanga.

Pulp and Paper Mill A has a production capacity of 700 metric tons daily. The three paper grades that it currently produces are: newsprint, magazine publication paper, and econobond. It has a present workforce of over 500 rotating in three shifts, seven days a week production schedule.

Waste papers used as feedstock are mostly imported from USA, Australia, Hongkong, Canada, Japan and Europe. These imported waste papers make up 90% of the total raw material demand of the mill. There are three major stages in the waste paper recycling process at Pulp and Paper Mill A, these are: repulping, pulp processing or de-inking and paper making. These processes are being handled by three different departments namely: the Raw Materials Department, De-inking Plant, and Paper Mill Department respectively.

Pulp and Paper Mill A's strong desire to do what is right has led the operation to manage its production wastes early on not only to comply with regulatory standards but to protect its workers' safety and the environment primarily.

II. PROCESS DESCRIPTION

Raw Materials Warehousing

The raw materials coming from foreign and local sources are stocked in a warehouse for sorting of contaminants that could affect the grade of the fiber and damage the process equipment. At any time, the warehouse maintains a buffer supply of 10,000 metric tons of scrap paper to ensure continuous production at the mill. After sorting, waste papers get loaded by a conveyor to the pulper initially filled with 30% of the required water and chemicals. Here the waste papers are slushed and repulped to its fibers. The product from this step is then pumped into the dump chest.

Wastes generated from this step are mostly rejected waste papers and cardboards that get sold to recyclers and also to a sister company, A Inc.

De-inking

The pulp slurry from the initial step undergoes the removal of various contaminants at this stage. High density and light density contaminants, ink, glues, etc. are removed through a series of screening, de-inking, cleaning, washing and thickening operations.

Cleaning and Screening

The pulp slurry from the dump chest is screened and cleaned. Coarse fibers are further screened out and get reprocessed for the recovery of good fibers. Final tailings from this step go to a landfill.

Flotation and Screening

Ink is removed from the fiber through a flotation process. The pumped slurry from the cleaning and screening section is pumped to a series of flotation cells where fine bubbles of air are introduced through fine nozzles to form fine bubbles at the surface to carry with it the ink particles. The froth is overflowed to a chest for a secondary treatment.

After most of the ink is removed, the pulp slurry goes to a superclone for the removal of glues and adhesives. Screening again follows to further remove fine dirt, after which, final removal of the remaining ink takes place in another flotation stage. Foam is separated from the slurry through a continuous spray of water and collected in trays.

Washing/ Thickening/Kneading/Bleaching

The de-inked pulp from the flotation process is washed and separated from the filtrate through a thickening process. The pulp stock is fed to an extractor headbox, then passes through an extractor cylinder. The washed stock is discharged to a stock chest and the filtrate separated from the slurry gets clarified before it gets reused in the process again.

The pulp stock is further dewatered in thickeners before fed to the kneading machines. Kneading is done by passing the stock between two rotating screen blades. The stock is then transferred to the soaking tower, once kneaded. From the soaking tower, the pulp proceeds to the low density tank. Carry over bleach chemicals are washed and separated from the pulp by passing it through a second stage thickener. The dewatered pulp then goes to the bleach tower. The stock coming out of the bleach tower undergoes dilution where it is bleached further. The bleached pulp is stored in a low consistency tower before it is pumped to the paper mill.

Wastes from the De-inking Plant include empty chemical containers (drums and plastics), wastewater and sludges. The empty chemical containers are sold to buyers while wastewater all go to a wastewater treatment plant before discharged to a nearby creek. The sludge coming from the process and the sludge from the wastewater treatment facility go through dewatering before stored in an onsite landfill. Research on using the sludge with cement to produce panel board material for construction has been successfully conducted by the company in partnership with DOST. Currently final studies are being done to fully commercialize this project.

Paper Milling

The Paper Milling Department processes the bleached pulp from the De-inking Plant to produce paper. The bleached slurry is pumped to the headbox for sheet formation in the fourdrinier machine. Here, the pulp undergoes a series of dewatering and drying steps to separate water from the fiber material. The dried paper is then rolled on a reel and tested for quality. After rolling, the paper goes through a finishing process that include rewinding, cutting, measuring, weighing and packing that creates the final product ready for delivery.

Wastes produced from the paper making process include process water, paper cuttings and rejected paper that all gets reused in the process.

Input	Process	Output	Current Waste Minimization Practice
Waste Papers	Raw Materials Warehousing	1) Rejected waste papers 2) Sorted waste papers	-Rejected waste papers are sold to Fiber Sorting, Inc.
Sorted Waste Papers	Pulping	1) Pulp Slurry	
Pulp Slurry	De-inking / Cleaning	1) Wastewater 2) Coarse Fiber 3) Pulp Stock	- Wastewater is treated on site prior to release to a nearby creek - Coarse fibers are returned to the system for reprocessing
Pulp Stock	Sheet Formation (Dewatering/Drying)	1) White water 2) Dry paper	- White water is re-used at the de-inking process
Dry Paper	Reeling	1) Broken Sheets 2) Rolled paper	- Broken sheets are re-used as raw material
Rolled Paper	Rewinding / Cutting/ Wrapping	1) Finished Product	
Wastewater	Wastewater Treatment	1) Sludge 2) Treated Wastewater	- Sludge is stored on site pending use as cement panel board material

III. IEM MEASURES

Prior to IEMP

Even before the company's participation to USAID's Industrial Environmental Management Program (IEMP) in 1994, Pulp and Paper Mill A already had some waste minimization programs in place. It has been also involved in a Self-Monitoring Project conducted by AF-IPK in cooperation with the Development Bank of the Philippines and B.I.T.S. of Sweden. Through the project, the company was able to acquire automatic samplers and other equipment for continuous wastewater characterization. Pulp and Paper Mill A also had an onsite testing laboratory for water and wastewater.

The following table lists Pulp and Paper Mill A's waste minimization program and their benefits.

Waste Minimization Measures	Benefits
Cardboards and rejects from RMD are sold to recyclers and Fiber Sorting, Inc.	Increased revenue Minimized solid waste problem Reduced disposal cost
Empty chemical containers are sold to local residents	Increased revenue Minimized solid waste problem Improved community relationship
Filtrates generated during fiber processing are reused within the process	Reduced water consumption Reduced wastewater generation
White water from paper making operations is reused at DIP	Increased fiber recovery
Spilled thickened pulp stock are returned to power thickeners for reprocessing	Reduced fiber loss Improved housekeeping
Treated wastewater is partly used to water the plants around the facility	Reduced pollution load to creek Recovered nutrients in wastewater essential to plant growth Reduced water consumption Enhanced beautification of plant site

During IEMP

The interviewee noted that options recommended by IEMP outlined in the following table all pertained to Paper Mill No.1 which was totally shut down in 1995 and thought that these may no longer be relevant. However two new mills were built to replace it including a fully computerized De-inking Plant. Waste minimization principles have been fully considered in the operation of these new mills.

WASTE MINIMIZATION OPTION	EXPECTED IMPACT	ACTION BY THE COMPANY	ACTUAL BENEFITS DERIVED AND COST INCURRED
Repair leaking pipes and pump seals	Reduce water usage and production cost by 3% Reduce wastewater generation and treatment cost by 3% Reduce impact of water shortage	Implemented but with modification	
Install nozzle with flow control valves on hoses used for equipment and facility cleaning	Reduce water usage and production cost by 1% Reduce wastewater generation and treatment cost by 1% Reduce impact of water shortage	Implemented with modification	
Repair leaking feeder tube of ink collector at DIP	Reduce chemical cost Prevent accident of workers	Implemented with modification	
Post signs or reminders in work areas to encourage workers to help save water	Reduce water usage Reduce wastewater generation Reduce water and wastewater treatment cost Create environmental awareness among workers	Implemented with modification	
Monitor closely water quality of deepwell nos. 2 & 3 because of its proximity to wastewater holding ponds and landfill site	Safeguard health of workers and their families Reduce medical cost Provide baseline data to future water related projects	Implemented with modification	
Keep track of water consumption and wastewater generation at each stage of operation	Provide data to evaluate impact of waste reduction programs	Implemented with modification	
Monitor heavy metals concentration in effluent and sludge	Prevent contamination of water body located downstream of TIPCO Prevent groundwater contamination Safeguard public health	Implemented with modification	
Flush out drainage canals regularly	Allow continuous flow of wastewater to WTP at a steady flow rate Prevent flooding of work area Increase chance to receive awards and other incentives	Implemented with modification	

WASTE MINIMIZATION OPTION	EXPECTED IMPACT	ACTION BY THE COMPANY	ACTUAL BENEFITS DERIVED AND COST INCURRED
	for good housekeeping		
Replace oil cooling system with a radiator type cooling system	Reduce water usage and pumping cost Reduce wastewater generation and treatment cost Reduce corrosion of other parts of equipment due to continuous contact with corrosive water supply Reduce O&M cost and extend life of equipment Increase energy consumption		
Evaluate maintenance schedule of oil cooling system	Reduce water usage as spent cooling water Increase efficiency of cooling system Reduce energy consumption	Implemented with modification	
Hard pipe Sewer 2 al the way to the WTP	Increase WTP efficiency Reduce wastewater treatment cost Improve status on environmental compliance Enhance public image	Implemented with modification	

After IEMP

In 1999, Pulp and Paper Mill A merited an ISO 14001 certification for their EMS. Cleaner Production and Waste Minimization principles are key components to their environmental management programs that made them achieve current outstanding environmental performance. This also enhanced productivity since major programs focused on resource use optimization.

To ensure product quality, the company also adopted QMS that was certified to ISO 9002 in 1997. It's also among the first companies in the country to adopt occupational health and safety standards that got certified to OHSAS 18001 in 2001.

The company also invested on a research that would utilize their sludge by-product in the manufacture of cement bonded boards. This was done in collaboration with PCIIRD-DOST and UP Los Baños. Final studies are being conducted for the commercialization of this innovative product. This would primarily solve the problem of sludge accumulation on-site and at the same time generate additional revenue.

Motivations

The company believes that environmental management is a corporate responsibility and that only those that meet environmental requirements will survive in the long term. This basically is what drove them to go for an ISO14001 certification.

IV. DRIVING AND RESTRAINING FORCES

- Driving Forces: (first being the strongest)
 - *Management philosophy to do what is right.* The company acts out its belief that protecting its workers and its physical environment is an important corporate social responsibility and is the right thing to do.
 - *Reduction of production and wastewater treatment costs.* The operation utilizes a large volume of water thereby generating a large volume of wastewater that adds considerably to their production cost. Improving their water use efficiency has therefore been a continuous goal by the company in order to save on an important resource and improve on the production cost as well.
 - *Safeguard health and safety of workers and their families.* The company through their IEM programs has helped ensure that the workplace and the surrounding community are safe for the employees and their families.
 - *Customer needs and preferences.* Market demands a lot from the manufacturer these days. Besides assurance of product quality, clients are also looking at how the company deals with their environmental issues. Proactive management of the company's environmental impacts through an ISO 14001 certification has enhanced the company's performance in the market also. The company believes that only those that manage their environmental issues well stand to survive in the long term.
 - *Compliance with DENR regulations.* The environmental management programs implemented by the company especially the ISO 14001 certified EMS has allowed them to continuously comply with the regulatory requirements.
 - *Enhance public image.* Acting responsibly towards the protection of workers and the environment has helped enhanced the company's good public image.
- Restraining Forces: (first being the strongest)
 - *Lack of capital.* Major investments on environmental programs are often put on hold due to lack of financial capital.
 - *Limited technology and information.* Access to information on cleaner technologies is rather limited.
 - *Production as a priority.* Most often employees are tied up with meeting production goals thus environmental goals that are not linked with productivity improvements still take second priority. However with the EMS in place, environmental duties already become a part of the daily routine in the workplace somehow easing up on this issue of priority.

V. FUTURE PLANS AND PROGRAM

- Continuously improve environmental performance thru EMS particularly on water reuse and compliance to the Clean Air Act. A new committee has been created to look at opportunities to improve quality of air emission from operation

and company vehicles.

- Plans to implement the “Green Purchasing” concept

VI. MAJOR CONCERNS

- **Local sourcing of waste paper.** Implements outreach program to the public through lectures on waste paper recycling to promote proper management and at the same time improve local sourcing of raw materials.
- **Water use reduction.** Further reduce water consumption to conserve an important resource and to lower the production cost as well.
- **Solution to the sludge problem.** Aims to push for the commercialization of the production of cement bonded boards utilizing the operation’s sludge by-product to finally provide solution to the problem of sludge accumulation on site.

VII. CONCLUSION/EVALUATION SUMMARY

Pulp and Paper Mill A has shown successful management of the environmental, health and safety aspects of their operation as exhibited by their ISO 14001 and OHSAS 18001 certifications. Apparent driving forces for this are their strong corporate social responsibility and keen business sense. They have demonstrated that with an EMS, they were able to continuously improve their environmental performance along with their productivity as well.

2.2.26 Pulp and Paper Mill B

I. PLANT BACKGROUND

The company is engaged in the manufacture of high-grade pulp from raw abaca fibers since 1975. The plant, located in Canlubang, Calamba, Laguna is currently producing 7 metric tons per day of quality pulp. The present manpower complement is around 262 employees working in 2 shifts.

The company participated in IEMP-PMA waste minimization program on May 9-10, 1996. The PMA activity has for its objectives the identification of opportunities for source pollution reduction, waste recycling and waste re-use.

The goals set by PMA include:

- Reduction in 12 months the plant’s WTP color from 250 to 150 units
- Reduction in the fuel consumption by 5% in 6 months time
- Reduction in chemical usage by 5% in 6 months time

II. PROCESS DESCRIPTION

The table below outlines the general process, flow diagram, including inputs, outputs and current waste management practices at Canlubang Pulp Manufacturing Corporation.

<i>Input</i>	Process/Operation	Output	Current Waste Management Practice
Abaca fiber. Water, steam, Caustic soda Sodium sulfite	Cooking	Black liquor	To Wastewater Treatment Plant
Pulp water	Beating	Wastewater	
Stock pulp, water	Final washing	Washwater	

III. IEM MEASURES

Prior to Previous Projects

Measures	Benefits	Cost/Input	Motives for Implementation
Solid waste collection	Solid waste reduction	N/A	Waste Reduction
Re-use/recycle packaging materials	Solid waste reduction	N/A	Waste Reduction
Installation of coarse screens in canals	Reduction of solid waste going to WTP	N/A	Solid waste reduction
Collection of pulp trimmings, brokes/rejects	Recovered to production	N/A	Minimize wastage

Proposed by Previous Projects

<i>Measure</i>	<i>Benefits</i>	Remarks
Re-use of condensate from steam trap	Recovery of waste energy	Implemented
Reduce chemical usage	Cost reduction	Implemented
Repair of steam leaks at digester area	Energy savings	Implemented
Reduction in fresh water usage in washing	Decreased water usage/cost	Implemented
Use of black liquor as reducing agent from chrome-plating wastewater	Reduce volume going to WTP	Not implemented

Measures Taken After the Previous Projects

<i>Measures</i>	<i>Benefits</i>	Motive for Implementation
Monitoring WTP effluent	Meeting LLDA Limits for effluent	Compliance to regulations
Monitoring water usage as part of water conservation/pollution prevention program	Reduced cost	Reduce water pollution load
Selling black liquor to cement mixers as hardening retardant	Additional revenue	Reduction in pollution load

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

Pulp and Paper Mill B mentioned the following benefits from practicing waste minimization. These include meeting the effluent standards of LLDA, and increased productivity, and generating additional revenue from its black liquor.

➤ Driving Forces

- Resident complaints on pockets of odor emanating from the WTP
- To meet the LLDA effluent color standard of 150 color units

- Technical assistance from IEMP on the PMA process, waste exchange and their implementation
- The need to improve plant productivity and public image
- Management and in-house technical staff commitment for waste management programs to generate savings and reduce wastage

The need to improve plant productivity and public image is what prompted the company to participate in IEMP. Realizing the gains from previous programs the company has participated, the company hopes to sustain this and be able to reduce wastes and costs in the process.

According to the PCO, the company has satisfactorily met the LLDA requirements for Class C water in view of the sustained efforts in minimizing wastes from production area and the concerted efforts from all staff in implementation of waste minimization program.

➤ **Restraining Forces**

- The company's plan to expand and relocate to another relocation
- Negative attitude shown by some union officers and employees toward productivity improvement programs as demonstrated in the past
- Limitations in financing highly capital intensive projects

These forces were identified by the PMA team at that time. To date, the company still exists in the same location, however the company was not spared from the economic crisis in the 90s.

V. FUTURE PLANS

The management shall endeavor to monitor and maintain the wastewater treatment facility and continue to implement waste minimization measures. No other plans were disclosed in view of the present economic situation.

VI. CONCLUSION/EVALUATION SUMMARY

Based on the site visit and information gathered from the PCO/Sr. Researcher who has been with company for a long time, the company has sustained the implementation of its waste minimization program and can claim some success in it especially immediately right after the IEMP program. The company however, has also reduced its production output and personnel as it was also affected by the economic slowdown in the 90s.

2.2.27 Textile Industry A

I. PLANT BACKGROUND

Textile Industry A, Incorporated is a commission dyer of pure cotton, pure polyester, and blends of cotton and polyester knitted and woven fabrics. The company is located on 24,862-square meter lot at Dasmarinas, Cavite (approximately 50 kilometers south of Manila). It was established in 1994 with a capitalization of about ₱ 200 million. Currently, its labor force of 230 personnel produces 5,000 tons of fabric per month. Saffron uses 14 jet-dyeing machines for its wide range of fabrics resulting in a high degree of variability in dyeing operations.

Textile Industry A participated the Australian Agency for International Development (AusAID) Wastewater Treatment Technology Transfer and Cleaner Production (W2T3CP) Demonstration Project from 1996 to 2000.

II. PROCESS DESCRIPTION

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices, at Chrome Dazzler.

Input	Process/Operation	Output	Current Waste Management Practice
Fabric, chemicals, water	Bleaching/Scouring	Non-colored wastewater	To wastewater treatment plant (wastewater segregated according to color)
Water	Rinsing	Non-colored wastewater	
Chemicals, water	Dyeing	Colored wastewater	
Water	Rinsing	Colored wastewater	
Chemicals, water	Fixing/Neutralization	Colored wastewater	
Water	Rinsing	Non-colored wastewater	

III. IEM MEASURES

Listed below are IEM measures undertaken by Textile Industry A prior to, during and after the EIM Project.

Prior to Previous Project(s)

Measures	Benefits	Costs/Inputs	Motives for Implementation	Remarks
Use of low water: fabric ratio dyeing equipment	Lower water consumption	~ P 100 million	Cost-benefit	Equipment supplier gave concessionary rate as long as company makes their facility a demonstration plant
Wastewater treatment plant	Treatment of wastewater	N.A.	Compliance	Inadequate treatment of wastewater

Proposed by Previous Project(s)

Measure	Benefits	Remarks
Waste stream segregation	Better treatment	
Modification of WTP	Compliance	AusAID project provided technical and financial assistance
Training	Staff development	ITDI/DOST, through IPCT provided training

Measures Taken After the Previous Project(s)

Measures	Benefits	Motives for Implementation
NONE		

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

- Textile Industry A cited the following benefits of practicing IEM:
 - Increased productivity
 - Reduced operating costs

- Reduced waste treatment and disposal costs
- Improved public health and environmental benefits
- Driving forces for implementing IEM at Saffron includes the following:
 - Top management commitment
 - Strong motivation on the part of operating personnel
 - Immediate realization of benefits
 - Waste assessment by trained and unbiased personnel to identify waste sources and waste minimization options

Textile Industry A top management initially implemented clean technologies because they got concessionary rates for the purchase of their textile dyeing equipment. The equipment supplier provided the dyeing equipment at lower rates provided the company will be demonstration plant for clean technologies. Textile Industry A also participated in the AusAID project because the then plant manager viewed that implementing IEM can help reduce Saffron reduce waste treatment and disposal costs. He also that the technical and financial assistance would be beneficial to their company. The project staff (both local and Australian) involved in the AusAID project demonstrated that they had the skill to conduct an independent and knowledgeable assessment of their operations. Local counterparts for the AusAID project were project staff of the Integrated Program on Cleaner Production Technologies (IPCT) of the Department of Science and Technology (DOST). The financial assistance (AusAID provided for the purchase of an aerator for the wastewater treatment plant of Saffron) helped the company defray some expenses for their operations. Textile Industry A still provided for civil works at the wastewater treatment plant to complement the technical and financial assistance of AusAID. Through the AusAID assistance, Textile Industry A management also realized their other environmental obligations such as assigning a pollution control officer and securing an environmental compliance certificate. Unfortunately, the cause champion for Textile Industry A had been assigned in marketing, thus, efforts to further IEM had been reduced.

Textile Industry A did not identify any restraining force pursuing IEM.

V. FUTURE PLANS

Textile Industry A intends to pursue the installation of a heat recovery system wherein the facility will utilize the hot effluent from the factory to heat up its dye bath solutions. Capital investment costs is the challenge identified for this plan.

VI. CONCLUSION/EVALUATION SUMMARY

Textile Industry A had a cause champion in the person of the Mr. I, who was previously in charge with production. However, when he was made the vice-president for marketing, IEM efforts at Mr. I waned. He also mentioned that three (3) persons that he had initially trained for IEM at Textile Industry A had since resigned.

It was during the time of Mr. I that IEM activities at Textile Industry A were attended to. Saffron even secured its environmental compliance certificate during the AusAID project duration.

Currently, the owner takes charge of production. Unfortunately, this person is not very exposed to IEM. As such, IEM has not received the attention it used to enjoy.

The WTP, however, can still handle the volume of wastewater; therefore Saffron is still in compliance with effluent standards.

2.2.28 Suger Miller A

I. PLANT BACKGROUND

Suger Miller A has been manufacturing raw sugar from cane since 1920. It is one of the oldest sugar mills in the country. In 1998 a management change-over took place and the new owner leases the plant at P20 million annually.

At the close of last year's crop season, Suger Miller A produced some 140,000 bags of raw sugar valued at about P120 million. The company's workforce at present stands at about 400 (mostly seasonal) from a high of over 1,000 workers about 5 – 10 years ago.

The raw sugar manufacturing process at the facility involves the following operations: cane weighing, unloading, cutting/shredding, extraction, heating, lime addition, clarification, evaporation, crystallization, centrifugation and drying.

The company volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1994. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now TetraTech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Waste Management Practices
➤ Canes	Weighing, unloading		
	Cutting/shredding	➤ Trash	➤ Fuel
➤ Hot water	Extraction of juice	➤ Spills ➤ Bagasse/trash	➤ WTP ➤ Fuel/boiler
➤ Exhaust steam	Heating	➤ Condensate	➤ Recycle
➤ Exhaust steam ➤ Hot lime	Lime addition/pH adj.		
➤ Polymer	Clarification	➤ Mud/filter cake	➤ Farms/soil conditioners
➤ Steam	Evaporation	➤ Exhaust	➤ Recycle to heaters
	Crystallization		
	Centrifugation	➤ Molasses	➤ Sold to distillery/ alcohol plant
	Drying		
	Raw sugar storage		

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Implementation Cost	Remarks
1. Water conservation program involving recovery/collection of spills	<ul style="list-style-type: none"> • Reduced water use/waste generation 	Minimal	Still on-going
2. GMP practices	<ul style="list-style-type: none"> • Improved quality • Reduced 	ND	Still on going

	waste/disposal		
3. Installation of WTP (lagoon/pond)	<ul style="list-style-type: none"> Regulatory compliance 	ND	Unable to meet effluent standard

IEM Measures Proposed by IEMP

Measures	Benefits	Implementation Costs	Remarks
1. Recovery of cooling water at turbine pumps (shredders in milling area)	<ul style="list-style-type: none"> Water use/waste water reduction 	Minimal	On-going
2. Recovery of oil spills (lubricant from gear box, etc.) as lubricants for other equipment.	<ul style="list-style-type: none"> Reduced hazardous waste generation Added revenue Improved worker safety 	Minimal	On-going
3. Expansion of lagoon	<ul style="list-style-type: none"> Increased waste storage/holding 	ND	Ok

IEM Measures Taken after IEMP

Measures	Benefits	Costs	Remarks
1. Institutionalizing (SOPs) the minimization and recovery of juice spills from floors.	<ul style="list-style-type: none"> Reduced waste generation Material recovery 	ND	Good
2. Increase water pressure at vacuum filters to reduce polarity of mud cake from 4.5 to 3%	<ul style="list-style-type: none"> Material recovery (equiv 1000 kg/day) Minimized odor, rapid deterioration of mud 	ND	Very good
3. Improved/enhanced condensate recovery to boiler	<ul style="list-style-type: none"> Fuel savings Reduced worker risks Better workplace 	ND	Started 2000
4. Improvement at crystallizers to reduce purity of molasses from 38 to 35% sugar – by converting from air cooled to water cooled.	<ul style="list-style-type: none"> Cost reduction Added revenue 	ND	To be done within this year
5. Close loop method of condensing water to evaporator. Condensing water is mixed river water and condensate	<ul style="list-style-type: none"> Improved productivity 	ND	On-going

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

- Some of the benefits/incentives gained by Suger Miller A from past IEM projects include:
 - Reduced operating costs
 - Increased productivity
 - Improved public health/worker safety
 - Improved corporate image
- Driving factors:
 - Management commitment/directive
 - Motivation from workers
 - IEM measures are easy to adopt and benefits can readily be realized

Suger Miller A is also an old sugar factory operating in central Luzon. Unlike other sugar factories, Suger Miller A is located in an urban area (city) and is acknowledged as being a contributor of air and water pollution in the area. It has been receiving complaints from its neighbors. Its previous owners had only followed the mediation and "carrot and stick" approach in solving its environmental compliance problems.

About 5 years ago, a new owner took over the business. It was the new professional and young plant manager who has changed the mindset of the workers hoping that the business can turn around. Coupled with regulatory concerns and compliance problems, the new management has set forth to pursue cost reduction programs through waste reduction and productivity improvement programs. It has also organized its own EMS team and sent representatives to EMS awareness and training programs.

To date, the new management efforts are still far from over. It has upgraded its old wastewater treatment plant. In the meantime it is pursuing its productivity improvement-waste reduction programs that are less costly to implement while contemplating on whether to modernize equipment or downscale its operations and build a new factory.

Obviously, management commitment and a relatively motivated staff of this company have influenced organization to implement IEM and related programs especially those involving low costs, easy to do measures. They are also pressed by regulatory in view of the Clean Air Act and business competition for efficiency especially that the Sugar Mills in the area are competing for access to cane supply.

➤ Restraints:

- Financial
- Economic
- Technical (internal staff) – plant lacks specialized experts

Some of the stumbling blocks in pursuing IEM at Suger Miller A include - financial and economic (e.g. seasonal nature of operations time which is 5 months or less per year only). The benefit sharing mechanism between cane farmers and millers (e.g. farmers take about 65% of output while factory owners get 35%). Putting in new investments also falls solely on the factory owners because farmers do not co-share in any investment or improvement of the factory.

Another major business concern which could deter management from further investment and improvement is economic, i.e. the declining quantity of cane supply in the area especially with the opening of a new sugar factory in the area in late 2001.

A minor deterring factor is the lack of specialist staff.

V. FUTURE PLANS

- Energy conservation – Acquisition of new boilers to replace old inefficient ones.
- Emissions control – Meeting Clean Air Act emissions standards
- Hazardous wastes – Sludge tank nearly full. Problems on disposal of this sludge. They are also planning to upgrade WTP from chemical to biological (aeration method which is more accurate due to nature of its wastes).

VI. CONCLUSIONS/EVALUATION SUMMARY

Suger Miller A level of implementation for IEM measures may not be considered satisfactory because it has not done so much progress.

The major factor that might have contributed to its lack luster performance in IEM may be financial and economic issues, technical as well, and probably because they had not been pushed by regulatory bodies. A compounding factor could be the nature of its operations – e.g. seasonal milling period (3-5 months only) and the fact that the mills are merely processors of cane and not owners. Only about 35% of the raw sugar proceeds goes to the miller while the rest goes to the farmers.

2.2.29 Suger Miller B

I. PLANT BACKGROUND

Suger Miller B has been manufacturing raw (washed) sugar from cane since 1928. It is one of the oldest sugar mills in the country also. Plant was capitalized at P60 million.

At the close of last year's crop season, Suger Miller B had sales estimated at P140 million. The company's workforce at present number about 300 (mostly seasonal).

The raw sugar manufacturing process at the facility involves the following operations: Cane weighing, unloading, cutting/shredding, milling/extraction, heating, lime addition/clarification, evaporation, vacuum pans/mixing, crystallization, centrifugation and storage/bagging.

The company volunteered in a waste minimization project of IEMP (Industrial Environmental management Project) in 1995. IEMP was a DENR project funded by USAID. It was managed by PRC Environmental Management Inc. (now Tetra Tech EMI).

II. PROCESS DESCRIPTION

Input	Process Flow Diagram	Output	Current Management Practices	Waste
➤ Canes	Weighing, unloading			
	Cutting/shredding	➤ Trash	➤ Fuel	
➤ Hot water	Extraction of juice/milling	➤ Spills ➤ Bagasse/trash	➤ WTP ➤ Fuel/boiler	
➤ Exhaust steam ➤ Hot lime	Heating/Lime addition	➤ Condensate	➤ Recycle	
➤ Polymer	Clarification	➤ Mud/filter cake	➤ Soil conditioner	
➤ Steam	Evaporation	➤ Exhaust	➤ Recycle to heater	
	Vacuum pans/mixing	➤ massecuite		
➤ Massecuite	Crystallization	➤ massecuite		
	Centrifugation/drying	➤ Molasses	➤ Sold to distillery	
	Raw sugar storage			

III. IEM MEASURES

IEM Measures Taken before IEMP

Measures	Benefits	Cost	Remarks
1. GMP practices	<ul style="list-style-type: none"> Improved quality Reduced waste 	ND	Still on going

IEM Measures Proposed by IEMP

Measures	Benefits	Costs	Remarks
1. Training of plant personnel	<ul style="list-style-type: none"> Consciousness 	Minimal	Ok
2. Repair of leakages, piping, etc.	<ul style="list-style-type: none"> Reduced water use/wastewater 	Minimal	On-going
3. Put back into service oil-water separator for waste oil recovery	<ul style="list-style-type: none"> Waste/disposal reduction 	-	Spills are retrieved
4. Installation of overflow alarms	-	-	Operators are more effective?
5. Proper identification/segregation of strong wastewater	<ul style="list-style-type: none"> Reduced WTP load Improved compliance 	ND	Good
6. Reuse of excess bagasse (fuel for refined sugar making, fiber board making, construction, etc.)	<ul style="list-style-type: none"> Added revenue Reduced disposal costs/fire hazards 	None	Done

IEM Measures Taken after IEMP

Measures	Benefits	Costs	Remarks
1. Installation of pressure feeders at roll mill 1.	<ul style="list-style-type: none"> Efficient cane feeding /inc. productivity 	ND	Good, increased productivity
2. Addition of an efficient roll mill (4 units)	<ul style="list-style-type: none"> Increased extraction capacity 	Aus\$300T	Very good
3. Replaced 1 compressor	<ul style="list-style-type: none"> Inc roller mills efficiency. 	P1 million	Ok
4. Reuse of fly ash for fertilizers, construction, etc	<ul style="list-style-type: none"> Reduced disposal 	ND	On-going
5. Installation of 1 diesel generator (200 KW) for continuous power supply	<ul style="list-style-type: none"> Energy savings/economics 	P7 million	Good
6. Improvement of make up pond	<ul style="list-style-type: none"> Inc. juice production Reduced juice spills 	P250T	Good

IV. BENEFITS, DRIVING AND RESTRAINING FORCES

- Some of the benefits/incentives gained by Suger Miller B from past IEM projects include:
 - Increased productivity
 - Reduced operating costs
 - Reduced treatment costs
 - Improved public health/worker safety
- Driving factors:
 - IEM measures are easy to adopt
 - Benefits can readily be realized
 - Management commitment/directive on productivity improvement

Suger Miller B is driven most importantly on productivity improvement/cost reduction programs that are easy to implement and benefits readily realized. Management has somehow shown a certain level of commitment to pursue productivity improvement programs which in the end would have some environmental benefits.

However, based on interviews, it appears that the company considers environmental issues as regulatory in nature. Hence, quite clearly regulatory compliance is a major factor in pursuing IEM at Suger Miller B.

➤ Restraints:

- Financial
- Economic
- Technical (internal staff) – sea weed industry lacks specialized experts

Financial/economic considerations and the lack of understanding/awareness from top management on IEM are major barriers in the pursuing IEM at this factory. This can be indicated in some instances - e.g. inactive PCO, and not sending representatives to some environmental forums/trainings as noted in the past.

V. FUTURE PLANS

- Energy conservation – Installation of turbine power plant
- Water conservation – To build a water recycling plant
- Emissions control – Meeting Clean Air Act emissions standards by installing wet scrubber at boilers 1 and 2.
- Non-hazardous waste management – To build an alcohol distillery plant (for its molasses)

VI. CONCLUSIONS/EVALUATION SUMMARY

Suger Miller B level of implementation for IEM measures have been just secondary in the sense that most of the programs they implemented concerned mostly on improving productivity (the bottom line). However, in the end most of these programs also reduced waste and consequently improved environmental performance.

2.2.30 Suger Miller C

I. PLANT BACKGROUND

The company established in 1927 is engaged in the manufacture of raw sugar from sugar cane. In the late nineties, the company operated its sugar refinery plant. The plant facility is located in Barangay Lumbangan, Nasugbu, Batangas. The company has manpower complement of 1,050 employees.

During its participation in the IEMP-PMA, the goals are more in the areas of water use, reduction and wastewater generation. In that program, the company's objectives are: (1) improve wastewater treatment plant efficiency, (2) reduce WTP maintenance requirements, (3) maintain compliance with existing regulations, (4) prepare for

future, more stringent effluent quality standards. The PMA was conducted on March 4-5, 1993.

II. PROCESS DESCRIPTION

The production of raw sugar from sugarcane involves:

1. cane preparation
2. cane juice extraction
3. juice clarification
4. juice concentration
5. sugar crystallization
6. separation of sugar crystals

The table below outlines the general process flow diagram, including inputs, outputs and current waste management practices at Suger Miller C.

Input	Process/Operation	Output	Current Waste Management Practice
Sugar cane	Cane Preparation		
Sugar cane Water	Cane milling	Bagasse	Sent to boiler house as fuel
		Wastewater	To WTP
Cane juice, Water	Sugar production	Molasses	Sold to contractors
		Wastewater	To WTP
Bagasse, Water	Boiler operation	Flue gas	Provided with multi-cyclone (Air Pollution Control Device)
		Ash	Collected and disposed

III. IEM MEASURES

Listed below are the IEM measures undertaken by Suger Miller C prior to, during and after the IEMP project.

IEM Measures Taken before IEMP

Measures	Benefits	Cost/Input	Motives for Implementation
Monitoring water usage	Reduced cost/less load	N/A	Water conservation
Dry cleaning floors with bagasse	Solid waste reduction	N/A	Solid waste prevention/fuel to boilers
Using bagasse as boiler fuel	Fuel alternative	N/A	Fuel alternative
Recovery of oil and grease from wastewater	Pollution reduction	N/A	Pollution prevention/ Added to boiler fuel
Selling molasses by-product	Additional revenue	N/A	Pollution prevention

IEM Measures Proposed by IEMP

Measure	Benefits	Remark
<i>Repair leaky valves and pipes</i>	<i>Water conservation</i>	Implemented
Clean debris from canal leading to WTP	Waste reduction	Implemented
Recycle clarified water from ASP	Water recycling	Implemented

Reduce quantity of process materials for analysis	Savings on chemicals and labor	Implemented
Recycle condensate tank overflow	Energy conservation	Implemented
Construct MCC slat cleaner/trash conveyor	Waste reduction	Implemented
Repair of leaky pumps	Efficient operation	Implemented
Dry hauling of fly ash from boiler	Reduced volume of solids	Not implemented but included in solid waste management plan
Power factor improvement	Power savings	Implemented
<u>Closed-loop cooling system</u>	Water conservation	Implemented

IEM Measures Taken after IEMP

Measures	Benefits	Remarks
All measures implemented	As stated	
Close-looping of cooling water system via cooling tower	Water conservation	
Upgrading of the WTP	Improved efficiency	

IV. BENEFITS, DRIVING, AND RESTRAINING FORCES

- Benefits derived by the company from this program include the following:
 - Improving efficiency of WTP, reducing WTP maintenance requirements
 - Maintaining compliance with existing regulations, increased productivity
 - Reducing the effects of water shortages on facility operations
- Driving forces:
 - Increased productivity
 - Environmental protection
 - Management support
 - Inadequate water supply
 - Compliance with wastewater standards and environmental regulations
 - Model sugar milling facility

The above forces enable the company to be at the forefront in the sugar industry in the Philippines today. With management support as the moving force, the company was able to modernize its air pollution control facilities to meet the requirements of the Clean Air Act, and upgrade its WTP. The company continues to become a model sugar milling facility. The company is presently in the process of implementing an Environmental Management System (EMS).

- Restraints:
 - Existing physical infrastructure (old equipment, lay out and drainage system)
 - Employee reluctance
 - Program implementation

These forces identified by the PMA team before are slowly being negated by Company efforts to modernize its facilities and its operation.

V. FUTURE PLANS

The management shall continue to modernize its facilities, sustain efforts on cleaner production, waste minimization, and adherence to good manufacturing practices. The company is presently working towards ISO 14001 certification.

VI. CONCLUSION/EVALUATION SUMMARY

The management of the company has demonstrated successful implementation of waste minimization options from previous programs. With full management support, it has consistently participated in pollution prevention and cleaner production programs and has shared part experiences on these with other companies.

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Questionnaire on waste minimization project

Date: / / Interviewer:

1. Company Profile

Industry Sector			Name of Company			
Contact Person/ Position						
Address						
Capital Investment (PHP)				Start of Business		
Number of Employees	Start: Full-time	1992: Full-time	1997: Full-time	2002: Full-time		
	Part-time	Part-time	Part-time	Part-time		
Main Products	Start:	1992:	1997:	2002:		
Sales (PHP)	Start:	1992:	1997:	2002:		
Declared Profit (PHP)	Start:	1992:	1997:	2002:		
Brief Description of Main Production Process (Present)						
Name of Waste Minimization Project(s) Previously Involved						
Major Inputs from the Previous Waste Minimization Project(s)	Area	Technical Assistance (Man-month)		Financial Assistance (PHP)		Other

2. Process Description (To be validated through facility walkthrough)

Input	Process Flow Diagram	Output	Current Waste Management Practices	Environmental Impact

3. IEM Measures

3-1. IEM Measures Taken before the Previous Project(s)

Measures	Benefits	Costs/Inputs	Motives for Implementation	Remarks

3-2. IEM Measures Proposed by the Previous Project(s)

Measures	Status			If implemented,			If not, reason	With modification impact
	I	NI	IWM	benefits	Inputs from the company	Inputs from outside of the company		

I – Implemented
 NI – Not implemented
 IWM – Implemented with modification

3-3. IEM Measures Taken after the Previous Project(s)

Measures	Benefits	Costs/Inputs	Motives for Implementation	Remarks

4. Driving and Restraining

Driving Forces	
	Top management commitment
	Strong motivation on the part of operating personnel
	Technologies are simple and easy to implement
	Immediate realization of benefits
	Waste assessment by trained and unbiased personnel to identify waste sources and waste minimization options

Restraining Forces	
	Financial
	Economic
	Policy-related
	Organizational
	Technical
	Conceptual/Institutional

5. Overall Benefits of Waste Minimization

	Increased productivity
	Reduced operating costs
	Reduced waste treatment and disposal costs
	Reduced risk of liability
	Improved public health and environmental benefits
	Improved worker health and safety
	Improved corporate image and competitiveness

6. Future Plans

Issue		Challenge	Future Plan
1. Energy conservation			
2. Water conservation			
3. Effluent control	Meeting standards/ requirements		
	Other		
4. Emission control	Meeting standards/ requirements		
	Other		
5. Non-hazardous industrial solid waste management			
6. Hazardous waste management	Meeting standards/ requirements		
	Other		
7. Management of chemicals	Meeting standards/ requirements		
	Other		
8. Noise and vibration			
9. Offensive odor			
10. Other ()			

ANNEX 2.3

REVIEW OF STUDIES RELEVANT TO IEM

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
MEIP- World Bank. Industrial Efficiency and Pollution Control Program. (IEPC) 11/92					
1.reviews env. conditions 2.develops ind.sector profile 3.reviews institutional framework 4.examines regulations & incentives 5.reviews ind. Pollution & control methods 6.projects future industrial pollution 7.develops mitigation options (tech, econ) 8.Proposes action plan & investment plan	Metro-Manila NCR Env. & Industry	Household pollution (sewage, solid wastes (BOD), vehicular particulates NOx, lead) much more important than ind. pollution, except for haz. wastes. Weak urb. planning, regulations & enforcement, lack of info. & PMAs, weak incentives, inadequate funding for PC. But ind. estates policy is effective	Proposes integrated environmental management strategy and action plan (including costing) to deal with all key issues	DENR and others	Sets industrial pollution in overall context in MMA. Provided basis for later studies & investments.
MEIP - World Bank. Laguna Lake Environmental Study (MEIP/LL) 1993					
Study analysed 1) change in ambient water quality, 2) pollutant sources, sectoral origin and volumes, 3)pollution impacts & costs on health & economy (mainly fish), 4) costs of control, 5) benefit valuation	Metro-manila, Rizal & Laguna. All sectors	Laguna Lake is a sensitive, high value ecosystem under the authority of LLDA. Pollution is leading to rapid env. Degradation and reduction in beneficial uses of Lake. Although BOD is major pollutant, increases in haz. Wastes are more serious & persistent.	1.Identifies affordable beneficial uses 2.Recommends adjustments to ambient & effluent standards 3.recommends pollution charges 4.recommends haz wastes storage 5. recommends LLDA & DENR coordination on Lake inflows	LLDA, DENR	Provided basis for LLDA water pollution charge. Provides useful case study on extent of env impacts & pollution inf. base

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
MEIP - World Bank. Urban Air Quality Program (URBAIR) 1994					
A comprehensive, quantitative study which analysed & modelled air pollution sources, evaluated their impact on health and the economy, made policy recommendations. Primary pollution sources are vehicular (lead, TSP, PM12, Nox), Stationary power stations (SOx), dust and household refuse burning are other contributors. Non fuel burning sources (eg. industry) are small	Metro-Manila Air Quality	Major problems are vehicle fuels and emissions. Inadequate air quality standards and enforcement, allowing importation of polluting engines, lead and high sulfur content in fuels	<ol style="list-style-type: none"> 1. Eliminate lead in gasoline through regulation and cross-pricing 2. Switch bus fuels to natural gas 3. Lower sulfur content in diesel fuels 4. Regulate adulterated fuels and importation of high emission engines 5. Establish vehicle emission inspection system 6. Improve solid waste collection & disposal & ban household burning 	DENR, DOTC, DTI	URBAIR Study was main basis for ADB air quality project & input to Clean Air Act. Improvements have already been made through reduction of lead, closure of Sucat power plant
World Bank - European Union. Hazardous Wastes Management Study (EnTec) 1997					
First major study on HW. Reviewed generation rates, sources, evaluated priorities, recommended institutional, regulatory improvements, investment requirements	Metro-Manila and CALABARZON	See JICA study on HWM which built on and extended EnTec work	See JICA study	DENR	Information base of HW generators rather weak, but overall recommendations similar to JICA study
Denmark - Pasig River Study (PR) 1990					
Undertook a detailed study of the sources of pollution to the Pasig river and their impact on the ambient water quality. Proposed technical, institutional and financial measures to improve ambient quality.	Metro-Manila (Pasig river)	Major polluters: households (sewage & solid wastes), piggeries, beverage industries. Lack of agreed plan or coordination between EMB, MMDA, LGUs	Identifies priority sectors. Established implementation arrangements	EMB, then Pasig River authority/council	

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
JICA - Hazardous Wastes management Project (HWM) 2001					
<p>The study used improvements in the EMB data-base on HW generators and an additional survey. It reviewed:</p> <ol style="list-style-type: none"> 1.Economy, industry & HWM situation 2.Regulation, administration & institutions 3.Situation and Issues on private sector participation in HWM 4.Estimation of HW generation, treatment 5.Policy proposals and strategy for HWM including source mgt, enforcement 6.Pre-feasibility study for model HW treatment plant & promotion plan for private sector 	<p>Metro-Manila, CALABARZON and Cebu</p>	<ol style="list-style-type: none"> 1. Lack of info. & mgt. system by EMB hampers monitoring, tracking & enforcement, leading to illegal disposal by generators 2.SMEs unaware & uninterested in HW problems, & need focus on cleaner production 3.Urgent need for centralized HW treatment plant, but Inadequate enforcement & small available HW stockpile deters potential investors 4.Non-incineration provision of Clean Air Act inhibits action 	<ol style="list-style-type: none"> 1.Strengthen HWM policy (3Rs, CP,mgt at source, priorities, targets) 2.Adjust HW regulations, introduce MBIs, raise awareness 3.Improve HW registration, tracking 4. Improve laboratory capabilities 5.Strengthen existing recyclers 6.Develop regulations, institutional arrangements for central HW treatment facilities 7.Prepare TOR for private sector participation in BOO of pilot central treatment facility 	<p>DENR, NEDA BOI, DOF</p>	<p>Discussion and action needed on policies. Second phase for pilot HW plant underway</p>
USAID - Industrial Environmental Management Project (IEMP) 1994					
<p>This \$24million project assisted firms in areas outside the MMA to implement CP activities. It also undertook a review of MBIs in general and in the Philippines. One of its most important activities was the development of a National/Regional Industrial Prioritization Strategy (NRIPS). Based on surveys of local industries, this assesses the 'net' pollution sources from different types of industry sectors, identifies the pollution pathways and the impact of their emissions on health and ecological systems. A NRIPS table was prepared which is intended to be used by EMB and consultants for industrial env analysis and planning.</p>	<p>All sectors</p>	<p>Limitations related to env. monitoring & enforcement and political will indicate that only a few selected MBIs are viable at present. Short and long term action plans are thus required. Useful document "Impact Evaluation" of IEMP, raises many matters concerning IEM Strategy</p>	<p>Action plan includes:</p> <ol style="list-style-type: none"> 1.promote an env. services industry 2.waste exchange & info. System 3.operationalise NRIPS in EMB 4.pollution charges 5.risk insurance 6. Env. Fund 7. Tradeable BOD permits 	<p>DENR, private sector firms</p>	<p>Actions (2) & (3) underway in DENR, PBE. (3) underway by LLDA. Check status of others. IEMP did not establish an institutional system for CP. IISE project is follow-up for this. See useful "Impact Evaluation" of IEMP</p>

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
USAID - Industrial Initiatives for a Sustainable Environment (IISE) 1998					
<p>Project focused on reducing pollution from firms. Achieved in 297 firms (27 ISO14001 certified), In addition, EMS extended to 2 govt agencies, 1 bank, training consultants, 1 Province, 12 LGUs. Generic tools for EMS developed, risk measurement, handbooks, review of public and private laboratories, 6 Policy Studies</p>	<p>General, with EMS focus on power, cement, furniture-manufacturing</p>	<p>Survey of the 27 ISO14001 firms (7 SMEs, 27 LEs) showed: I) good implementation of CP, ii) SMEs need cooperation and support to maintain commitment, importance to them of safety issues & regulatory compliance, ii) for LEs, env. quality & protection, mgt. support, economic value of waste reduction</p>	<p>1) EMS can be used for all types of organizations, emphasise cost savings, 2) DENR promote EMS thro implementation of DAO, info & training to SMEs, enforcement of regs, establishment of GIS system, 3) strengthen & expand IISE network, 4) reduce cost of EMS thro training & competition, 5) DTI to implement EMS accreditation, 6) support DOST's env. tech. info center, 7) GOP implement fiscal incentives proposed by IISE, Env. Fund</p>	<p>DENR, DTI, DOST, NCC, Business assocns.</p>	<p>Check progress on these recommendations See also items in this table on IISE studies on Fiscal and on Financial incentives, Env. Fund.</p>
Asian Development Bank - Evaluation of Environmental Standards for Selected Industry Sub-sectors (EESIS) 1998					
<p>EESIS is a detailed study of a few polluting industrial sectors based on detailed data gathered at the plant level. 1.Phil. Env. Standards, int. comparisons 2.Issues in setting appropriate standards 3.Review of current standards 4Industrial profiles & criteria for standards 5.Methodology and appropriate standards 6.Setting emission & effluent targets 7.CP options, analysis of technologies 8.Economic instruments to adopt CP tech. 9.Implementation Plan, incl tracking system</p>	<p>Sugar, Cement, Power generation</p>	<p>Three highly-polluting sectors selected. Polluting due to old technology, govt. protection (cement), quedan system (sugar), govt. monopoly (power). Other issues include too high and complicated standards unrelated to industry type & affordability, weak enforcement of env. laws, unattractive financing., weak monitoring & tracking by EMB</p>	<p>1.Adjust env. standards & improve efficiency of permitting system 2.Establish a CP policy 3.Implement selected MBIs 4.Empower LGUs to set & collect charges 5.Establish and promote cost-effective technologies to the sectors 6.Improve financing terms and promote env. windows to firms. 7. Implement CPAS registration, monitoring & tracking system</p>	<p>DENR, DTI, BOI, DOST, DBP, LBP</p>	<p>check progress on these actions. These sectors will not need to be re-studied</p>

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
USAID - Philippine Environmental and Natural Resources Accounting Project (ENRAP - phase 3)					
<p>ENRAP is a long-term effort to formulate a national accounting system that reflects the interactions between the environment and the economy. ENRAP 3 focuses on depreciation of natural resources and on pollution management. Using information already collected on resource depletion, household wastes, and pollution indices (from USEPA & WHO) applied to the PSIC code to obtain industrial pollution, it maps the extent and type of pollution in the 12 National regions, CAR and NCR. It identifies high-polluting sectors having health and economic impacts, and undertakes impact simulations for economic growth, trade liberalization & other factors. Policy recommendations</p>	<p>All regions, all industrial and domestic pollution sectors. Also resource depletion through forestry, agriculture and fishing</p>	<p><u>Air:</u> emissions from fuel combustion (not process-based emissions) are predominant sources, especially household burning, cement production and vehicle sources (major cities only) <u>Water:</u> households are greatest polluters (BOD), but industrial hazardous wastes are danger in metro areas and mining areas <u>Costs of Pollution Control:</u> Forestry should account by far (26%) of national pollution control costs, followed by mining (16%), agriculture, (15%), urban (11% - surface water and sewage). Manufacturing is very small (1.3%)</p>	<p><u>Air:</u> Costs of damage control (P1.5 billion) is less than health damage (P1.9 billion) in Metro-Manila which is 30% of national total. Figures justify investments in control. Cleaner fuels (bottled gas for households, non-lead petrol, clean diesel and natural gas for vehicles) are priority. <u>Water:</u> Sanitation & sewerage, solid wastes mgt. are priority. Also agro-industrial (especially livestock), but these are concentrated in 'hot-spots' <u>Distribution</u> of pollution across & within regions very important for land-use planning. Pollution monitoring by LGUs needed.</p>	<p>DENR, NEDA, NSCB, all sectoral agencies</p>	<p>ENRAP approach is excellent base for an industrial environmental master plan. DENR should expand the GIS system and incorporate all environmental media sectors. ENRAP probably underrates the health and economic impact of haz wastes from industry</p>
National Statistical Coordination Board and UNDP - Environmental Degradation due to Selected Economic Activities (NSCB) 2000					
<p>Provides the supporting statistics to the ENRAP study. Each sector analysed by 1. Production process and pollutants generated, by facility size 2. Pollution control technology (mainly EOP) and their costs 3. PC costs as %age of production costs</p>	<p>All regions and sectors. Industry - priority to canning, textiles, tanning, paint, sugar, cement, mining, petroleum</p>	<p>Issues raised for each industrial sector as well as statistical and measurement matters.</p>	<p>Policies recommended for each sector (technical and economic). Also additional research recommendations</p>	<p>NSCB, NEDA, DENR, Private industry & assocns.</p>	<p>Useful statistical base. Should be used to build on technical and economic information and avoid duplication</p>

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
Asian Development Bank - Potential Uses of Market-based Instruments for Environmental Management in the Philippines (ADB-MBIs) 1997					
<p>Building on the analytic work of ENRAP, this study reviews structure of env. mgt, effectiveness of regulations, Philippines experience with MBIs, cost of abatement, effluent charges polluters response. MBIs use as revenue potential are reviewed and choice of policy instruments recommended for Phil conditions, as well as decentralization and MBIs. Several case studies are reviewed, and role of govt, NGOs and ADB discussed</p>	<p>Major polluting industrial sectors</p>	<p>Highly-regulated system in Phil is inefficient (if enforced), with an undue focus on industrial BOD compared to more polluting sectors (vehicles, households). Introduction of MBIs could reduce env control costs by US\$300 million/yr (1997) and yield \$77-115 million/yr (from BOD discharges), compared to costs of implementing regulatory standards. Charges must be equitable, easy to collect</p>	<p><u>Short term:</u> Presumptive water surcharge and presumptive emission surcharge (for air), tax differentiation on fuels, incremental tax on all polluting fuels. Taxes pay for improved traffic management. Improvements to Environmental Guarantee Fund for mining <u>Medium term:</u> Effluent charges, effluent trading permits, emission charges, vehicle registration fees linked to pollution potential, road access fees to reduce congestion.</p>	<p>DENR, Water and electricity companies</p>	<p>Check how much these have been discussed with govt re their acceptability for implementation</p>
World Bank - Philippines Environment Monitor (WB/PEM) 2000					
<p>Provides a summary description of green and brown agenda of govt. Shows key indicators, hot-spots, and recent changes in environmental quality.</p>	<p>all sectors, regions</p>	<p>Similar to those enunciated in ENRAP study, but less academically presented. Additional health and control cost indicators</p>	<p>Similar policy recommendations to other studies (MEIP-IEPC and LL, ENRAP, ADB/MBIs), but also notes rapid rise in hazardous wastes</p>	<p>Awareness-raising document</p>	<p>Useful for quick grasp of issues and statistics. Increasing priority for Haz. wastes</p>

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
JICA - Donor Strategies & Methodologies for Promoting Cleaner Production in Developing Countries (JICA-CP) 2001					
Report provides a thorough overview of CP issues, barriers & opportunities, measures, donor activities, case studies, research. One of the useful pieces of research for EMPOWER is the WB/USEPA analysis of industrial sectors & pollution intensities related to impacts on different media and on human health	Global	Covers numerous issues	Numerous recommendations, many of which are relevant to the Philippines		Complements the ENRAP and IEMP analyses of pollution impacts. Offers international perspective on regulatory, MBI & knowledge measures
USAID - An Assessment of Fiscal Incentives for Environment Projects (IISE/Fisc) 2001					
Succinct review of health & econ impacts of pollution, trends in env mgt, review of Phil fiscal incentives, brief review of other Asian countries, impact of BOI incentives on env projects, barriers to improvement, recommendations	Industry & tax	Very low availment of BOI incentives for env projects, mainly because of weak enforcement of env laws - cheaper for firms to pay fines than to invest in & run PC plants. Incentives must be attractive enough to increase profits	Stronger monitoring & enforcement should precede incentives. . Recommends: range of incentives proposed by BOI but excluded from HB 10596, addition of incentives for env compliance and innovation (env benefits on these will be much greater than revenue forgone)	BOI, GOP legislature	See thematic table for detailed list Check whether any of these recommendations have been followed up.

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
USAID - An Assessment of Financial Incentives for Environment Projects (IISE/Fin) 2001					
<p>Banking industry's role is to go beyond mere provision of capital, to promote env-friendly projects. Reviews existing banking practices, lending windows & foreign tech & fin assistance, identifies reasons for lack of availment, recommends changes</p>	<p>Banking & finance</p>	<p>Env lending still low, despite efforts. Only 3 banks require 'due diligence' procedures by their staff, borrowers thus go to other banks who do not require ECC. Banks' TA to borrowers is weak, do not focus on CP & cost reduction. BSP doesn't require 'due diligence'. Changes needed to conventional project analysis to include env benefits, cost savings, reduced collateral requirements (for SMEs). Reductions to LBP's on-lending rates to other banks & pre-payment requirements needed. Lack of awareness on env by borrowers. Weak enforcement of env regs.</p>	<ol style="list-style-type: none"> 1.All banks should have an env unit which will screen & evaluate projects, advise on CP approach, develop env policy & procedures for the bank, undertake information & awareness & training. 2.Reduce interest rates for env lending, & liberalize financial hurdles 3.Abolish pre-payment fees 4.BSP with National Credit Council to develop guidelines, require & monitor 'due diligence', & implement other reforms noted above. 5. Investigate the desirability of strengthening the Natural Resources Development Corporation as an alternative source of financing. 	<p>BSP, NCC, banks, DENR, NRDC</p>	<p>See thematic table for detailed list Check whether any of these recommendations have been followed up</p>

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
UNDP - Private Sector Participation in Managing the Environment (PRIME) 1999- 2002					
<p>PRIME has 4 modules:</p> <ol style="list-style-type: none"> 1. <u>Business Agenda 21</u> - assisted 83 business associations to develop their env agendas and help their members 2. <u>Industrial Ecology</u> - developed the By-product Exchange Program in 5 industrial estates, and an Eco-industrial Park design (in conjunction with a petro-chemical industry) 3. <u>Env. Mgt. System</u> assisted 9 SMEs in the food processing & chemical sectors to undertake EMS &ISO14001. Also set up Env Auditors Registration System (with PAEP), and an 'eco-labelling' survey 4. <u>Env. Entrepreneurship</u>. Study reviews env consultancy, engineering, training, laboratory and certification services, identifies market weaknesses and causes, market opportunities, makes recommendations. EMB developed laboratory recognition guidelines & applied to 23 labs, also operated SME info desk 	All industry	<ol style="list-style-type: none"> 1. Raised industry awareness and initiated focus on env. SMEs still lagging 2. Initiated concepts to industry with some operational success but incentives still weak. 3. Success with the firms assisted, but most SMEs reluctant due to lack of supportive MBIs, weak enforcement of regs, difficult access to finance, high cost of consultancy 4. Useful study. SME desk moderately successful 	<ol style="list-style-type: none"> 1. Needs continuing effort to maintain momentum. 2. Stronger guidance to selected industries, more attractive MBIs needed 3. Raise awareness, especially of economic benefits of CP, strengthen enforcement, more attractive MBIs, better access to finance, lower cost of consultancy services 4. Study recommended strengthening overall env mgt programs, privatizing some env mgt responsibilities, expand financial window for env services and investments, provide market information on env investments. Promote knowledge of SME desk 	DTI/BOI PBE, EMB	

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
EMB - Industrial Environmental Management System (IEM/GIS) 2001					
<p>The MIS section of EMB has designed this GIS system to consolidate all monitoring information on industrial emissions (from all media) for the purposes of operations (eg. tracking permissions) and for environmental planning. The system has a key which can consolidate EMB's existing data sets on air, water and hazardous wastes, and can input data on ecological systems and other factors such as population etc. and data from other studies (eg. ENRAP). It is presently in the design stage and no data has yet been entered (except for an initial test at Batangas)</p>	<p>All industrial sectors and emissions, ambient media, all regions</p>	<p>This is potentially a very powerful tool for EMB's env planning. It has very demanding data requirements, but is essential if EMB is ever to develop a fast and accurate information base for its operations. Initial examination of the data from EMB's regional offices indicates variable, duplicative and unreliable data & difficulty in obtaining emissions data from industries. Much work is necessary to verify and correct this data and to ensure that future data collection by staff is consistent, accurate and up to date.</p>	<p>EMB proposes to prepare a handbook to train the regional office staff, and mount an expanded effort to register and record more firm-level information.</p>	<p>EMB</p>	<p>This should be a high priority item for EMB and for all concerned with effective env mgt. Additional budget is needed to hire more staff or local contractors, to expand the data collection effort. Presumptive method might be used, based on PSIC data and emission factors</p>
IDRC - An Ex-Ante Analysis of a Water Pollution Tax for the Mecauayan Tanning Industry (WPT-Mec) 1996					
<p>An evaluation of the different effects of two approaches to reduce pollution from tanning industries along the Mecauayan river - C & C with fines versus a tax on BOD</p>	<p>River basin in the NCR</p>	<p>Shows difficulty of reaching efficient pollution control with a C & C and fines only approach.</p>	<p>Recommends implementation of a charge on BOD effluent</p>	<p>EMB</p>	<p>Useful analysis</p>

Description	Region/Sector	Key Issues	Recommendations	Action	Notes
ADB - Promotion of Cleaner Technologies (DOST-CP) 2002-2004					
TA to enhance DOST's capabilities in industrial CP. Will i) build capabilities of DOST staff & other govt agencies & industry, ii) assist industry, especially SMEs thro training & demonstration programs,		Expected outputs include; I) developing EMS with 20 companies, ii) establishing support mechanisms for 8 industrial subsectors to evaluate, select & acquire cost-effective technologies for CP, iii) training & TA to SMEs, iv) business plan for ITDI, DOST to promote CP, v) training for 500 staff from govt., industry, banking, v) developing technical manuals		DOST	Ensure that EMPOWER does not duplicate this work

NATIONAL IEM STRATEGY - DESIGN STEPS AND EXISTING INFORMATION

Annex 3-2

DESIGN STEP	STUDY	TOPIC / RELEVANCE	RECOMMENDATIONS	ACTION	NOTES
INDUSTRIAL POLLUTION - existing situation					
1. Identification & quantification of all pollution sources, and pollution from industrial sectors, related to health, ecological and economic impacts	JICA-CP	WB/USEPA tables	Useful to improve NRIPS impact ranking Update and apply NRIPS for industrial & non-industrial emissions & incorporate into EMB's IEM-GIS system.	EMB	Using the PISC data, this can be a useful planning tool until more accurate data emerges from EMB's industrial registrations
	IEMP ENRAP	NRIPS tables First effort to do this nation-wide	Needs up-dating and applying to EMB's IEM-GIS.	EMB	
	URBAIR MEIP/LL	Air pollution health impacts in MMA Health & economic impacts on Laguna Lake	Data can be used for air analysis.	EMB	
	HWM	Types & volumes of HW generated	Incorporate in EMB's GIS	EMB	
2. Spatial distribution of industries by Province (plus by LGU for NCR, Cebu, Davao)	IEMP ENRAP IEPC, PR HWM and EnTec	Outside NCR. Province-wide only. Broad, Province-wide only NCR only. Needs updating CALABARZON and Cebu, HW generators only	All these data-bases need to be reviewed to see how much use they are to be up-dated and incorporated into EMB's IEM-GIS.	EMB, LLDA	EMB and LLDA should cooperate on this
3. Identify 'net' emissions (to water, air, land) by industrial sectors, by Province	HWM EESIS IEMP MEIP/LL PR	Estimated 'net' emissions for HW Precise analysis for 3 sectors NRIPS tables For LL based on ambient monitoring Based on ambient & point monitor.		DOST/DTI	The NRIPS tables need to be improved by more accurate analysis of industry sectors, similar to that undertaken by EESIS,
4. Identification of linkages with other polluting sectors (households - sewerage, solid wastes fuelwood vehicles, agriculture, mining etc), and industry's share of pollution)	ENRAP IEPC MEIP/LL PR	Good evaluation nation-wide Undertaken for the NCR only For LL in broad terms Detailed for Pasig river	More work overall is needed on these relationships, which should be captured in EMB's GIS system	EMB, LGUs	It is essential that EMB puts industrial emissions in the context of overall pollution types and sources, otherwise there will be a false picture of the role of industry, and industrialists will object that they are being unfairly treated

DESIGN STEP	STUDY	TOPIC / RELEVANCE	RECOMMENDATIONS	ACTION	NOTES
5. Identification of 'hot-spots' by priority locations & sectors, based on ambient receiving media (water, air) & population density.	ENRAP IEPC PR HWM	In broad terms only For NCR in broad terms Detailed for Pasig river Volumes & types identified by region		EMB, LGUs	Most hot-spot locations known, but the intensity of pollution, balance among sources, and impacts on health and economy are less known, except for the detailed studies of LL and Pasig
INDUSTRIAL PERFORMANCE (abatement options, costs - incl. CP, LCA)					
6. Industry control & CP measures, technologies, costs, affordability	EESIS NSCB Entec HWM IEMP, IISE, MEIP(CP), PRIME URBAIR, ENRAP DOST-CP	Did 3 sectors. Study is a model. Brief analysis of several sectors Some industrial analysis for HW. Broad recommendations for HWM. Detailed technologies for HW processing facility. Through EMS/PMA's, all these initiatives have identified appropriate technologies for some industries. Fuel switching Still to be undertaken. 8 sectors	Undertake this work for other key sectors HW control methods by enterprises. Design of 'model' TSD facility, landfill design Results need to be organized into handbooks & affordability analyses added as necessary	DOST/DTI, Industries & industry assoc's. EMB	This is an important area of work. As well as engineering, It should include analysis of the financial impacts to the firm/sector, in order to show affordability to industry and also as a basis to adjust regulatory standards. Handbooks, promotion to SMEs needed.
7. Pollution Reduction Targets & phasing - initially for 'hot spots' (related to ambient quality targets in relevant watersheds airsheds).	IEPC MEIP/LL URBAIR PR	For the NCR (water and air, v broad) For Laguna Lake (water) For MMA (air) For Pasig river watershed	Evaluate and incorporate these measures into EMB's Pollution abatement planning	EMB	
8. Identification of priority firms for pollution reduction	PR Other studies	Only detailed study which specifically identifies polluters. Other studies have identified by sector type and size	This is a sensitive issue, and should be set within an EMB policy for actions to target major polluters (eg. 'dirty dozen' etc)	EMB	EMB needs to develop a clear implementation strategy with popular support, then pursue it vigorously

DESIGN STEP	STUDY	TOPIC / RELEVANCE	RECOMMENDATIONS	ACTION	NOTES
9. Costs and benefits of industrial pollution control	EESIS MEIP/LL ENRAP	Only study which attempts to link affordable PC at the firm level with revisions in standards, to indicate and justify affordable and cost-effective standards For Laguna Lake Broad sector policies (implement where control costs are less than health damage costs)	This analysis yielded information which led to proposals on significant changes in standards	DOST, EMB NEDA,	This type of analysis should be undertaken for all key polluting sectors (especially those where costs of PC to the sector are high). Should also be applied to ecosystems (eg. watersheds, airsheds)
POLLUTION ABATEMENT INSTRUMENTS - (Legal/Regulatory)					
10. Review key legislation & regulations (especially standards) in view of i) costs to industry, ii) effectiveness to reduce pollution, iii) regulatory costs	EESIS HWM Other studies IISE/Fisc/Fin JICA-CP	Affordable and relevant standards Adjust HW regs for firms & central facility. Improve registration Most other studies propose review of standards & recommendations See legislation for fiscal & financial practices (below) Reviews innovative regulatory ideas	See recommended standards for the 3 sectors, also legislation for CP Changes to incineration & Clean Air Act, regs for HW landfill & TSD, recycled products, data mgt for HW Adjust standards re. abilities of industries to comply, emphasize CP approaches, phased compliance	EMB with DOST Industry Assns.	Summary of all the various proposed changes should be made, then discussed in the committees set up for this purpose
11. Urban planning, zoning, industrial estates	IEPC HWM	Reviewed	Stronger powers to enable MMDA to plan Mini-industrial estates to relocate polluting SMEs and locations for HW storage facilities and site for central treatment (TSD) plant	MMDA	Industrial estates have been an effective instrument, but overall better urban planning is not practical in Philippine context
12. Product performance standards (eg. Ecolabeling)	PRIME	Did ecolabeling survey	More needed on this topic	Trade and industry associations	Work also needed on recycling industries (especially used oil)
POLLUTION ABATEMENT INSTRUMENTS - (Market-based)	JICA-CP	see for global overview			

DESIGN STEP	STUDY	TOPIC / RELEVANCE	RECOMMENDATIONS	ACTION	NOTES
13. Taxes on Inputs	EESIS HWM		Selective, related to biggest polluters On virgin materials, related to toxicity, On industrial water, including groundwater charges	EMB, DOF LUA, PEZA	Needs attention during engineering analysis of industrial sub-sectors
14. Presumptive charges and taxes	ADB-MBIs		Water and Air charges (in short term) Emission charges pay for traffic mgt.	MWSS, DOE, DOTC	Check status. Presumptive charges easier re monitoring but possible resistance from industry
15. Emission and effluent charges, trading permits	LL, IEMP ADB-MBIs, HWM, IDRC EESIS	Effluent and emission charges which change firms' behavior and provide revenue for regulator	Proposed effluent charge Effluent & emission charges, effluent trading permits (all in medium term). Empower LGUs to set & collect charges	LLDA EMB, DOE LGUs	LLDA subsequently implemented effluent charge. Draft Clean Water Act also proposes. Check status
16. Fees	ADB-MBIs HWM		Vehicle registration fees linked to pollution potential, road access fees to reduce congestion (later term) Private TSD facility charges fees for HW processing	DOTC TSD, EMB	Check status
17. Fines	Most studies		Increases in fines for non-compliance,.	EMB	
18. Deposit-refunds	HWM		On containers, batteries, tyres		
19. Procurement policies	PRIME HWM		Government supplies having eco-labels All new industries , Govt Corps & hospitals to send HW to TSD facility	Govt. Depts EMB	Check status
20. Product taxes	URBAIR and ADB-MBIs		Cross-pricing from leaded to un-leaded fuels, surcharge on all polluting fuels	NEDA, DOF	Cross-pricing introduced
21. Tax relief	IISE/Fisc EESIS HWM	Support to House bill 10596	9 incentives proposed (pp. 20-25) BOI incentives to incorporate CP Sales tax relief on re-cycled products	BOI LGUs	Check status, views of BOI
22. Subsidies	EESIS HWM		cash for innovative demonstrations, interest rate subsidies for env investments Time-limited subsidy on HW disposal fees for SMEs , and re-location subsidy for SMEs to industrial estates	NEDA, DOF, Banks	use should be carefully limited
23. Banking practices - (interest rates, collateral, credit ratings)	IISE, IEMP HWM	Banks establish Env Unit. 4 main reforms proposed	BSP authorizes and monitors reforms IEMP evaluates & proposes Env. Fund to assist industry, regulator	BSP, Banks EMB	Necessary reforms. Discuss with BSP, DBP, LBP, EMB, DTI
24. Guarantees	ADB-MBIs		Improve mining guarantee fund		

DESIGN STEP	STUDY	TOPIC / RELEVANCE	RECOMMENDATIONS	ACTION	NOTES
25. Insurance	IEMP, HWM HWM		Banking sector examine risk insurance Risk insurance for HW transporters	BSP, banks DTI, Banks	Check status
POLLUTION ABATEMENT INSTRUMENTS knowledge	JICA-CP	see for global overview			
26. Information campaigns, tools	IISE, PRIME	Have prepared manuals, training materials	HWM recommends public awareness strategy for HW	EMB, NGOs	Needs action for HW
27. Disclosure, Awards	IISE		Recommends their development	EMB, DTI, DOST	Does EMB operate these?
28. Waste exchanges	PRIME	PBE operates one		PBE	
29. Training and Technical advice (EMS, LCA etc)	IEMP, IISE PRIME PRIME HWM DOST-CP	Trained local cons., EMS database, prepared handbooks, drafted DAO to include EMS in Clean Air Act Study on Env Entrepreneurship SME information desk Training Training, EMS, sector analysis, policy			Check status - see item 27. Note IEMP's Impact Report for a good evaluation of why firms have not maintained CP initiatives that started. Care re. Overlap with EMPOWER
30. Codes of Practice & Certification (eg. ISO 14001, companies auditors, laboratories)	IISE	Assisted frms. Assisted AIM to become first EMS-certified training institute	Proposes National EMS accreditation Program (EMSAP) for auditors, to reduce costs of foreign certification	BPS,	Check status
	PRIME	Set up Env Auditors			Check status
		Registration System with PAEP,	Laboratory recognition guidelines	EMB	Check status
INSTITUTIONS AND ORGANIZATIONS	JICA-CP	see for global overview on CP			
31. DENR/EMB	EESIS, IISE, EMB HWM IEPC, IISE	Helped to start CPAS and MIS/GIS GIS structure established, tested, EMB admin for HW Efficiency improvements needed	Data problems slowing implementation, Need urgent attention & staff training Operational system recommended 'one-stop shop', sub-contract operations, Env. Fund to help support EMB operations	DENR/EMB DOF, DBM	Should be discussed with DENR/EMB, DOF, DBM
32. DOST	DOST-CP		Study will make recommendations as part of business plan for ITDI and DOST	DENR/EMB	DOST should be strengthened as main IEM/CP center
33. Banks	IISE/Fin		See recommendations above	BSP, banks	

DESIGN STEP	STUDY	TOPIC / RELEVANCE	RECOMMENDATIONS	ACTION	NOTES
34. LGUs	ENRAP, IISE		LGUs' bigger role in pollution monitoring, applying waste fees, revenues to accrue to LGUs, require ecolabeling, EMS or ISO certification from polluters	LGUs, DOF	What are DOF's, EMB's actions on this?
35. Others	PRIM, HWM	Evaluates Laboratories	Equipment, Certification, training, sub-contracting	EMB, BPS	
	HWM,	Strengthen existing recyclers	Tax relief, product standards	BOI, BPS	
36. Networking	IISE	Formed Phil Env Partnership program (PEPP), IISE website	Continue PEPP network of DOST, BPS, BOI, AIM, ULAP, DBP, LBP, PATLEPAM	PEPP	Strengthening networking between public, private sectors, communities v. important. Also at policy level (eg. NEDA, DOF, DBM, DTI, DENR, DOST)
	PRIME	BA 21 helped 83 associations	Continue support for PBE	PBE	

ANALYSIS FOR SELECTION OF PRIORITY INDUSTRIES IN STUDY AREAS (Region 4 and NCR, Region 7 Annex 3-3
(base data from 1997 NSO Survey of Manufacturing Establishments)

PSIC CODE	SECTOR	TOTAL RECEIPTS (PhP Million)		NUMBER OF ESTABLISHMENTS		AVERAGE NO. OF EMPLOYEES PER ESTABLISHMENT		AVERAGE SIZE OF FIRM (3) (S,M,L)	HEALTH IMPACT (1)			
		R4&NCR	R7	R4&NCR	R7	R4&NCR	R7		Sector's Rank (Impact by Type of Pollutant) (1)		Weighted Rank by Size of Receipts (2)	
									Combined Index	Toxics & H Metals	R4&NCR	R7
230, 231,241	Industrial Chemicals & Fertilizers	24,745	1,784	221	20	67	38	S	1	High	6	5
191,192	Tanneries, Leather Products	4,276	254	448	20	49	88	S	2	High	3	3
272	Non-ferrous Metals	2,452	29	16	3	135	(19)	M (S)	3	V. High	2	2
252	Synthetic Resins, Plastics	24,168	668	410	17	72	64	S	4	Medium	13	12
271	Iron and Steel	34,987	5,056	318	29	77	67	S	5	V. High	5	1
210	Pulp and Paper	16,230	484	248	7	66	107	S(M)	6	Low	12	16
171 - 174	Textiles and Dyes	25,171	703	455	16	97	66	S	7	Medium	9	14
242 - 243	Other Chemicals (incl. paints, pharmaceuticals	84,997	3,530	332	16	100	153	M	8	Medium	2	2
232	Petroleum Refining	98,776	0	2 (R4)	0	738	0	L	9	Medium	1	
281 - 289												
321 - 323	Fabricated Metal, Electroplating	93,278	9,814	795	62	121	144	M	10	High	3	1
251, 313	Rubber Products	13,909	72	120	9	132	39	M(S)	11	High	19	18
201, 202	Wood & Cork products	3,981	355	310	37	31	37	S	12	Low	24	19
324	Radio & TV manufacturing	15,714	0	37	0	248	0	M	13	Medium	17	
261, 269	Clay and Glass products	16,694	1,582	397	69	73	52	S	14	Medium	16	11
311, 312, 314 - 319	Electrical products manufacturing	40,172	4,582	148	7	216	405	M	15	Medium	8	3
158	Vegetable Oils and Fats Refining	1,607	0	21	0	38	0	S	16	Low	28	
331 - 333	Photographic and Optical	6,280	4,353	40	22	289	972	M(L)	17	Low	23	
	Structural Metal manufacturing								18	Low		
341 - 343 351 - 359	Motor Vehicle Assembly, Vehicle Body manufacturing	68,982	4,633	266	25	109	132	M	19	Low	4	6
371 - 372	Metal recycling (NCR only)	90	n/a	4	n/a	43	n/a	S	20	Low	29	
	Carpets and Rugs weaving								21	Zero		
291 - 294 300	Machinery & Equipment NEC	39,987	615	490	45	72	65	S	22	Low	7	20

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PSIC CODE	SECTOR	TOTAL RECEIPTS (PhP Million)		NUMBER OF ESTABLISHMENTS		AVERAGE NO. OF EMPLOYEES PER ESTABLISHMENT		AVERAGE SIZE OF FIRM (3) (S,M,L)	HEALTH IMPACT (1)			
		R4&NCR	R7	R4&NCR	R7	R4&NCR	R7		Sector's Rank (Impact by Type of Pollutant) (1)		Weighted Rank by Size of Receipts (2)	
									Combined Index	Toxics & H Metals	R4&NCR	R7
	Paper and Paerboard Containers								23	Zero		
391 - 399	Sports Goods, Jewelry	8,408	1,004	217	44	85	74	S	24	Low	21	17
360	Manufacture & Repair of Furniture	4,321	3,353	305	138	41	92	S	25	Medium	26	10
221 - 223	Printing and Publishing	15,154	346	666	50	38	28	S	26	Zero	20	23
	Tyres and Tubes								27			
157	Sugar factories	3,883	2,640	8	7	339	387	M	28	Medium	27	12
151	Fish, Meats, Preserved Foods	44,600	5,826	220	45	102	108	M	29	Zero	10	7
152	Dairy Products	27,212	199	40	3	193	132	M	30	Zero	18	24
160	Tobacco Products	29,826	n/a	8	n/a	1,079	n/a	L	31	Zero	16	
	Sawmills								32	Zero		
	Wine								33	Zero		
155	Beverages, Liquor	35,192	6,842	42	13	305	251	M	36	Low	15	8
262	Cement, Lime, Plaster	8,417	1,617	5	3	523	408	L(M)	37	Low	25	15
153, 159	General Food Products, Grains	54,778	5,686	427	90	66	32	S	38	Zero	11	9
156	Bakery Products	11,502	300	603	182	44	14	S	39	Zero	22	21
181 - 189	Garment Making	45,009	1,399	1,501	56	84	128	S(M)	40	Zero	14	22
	TOTALS	906,981	68,846	9,120	1,035							

Industry Size (all Philippines)		
10 and over	1,338,543	14,734
Under 10	48,757	101,052

- NOTES:**
1. Based on the World Bank / USEPA Pollution Impacts on Health (Industrial Projection System - by Hettige, Martin, Singh and Wheler). The ranking (1 is highest) combines impacts originating from air, water and land, with a separate indication for toxics.
 2. To establish the ranking for the sectors in the study regions, each sector has been weighted by its size of revenues (a proxy for product volume, which is not available), divided by the original ranking (1 to 10 is 1.1 to 2.0 etc). Final adjustments were made to raise the ranking of those sectors which have very high and high intensity of toxics and heavy metals.
 3. The average size of firm gives a broad indication of the concentration or dispersion of the sector in terms of firm size. Some firms in each sector will, of course be both larger and smaller than the average. The size classification used in this table is: Large - above 500 employees. Medium - 100 to 499. Small - 10 to 99. Micro-enterprises (below 10 employees) are excluded (these enterprises account for the largest number of all firms in the Philippines, but only 3.5% of receipts - see notation of industry sizes above)

Annex 3

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ANNEX 3

1 Current Practice in Industrial Environmental Management and Issues for the Further Advancement

1.1. Current Practice in Environmental Management in the Industry Sector and Issue for Further Advancement

Historically, environmental legislation in the Philippines may have started during the pre-Spanish Period when the Code of Kalantiyaw was forged and addressed noise pollution and waste disposal problems. During the Spanish colonial period, industrial environmental management became a government concern when the Spanish Governor-General was granted in 1866 royal authority to suspend operations of an industrial establishment found contaminating the waters with substances or properties noxious to public health until the owner adopted a suitable remedy. This model of industrial environmental management, wherein the police power of the state is exercised to regulate pollution and other environmental effects of industrial activities under a command-and-control structure, has preoccupied the Philippines since the industrial revolution until recent times.

It should be asked how this strategy has contributed to the protection and conservation of the Philippine environment. The latest environmental quality report to the nation by the Environmental Management Bureau (EMB) under the Department of Environment and Natural Resources (DENR) strongly suggests that industrial environmental management in the Philippines has been a dismal failure. The environmental degradation caused by industry has in fact worsened over the years particularly during the 1970-2000 period when industrial growth was unprecedented. A global survey reported by media last February 2002 ranked the Philippines as the most polluted country in Southeast Asia.

The present worldwide economic slowdown provides perhaps enough respite, opportunity and time to review what the status of industrial environmental management is, rethink strategies that have failed to deliver the desired outcomes and forge goals, innovative approaches and measures that can make a difference in industrial environmental management.

Current initiatives in transforming industry into a promoter of sustainable development through integrated environmental management are beginning to reap encouraging results. The paradigm shift from the full reliance on command-and-control strategy to a more market-based, results-oriented and participatory model of environmental governance is providing much impetus to both government, industry, civil society and communities to work together for the environment and sustainable development.

This chapter provides a “snapshot” of this incipient transformation in the Philippines, describing the key players, their initiatives, , lessons learned from their pioneering works, and their plans.

1.1.1 Relevant Projects and Their Outcomes

The Study Team reviewed the most recent projects that focused on promoting industrial environmental management, as follows:

- UNDP-PRIME Project
- USAID-IISE Project
- JBIC-EISCP-2
- WB-CLF

The first two projects will be discussed in next sections, while the other two projects will be discussed under the section on financial institutions (Section 1.2.4).

1.1.1.1 UNDP-PRIME Project

a) Rationale and Objectives

PRIME refers to the Private Sector Participation in Managing the Environment project funded by the United Nations Development Programme. PRIME started in January 1998 and ended in December 2001. A new DTI Shell Program on Environmental Management for Industry Competitiveness was approved by DTI and UNDP in June 2002.

The PRIME project signified a paradigm shift and a landmark in strengthening DTI-BOI initiatives to mainstream industrial environmental management in their sphere of influence. In fact, UNDP had to negotiate with both DENR and BOI to agree on the deliberate choice for BOI to lead in implementing PRIME. After the decision was made, PRIME sounded the new battle cry in business and environment: to enhance business competitiveness in the global and local marketplace through environmental management. Thus, it was hoped that industries would adopt environmental management concepts and tools proactively and on their own and not as a result of regulatory pressure. The target was “green and profitable industries”.

PRIME covered all industry types: small and medium enterprises, large firms, industrial estates, industry associations and environmental entrepreneurs. Training and assistance in finding financial and technical resources were the key strategies of PRIME. Online services were also provided. Partnerships and policy advocacy on market-based instruments and environmental incentives complete the well-rounded and soft-sell approach in achieving PRIME’s thrusts.

PRIME consisted of four modules, implemented in partnership with public and private key players in IEM, as follows: 1) Business Agenda 21, led by Philippine Business for the Environment (PBE), 2) Industrial Ecology, Board of Investments (BOI), 3) Environmental Management Systems, DTI-Bureau of Product Standards (BPS) and Philippine Association of Environmental Assessment Professionals (PAEAP). These organizations involved in PRIME are further described in Sections 1-1-2 and 1-1-3.

In November 2001, the PRIME Project received an international award called the Intel Environment Award as one of the five environment finalists in the inaugural gala of Tech Museum of Innovation Awards held at San Jose, California, USA.

b) Module 1: Business Agenda 21

Business Agenda 21 (BA 21) is the strategic effort of business to help the country achieve sustainable development. It consists of voluntary environmental action plans of a wide range of business associations. PBE coordinated and assisted many industry associations

nationwide in preparing their own environmental agenda. In the end, 82 industry associations are now BA 21 participants, a fruit of active advocacy and partnership building. The roundtables and tutorials became the venue for industry practitioners to voice their environment concerns.

The BA 21 has two parts: the environmental aspects that are of greatest concern to the different industries and the perceived impacts, and strategies that can be pursued to address these concerns. Among the environmental concerns of the associations are: use of natural resources, depleting scarce or non-renewable natural resources; process by-products and waste that result in air and water pollution and land degradation; and, occupational risks inherent to industry due to use of hazardous materials. The strategies to be pursued are: enhance awareness, reflect commitment from top management for ranks to follow suit, and take action to address specific goals and timetables.

BA 21 has shown that corporate environmental responsibility is a sensible and profitable way of doing business.

c) Module 2: Industrial Ecology

This component aimed to develop industrial symbiosis and designed a continuous flow of industrial materials to minimize waste and maximize use of resources. BOI implemented 4 subtasks: 1) By-Product Exchange, 2) Eco-Industrial Park, 3) Policy Study, 4) Integrated Resource Recovery System Feasibility Study.

The By-Product Exchange (BPX) program was piloted in five Industrial Estates in the CALABARZON area, namely: Carmelray Industrial Park, Laguna International Industrial Park, Light Industry and Science Park, Laguna Technopark, Inc. and LIMA Technology Center. The collaboration helped establish the waste database that interested firms (within and outside the five parks) can access online and strike possible buy-outs, if not exclusive exchanges with the by-product generators. The BPX program is closely tied up with the Industrial Waste Exchange Program (IWEP) formerly administered by EMB but now turned over to the PBE.

The Eco-Industrial Park program is based on the concept of collaboration on resources and operation among locator companies to achieve a collective financial and environmental profit. This program used as model the Philippine Petrochemical Development Corporation (PPDC) of the Philippine National Oil Company in Limay, Bataan. The PPDC was also the demonstration site for applying industrial ecology concepts and tools. Among the IE tools are the life cycle analysis, green chemistry, and design with environment. In essence, the park integrates its resources, including materials, energy, production process, human resources, environment, health, safety, information systems, marketing, transportation, quality of life and community. PNOC implemented its Programmatic Environmental Compliance Certificate. Other developers adopted or are interested in the program: the Homabon Agro-Industrial Development Corp. in Bicol and San Miguel Corporation.

d) Module 3: Environmental Management System

The DTI-BPS supported nine SMEs in the food manufacturing and chemical industries sectors in implementing an ISO 14001 EMS. These nine firms include: Ariad Industrial

Corporation, Castillejos Agri Farms, Custom Clay Inc., Inchem Industrial Corporation, Nutrilicious Foods Corporation, Ostrea Mineral Laboratories, Power Synthetic Rubber Manufacturing Corporation, Redisol Inc., and TSB Enterprises Inc. Five of these firms opted to get ISO14001 certification with support from BPS under the latter's Industry Competitiveness Program. Inchem Industrial became ISO 14001 certified in September 2001. Certification to ISO standards is encouraged to give companies a competitive advantage especially with the growing global use of international standards in trade.

The Philippine Association of Environmental Assessment Professionals set up an Environmental Auditors Registration System (EARS). The system promotes the professional practice of environmental auditing, provides international recognition to local environmental auditors, alleviates the lack of local EMS consultants and environmental auditors, and provides business and industry with a reliable source of competent environmental auditors. In effect, the system makes EMS more affordable especially to SMEs.

Ecolabeling is an international practice of identifying products that reduce environmental impacts compared to other similar products, based on life cycle considerations - from production through packaging, to disposal or recycling. Ecolabeling promotes environment-friendly businesses. An Ecolabeling survey showed that Filipinos have generally high level of awareness of environmental issues but this does not translate well to "green" product preferences nor business philosophy. However, some industry associations are venturing into Ecolabeling through third-party certifications. This can initiate a private sector-led national Ecolabeling program based on ISO 14024 standard, as PRIME envisioned.

e) Module 4: Environmental Entrepreneurship

Implemented by EMB, the module explored the potentials for private sector to assume government's role in providing environmental services. There is proven market demand for environmental consulting, engineering services, environmental training, laboratory testing and analyses, and environmental certification such as ISO 14000 series.

EMB crafted environmental laboratory recognition guidelines that were initially applied to 23 laboratories nationwide through PRIME assistance. Most of the recognized laboratories are based in Metro-Manila; there were 3 laboratories based in Mindanao and 6 in the Visayas.

The module also operated an SME desk for environmental information, linked to a website.

1.1.1.2 Future Plans: The DTI Shell Program on Environmental Management for Industry Competitiveness

Much has to be done to solidify the framework of private and public partnerships that PRIME has built. The UNDP is supporting now a new shell program of BOI, building on the gains made by PRIME. Like PRIME, this program also aims to develop internationally competitive Philippine industry sector, through the use of environmental management tools.

The program areas to be promoted include the following:

- Promotion of ISO 14001-based Environmental Management System (EMS) & Ecolabeling
- Use of Eco-Industrial Development approaches to foster stewardship by industries
- Use of Environmental Cost Accounting and Environmental Performance Indicators to encourage Environmental Entrepreneurship and environmental investments.

The program objectives and targets over a three-year period (starting June 11, 2002) include the following:

- Wider adoption of environmental management practices by industry through the establishment of ISO 14001-based EMS in at least 20 local firms
- Pilot Ecolabeling program in at least one product category
- Industrial Waste Exchange database and matching programs in Luzon, Visayas and Mindanao
- Establishment of an Industrial Ecology - Asia Network
- Industrial Ecology module for the Academe
- At least two industrial parks or industry sectors practicing industrial ecology
- Policies on Industrial Ecology and incentives for industry to raise environmental performance

1.1.2 USAID-IISE Project

1.1.2.1 Background

USAID's Industrial Environmental Management Project with the Department of Environment and Natural Resources (DENR)/Environmental Management Bureau demonstrated that "Pollution prevention pays." Participating companies showed profits when pollution is reduced. However, many of those companies did not pursue pollution prevention beyond project assistance. Those who continued to improve their environmental performance did not share the information. Although DENR played a big role in getting the companies' participation, nobody at DENR advocated for pollution prevention.

USAID supported the Industrial Initiatives for a Sustainable Environment (IISE) to sustain advocacy of pollution prevention. IISE aimed for sustainable advocacy of pollution prevention. Its key strategy is promotion of Environmental Management System or EMS, which demands continuous environmental improvement of the implementor and influence to its suppliers/clients and community. The project targeted a number of industries (primarily those that produce toxic and hazardous waste) and this was implemented through direct promotion to private sector and involvement of the DENR. A complementary project, Assistance for Resource Monitoring and Information (ARMI) promoted the partnership of nongovernmental organizations with various sectors and the DENR to enhance community monitoring of industrial pollution.

1.1.2.2 IISE Achievements

The contract with Chemonics International ended on 31 August 2001, but DENR is continuing the project until December 31, 2002. To date, IISE achieved the following:

- **EMS implementations** (target = 300). A total of 297 EMS were under progressive implementation: 186 with IISE assistance, 46 by IISE-certified consultants without project

assistance, and 65 industries under greening the supply chain. A dialogue of DENR and BOI with IISE industry participants in Region 7 on July 2, 2002, however, showed that only 4 out of 13 participants are still pursuing EMS. Problems cited are lack of incentives, budget and time. Twenty-five other IISE participants did not heed the invitation for the dialogue. Under the greening the supply chain, Nestle Philippines is still monitoring the progress of its suppliers. Twenty-eight suppliers were honored for their progress in EMS implementation.

- **EMS certifications** (target = 75). Twenty-two certifications were achieved (representing more than one-quarter of total in the Philippines ; 8 with IISE assistance and 13 by IISE-certified consultants without project assistance. Fifty firms are estimated to have conducted an internal EMS audit.
- **Pollution reduction** (target = 20% average for 300 firms). Ten demonstration industries completed their initial pollution prevention/clean production (P2/CP) assessment, and were implementing P2/CP. Initial P2/CP assessment generated more than 60 options that addressed pollutants such as: heavy metals, used oils, acids, caustic substances, cyanide, hexavalent chromium, mercury, dissolved and suspended solids, volatile organic compounds, solids and plating wastes. Initial pollution-reduction rates for some targeted waste streams have ranged from 22% to 37%. Initial Environmental Reviews were conducted on 181 firms, all of which have identified their primary waste streams. Of these, 130 firms joined the IISE Joint Implementation Program and have targeted waste streams and percentage reductions within specified periods of time.

1.1.2.3 Other IISE Accomplishments

On private sector (industry and environmental consulting)

- Link between EMS and pollution reduction demonstrated
- EMS can produce savings above implementation costs
- 100 environmental professionals trained in EMS, P2/CP and EMS cost accounting
- 75% reduction in the cost of EMS implementation consulting
- More than 10 environmental consulting firms with expanded experience in EMS/CP

On public sector

- DENR and DTI are the first National Government Agencies to implement an EMS (both agencies need budgetary support and staff to continue EMS implementation)
- EMB is establishing a national Industrial Environmental Management GIS to locate waste streams and facilitate monitoring
- The Clean Air Act provides for the promotion of EMS, pollution prevention, and government-industry collaboration in industrial environmental management
- One regional policy (Bohol Investment Code) promotes environmental investment
- DENR position paper developed to support House Bill 10596 that would restructure fiscal incentives under the Omnibus Investment Code of 1987
- Proposed DENR Administrative Orders offer incentives and assistance for companies which will implement EMS/Pollution Prevention and a role of EMS in Environmental Impact Assessment
- Bohol is the first province in the country to be ISO 14001 certified
- DENR formed a partnership with Batangas LGU on GIS-based environmental planning and monitoring in order to strengthen environmental regulatory enforcement

On training institutions - professional and university

- Asian Institute for Management became the first EMS certified training institution in Philippines
- University of Southern Philippines (Cebu) established an Environmental Management Program with EMS courses
- The Philippine Association of Tertiary Level Educational Institutions on Environmental Planning and Management (PATLEFAM) is capable of promoting/disseminating EMS, P2/CP information
- DENR formed a partnership with the Philippine Institute of Certified Public Accountants (PICPA) to disseminate environmental costs and benefits accounting method in P2/CP as part of the Cash Flow Statement of business organizations

On advocacy groups - private/public consortia, NGOs

- Two EMS Auditors Professional Groups formed
- Feasibility study for PhilExport as EMS certifying body
- Plan for EMS Accreditation Board
- Collaborated with PRIME on EMS Registration Scheme
- Accreditation Program (EMSAP) and constituent components established
- Partnership established with NGOs to monitor industrial pollution
- IISE website created and transferred to stewardship of Ramon Aboitiz Foundation
- Environmental partnership of DENR with the Department of Science and Technology, Board of Investments, Land Bank, and Development Bank of the Philippines conceptualized and initiated with IISE support
- Two organizations formed to continue EMS promotion (Earth Charter and AmBionics)

The ARMI project ended July 26, 2002, and accomplished the following:

- Coalition building: three multisectoral management councils were organized and mobilized to abate pollution of Mactan Channel, Maribojoc Bay and Davao Gulf and promote cleaner production among industries. The councils were composed of civil society, government agencies, LGUs, industries and NGOs. They are undertaking various activities such as environmental monitoring, advocacy and coalition building.
- Established Environmental Awards with the local Chambers of Commerce and Industry to recognize outstanding companies or industries that exhibit their commitment for clean environment.
- Produced information materials such as posters, brochures, to increase public awareness on issues affecting the industrial sector. Monitoring reports were used for advocacy and negotiations with individual industries or establishments and/or referred to the appropriate government agencies for action. In Davao, a barangay LGU taps the environmental monitoring committee for recommendations before business permits are used. In Bohol and Cebu, the monitoring reports were used to settle issues of industries with DENR.
- Compliant industries in Davao City very actively participated and supported activities such as roundtable discussion with industries, development of information materials, industrial waste exchange, environmental awards, and community outreach.
- Cebu City monitoring council conducted research to establish an environmental monitoring system.
- 10 LGUs are in various stages of adopting EMS due to ARMI's influence.

1.2 Activities of Parties involved in IEM

1.2.1 Private Sector

1.2.1.1 Industry Associations

The National Statistics Office has listed more than 150,000 business establishments in the Philippines in Year 2000. Around 145,000 firms are considered SMEs (in terms of employment of 50 persons or less) and around 7,000 are potential hazardous waste generators (JICA-EMB Study, 2001). Many industry associations have been formed and a good number from various industrial sectors have inclinations for proper industrial environmental management.

A total of 83 industry associations signified strong interest in environmental management in terms of formulating their own Business Agenda 21. As the coordinator and facilitator in shaping 73 business agenda into the Philippine Business Agenda 21, the Philippine Business for the Environment (PBE) leads all industry associations in environmental management. A sequel will publish the BA 21 of 10 other industry associations.

EMPOWER study targeted 20 business associations (in addition to PBE) in order to know their present BA-21 related activities. The following information were gathered from brochures, websites, and responses to the questionnaire and/or interview (ADD SUMMARY OF INTERVIEW AND RESPONSE:

1) PBE (Philippine Business for the Environment)

PBE, an association of corporate executives and their member-companies, was established in 1992 to help industry address its environmental concerns and meet its environmental responsibilities. It acts as advocate, intermediary, catalyst and information provider on business and environmental issues. It operates with a relatively small budget and lean staff complement but has partnered well with donors, industry, government, and executing institutions to promote IEM.

Among its IEM-related accomplishments in the past year are the following: 1) managed the Business Agenda 21 module of the BOI/UNDP-PRIME and provided support to the crafting of environmental agenda of 84 industry associations, 2) maintained the “Environmental Information Center for Business and Industry”, the “Environmental Technology Referral System (ETRS)” and the “Information Center for Clean Technology and Environmental Management (CTEM)”, 3) published the magazine “Business and Environment” that contains also the Industry Waste Exchange Program directory, 4) issued “Environment Quarterly Briefs” to industry associations, 5) conducted “Corporate Environmental Training Series” consisting of 7 seminars for 200 participants on the following topics: EMS, In-House Environmental Review, Market-based Solutions to Environmental Problems, Environmental Finance and Cost Accounting, Industry-related Environmental Legislation and Policy, 6) co-organized an orientation seminar on SA 8000 with the Carl Duisberg Gesellschaft; and 7) assisted in drafting the position papers of the industry on the Clean Water Act and the Ecological Solid Waste Management Act.

2) The Philippine Chamber of Commerce and Industry (PCCI)

PCCI was formed in 1978, and by virtue of Letter of Instruction No. 780, the government recognizes it as the official representative of the entire private business community. Its mission is business growth and community development. It has 113 industry association and 115 local chamber affiliates. It has several environmental agenda, but it is more active in the discussions of policies such as the National Environmental Protection Agency, Clean Water Act and the Ecological Solid Waste Act. PCCI needs more encouragement to push BA 21 Agenda.

3) Cebu Chamber of Commerce and Industry (CCCI)

CCCI was formally organized in 1921 and was registered with the Securities and Exchange Commission in 1931. CCCI envisions itself to be the engine of Cebu's economic growth and is committed to initiate and influence the development plans of the government affecting business. Its advocacy program presents position papers on the various issues and concerns that deal with the promotion of business and trade. Its Philippine-German Chamber Cooperation Program (PGCCP) from 1986 to 1993 developed the Chamber's capability to assist its members. From 1994 to 1996, a Regional Chamber Development Program was also implemented to transfer the know how in institution building to the Chamber of Commerce and Industry in Iloilo, Negros Oriental, Bohol and Leyte. In 1997, the Chamber hosted the Philippine Business Conference (PBC) and was elevated to the Hall of Fame for successfully bagging the " Most Outstanding Chamber of the Philippine Award by PCCI for two consecutive years. The Chamber has been active in several environmental programs introduced in Cebu.

4) Cavite Chamber of Commerce (not BA 21)

The Cavite Chamber of Commerce and Industry (CCCI) was organized on June 24, 1983 to have a voice in the policy formulation in the Province of Cavite, Philippines Chamber of Commerce and Industry (PCCI) and national affairs as it relates to business. Today, it has more than 62 members, and has expanded to those outside Cavite Export Processing Zone (CEPZ), the General Trias industrial area, the Carmona People's Technological Complex and EMI-Yazaki in Imus.

It has partnered with JICA offering training on Saving and Re-using Industrial Water to its members.

5) Cagayan de Oro Chamber of Commerce

The Oro Chamber was established in 1985. It is at the forefront of lobbying on issues that affected or benefited the business community. It assisted in the completion of the master plan for the Cagayan de Oro-Iligan Corridor. In 1992, the Oro Chamber hosted the 1st Mindanao Business Conference for 400 delegates in Cagayan de Oro.

The Oro Chamber organizes business conferences, trade missions, management seminars and conducts market research studies. To keep members abreast of the latest update on the issuance of environmental compliance certificates, information seminars were conducted by DENR.

6) Energy Management Association of the Philippines (ENMAP)

ENMAP was established in 1978 and has about 400 members. Specific actions planned by ENMAP in BA 21 include training/seminars on energy efficient technologies for the industry, information dissemination through quarterly newsletter "The Energy Manager," seminars on new developments in new & renewable energy sources (NRES), and monitoring of commercialization of NRES.

ENMAP conducted several seminars on energy efficient technologies. These seminars were held in conjunction with the energy technology and environment conferences held by DENR. At these seminars, building energy management system was presented; the basic concept of the system is promotion of cogeneration system and utilization of solar heat. Other actions to promote energy efficiency taken by member companies were also presented at the seminars. ENMAP plans to have a series of technical sessions on energy technology and environmental aspects.

ENMAP has been lobbying in vain for the enactment of building energy management system for 4 years. A law on enforcement of building energy efficiency would lead to adoption by a large number of companies.

7) Philippine Sugar Millers Association (PSMA)

PSMA seeks to promote the development of the sugar industry through increased efficiency, productivity, and sustainability in a socially responsible environment. It was established in March 1922 for research and development. At present, it has 16 institutional members.

PSMA participated in BA 21 for prestige, and concern for environment and regulations. Their specific action steps have not been published in the BA 21. PSMA tried to set numerical targets for their action, but reaching agreement among members was difficult. PSMA is preparing an environmental management plan under the Industrial Reconstruction with Environmental Management project funded by Swedish International Development Agency (SIDA). The environmental management plan will have numerical targets and serve as a model for the sugar mill sector.

In early 1990, 10 members of PSMA participated in IEMP implemented by DENR and funded by USAID; on-site assessment of pollution management was conducted at the participating mills, and possible ways of waste minimization were introduced. Asia Foundation Project was a follow up of the IEMP; six members of PSMA participated in the project and conducted pollution management assessment. At one mill, 75% reduction in wastewater was achieved as a result of the assessment. Benefits of segregation of waste (separate cooling water from other type of wastewater) were disseminated through a leaflet to members.

The participants of these two projects also participated in EMS program under IISE. Five staff from each member attended a seminar on how to develop EMS. The outcome of this action is now under PSMA survey.

PSMA sees compliance with CAA (meeting emission standards) as the biggest challenge for its members. Under the economic hardship that the member companies are facing, it is difficult for them to make a large investment in flue gas treatment facilities, which are necessary to meet the strict emission standards. Average investment requirement would be

P 180M (3 stacks meeting the emission standards), which is almost equal to annual turnout. The new law concerning solid waste is also seen as a challenge for PSMA members in terms of organic waste management. Major wastes from the process are bagasse and filter cake. Bagasse is used as fuel at the sugar mills, and the filter cake is applied to soil as fertilizer. Because the filter cake cannot be applied to soil directly, sugar millers dump the filter cake on the fields for natural fermentation, which causes odor and methane problems. The sugar millers would like to have a composting facility for the filter cake. However, they do not have enough financial resources, and the interest rate (12%) that JBIC provides through DBP is still high for environmental investment.

At sugar mills, bagasse from the production process can cover need for fuel. PSMA is seeking for a possible cooperation with parties in developed countries for CO₂ emission trading.

The association has three staff involved in BA 21. Members contribute financially to ensure that BA 21 commitments are met. Cooperation is discussed in the meeting of the Environment Committee of the association.

8) Polystyrene Packaging Council

The Polystyrene Packaging Council of the Philippines was established in 1993 and has 18 member organizations nationwide.

The council considers concern for the environment as well as environmental regulations as the top two factors that led to its commitment to BA 21. Its environmental activities are focused on waste segregation and disposal. The council continuously participates in some environmental task forces and advocates recycling for foam polystyrene food packaging material.

PPCP members do not make financial contributions to BA 21, but they have very strong cooperation and commitment to address environmental concerns specifically those concerning foam polystyrene packaging. PPCP rates its members' commitment with a 9 from a scale of 1-10.

PPCP cites training/technical assistance and the provision of information materials as the necessary incentives to encourage more participation from member organizations. Its future plans include continuous information dissemination and commitment to addressing solid waste management issues.

9) Samahan sa Pilipinas ng mga Industriyang Kimika (SPIK)

SPIK was established in 1977 and has 71 member organizations nationwide. Among its member organizations are BASF Philippines, 3M Philippines, Vemaval, Chemphil, and Mabuhay Vinyl. SPIK considers concern for the environment and environmental regulations as the contributing factors for its commitment to BA 21. Its current environmental activities include the promotion of responsible programs. Member organizations make financial contributions to BA 21. Cooperation among members is practiced through signing the guiding principles of responsible care program design to implement the six codes of management practices. Sustainable funding is maintained through annual membership dues as well as seminar and workshop fees.

The SPIK Responsible Care Council is responsible for verifying its members' compliance

to the codes of management practices.

SPIK rates its members' commitment level as 4 on a scale of 1-10. Awards, training and technical assistance, and provision of information materials are suggested incentives to encourage member participation.

SPIK's future plans include increasing the number of companies participating in responsible care.

10) Philippine Wood Producers Association

The Philippine Wood Producers Association was established in 1951. It is composed of 78 regular and 354 associate member organizations in the national, regional and provincial levels.

Environmental concerns and regulations led to PWPA's BA 21 commitment. It participates in activities that are governed by the DENR/IRRs. It ensures that member organizations have valid Environmental Compliance Certificates. The association manages BA 21 through members' implementation of plans and ECCs as monitored and evaluated by DENR. It allocates funds as required for ECCs and its member organizations also make financial contributions to BA 21. Field technical staff from PWPA members is also involved in BA 21.

Cooperative action among member organizations is fostered through IEC, attendance in environment-related conferences, symposia, workshops, and cross-visits. Members also make contributions of materials and funds to regional and national activities when requested by concerned government agencies. Community participation is also practiced through employment of local people and/or funding of local community projects.

PWPA's fund raising for BA 21 is carried out as required for IRRs, ECCs and other activities. The central PWPA monitors its members' BA 21 activities, such as reforestation, through reports as well as by validation by DENR central and field offices. PWPA rates its members' commitment at 8-9.

PWPA considers the following as the necessary incentives for more participation from members: awards, training and technical assistance, provision of information materials, and tax deductions and subsidies.

11) Pulp and Paper Manufacturers Association

The association is composed of 15 paper mills, out of 32 mills in the country. Their members are buyers of used paper and kraft paper/paper boards. It is committed to BA 21 because of concern for environment and environmental regulations. Among its commitment are to formulate corporate environmental policy for members and association, promote ISO certification of members (six members are certified), and establish waste minimization program. To achieve its commitment, it is now working on solid waste/paper sludge project with the Development Bank of the Philippines and the Department of Science and Technology; recycling/solid waste management project with the DENR; and ISO 14001 certification for mills. Members do not contribute funds for BA 21, but cooperate during monthly Board meetings and Technical Committee Meetings. BA 21 commitment is high. Individual mills have community outreach programs. Training/technical assistance and information materials are the incentives for more

participation of the members. The association's main concern is consistency of policy implementation. They are concerned that enforcement agencies change policies and commitments with the change in leadership. They also call for coordination among agencies such as LLDA, DENR, and BOI in order to serve the needs of the industry.

12) Philippine Metalcasting Association

The name Philippine Metalcasting Association started in 1990, but the association has been established since 1972. It has 93 member organizations with national coverage. According to the respondent, only AceTech Metal is highly committed to BA21. The contributing factor that led to the Association's Commitment to BA21 are concern for the environment and concern over environmental regulations.

The Association's current environmental activities are seminars on ISO 14000.

Members do not contribute financially for BA21 activities. Staffs involved in environmental activities are mostly the technical committee members.

Member companies cooperate through attendance to training and seminars. Annual meeting among members are held during July and special monthly meeting between the board members.

Members need more encouragement to pursue BA 21 commitments. Incentives needed to encourage more participation are more training and technical assistance and information materials.

13) Chamber of Automotive Manufacturers of the Philippines (CAMPI)

CAMPI was established on May 1995 with 14 member organizations. Contributing factors that led to the Association's Commitment to BA 21 are concern for the environment and concern on environmental regulations

The association manage BA21 commitments thru its technical committee and respective company members. Individual company programs fund activities necessary for its BA 21 commitment. Among the commitments are the following:

- 1) Provide complete list of toxic substances by year 2001
- 2) 100% segregation within four years and on-site/off-site recycling
- 3) Reduce electric, water and paper consumption within 4 years
- 4) Compliance to effluent and emission standards (stationary)
- 5) 100% compliance on new product by 2000.

Cooperative action among member companies are fostered through:

- 1) Coordination and dialogue among members on a common direction
- 2) Group discussion with the government on industry environmental concerns on environmental matters
- 3) Coordination and consultation with foreign automotive associations and experts.

The CAMPI Technical Committee requires members to share information and report updates on BA 21 activities.

The association's assessment to members is given a rate of 9 to highly committed. Among the highly committed industries of the association are Toyota, Honda, Mitsubishi, Nissan, Ford, and Isuzu.

Current Environmental Activities of the Association include: 1) Revision of IRR Clean Air Act; 2) Global harmonization of standards; 3) Pushing for clean fuel consistent with worldwide fuel charter.

Incentives needed to encourage more participation are (1) information materials, (2) training/technical assistance, and (3) awards.

Future plans of the association include the following:

- 1) Discuss and implement revisions to CAA, IRR with DENR
- 2) Coordinate with DOE on clean fuel introduction
- 3) Support government participation in WP29 on global harmonization of standards
- 4) Coordinate and cooperate with ASEAN Automotive Federation, in pursuing harmonization mutual recognition.

14) Packaging Institute of the Philippines (PIP)

The PIP was established in 1967. It has 155 member organizations with national coverage. Among its member organizations are the following:

- Tin Can Manufacturing Association
- Unilever Philippines, Inc
- Nestle Philippines
- United Laboratories
- Wyeth Philippines
- Splash Research Institute
- Tetra Pak (Phils.) Inc.
- San Miguel Corporation

Members pledge full commitment to identified programs during organizational meeting but some members might have business conflicts with some regulations/programs.

Current environmental activities of the Association are continuous campaign among PIP members to reduce, re-use, recycle and substitute. It also aims for elimination of some form of packaging to reduce solid waste in the mainstream of municipal and industrial waste.

Members do not contribute financially to achievement of the association's BA21 commitment. The Association's staff members involved in BA21 are from member companies who have the expertise and on a voluntary basis. Mode of cooperation is through conflict resolution in terms of product lines and/or materials used. Members are encouraged to practice EMS within his organization and with his customers and the community where it is located.

To monitor members of BA21 activities the association sends out survey forms to members to update PIP's monitoring of BA21 commitments. Members need more encouragement to continue their BA 21 commitments.

Incentives needed to encourage more participation are awards, training and technical assistance and information materials.

Future plans and schedule include; conducting training programs from among PIP members to fill the need for qualified/ trained packaging technology practitioners to sit in the solid waste council of municipalities and cities, provinces and national organizations, as required and defined in the solid waste management law passed in the year 2000.

15) Philippine Oleochemical Association

The association has 5 member organizations:

- D & L Industries
- Senbel Fine Chemicals Co. Inc.
- Pilipinas Kao, Inc.
- United Coconut Chemicals, Inc.
- Sakamoto Orient Chemicals Corp.

Contributing factors that led to the association's commitment to BA21 are concern over environmental regulations and concern for the environment.

The association's commitment to BA21 are on target. Among its commitments are:

- Conduct seminar/training/information dissemination on existing waste treatment technologies with emphasis on locally developed microbial-based applications, CP strategies, handling of chemical products, basic environmental concepts for employees
- Register waste materials generated in IWEP
- Implement "buy back arrangement" with suppliers (e.g. supplier of catalyst buys back the supplier/s spent nickel)
- Utilize and disseminate Material Safety Data Sheets to operating personnel to convey health, safety and environment information on the products.
- Encourage members to incorporate the 3R concept in their day-to-day operations
- Attend environmental conferences to strengthen linkages
- Share best practices and voluntary initiatives

Current environmental activities of the association are conducting basic environmental seminar to members, distribute environmental education materials to members thru newsletters.

To monitor members, a special monthly meeting is held. The association submits progress report on BA21 commitments to Philippine Business for Environment and Department of Trade & Industry.

Incentives needed to encourage more participation among members are training/technical assistance on management of chemical products/ hazardous waste and in-house implementation of cleaner production.

16) Printing Industries Association of the Philippines (PIAP)

PIAP has 406 members and 102 associate members nationwide. It was formally organized in June 1963, starting as an association for Manila printing industries. It was extended to those engaged in the printing equipment, supplies, paper, and other service shops in 1996.

Its BA 21 commitments are consistent with its objectives of providing good environment for workers and use of alternative materials, e.g. water-based inks,

The association holds Monthly General Membership Meetings, and keep them updated through the Philippine Printer.

PIAP has built a reputation over the years and its credibility now allows access to key spots in the government's machinery where decisions that affect printers are made or influenced. As an organized body, **PIAP** can raise issues for clarification or remedy by executives in government ministries.

PIAP maintains mutually beneficial direct contact with officers in several organizations that directly influence the business such as **GATF**(Graphic Arts Technical Foundation), **NAPL**(National Association of Printers and Lithographers), **PCCI**(Philippine Chamber of Commerce and Industry), **ECOP**(Employers Confederation of the Philippines), **PIBFI**(Printing Industry Board Foundation, Inc.), **PHILBOOK**, Philippine Book Publishing Development Federation, Paper Traders Association, Ink Manufacturers Association of the Philippines, Machine Dealers Association of the Philippines.

Among its committed members are Paper Prints, Inc. ; 3M Philippines; Kimbells Pack, Inc.; Dynapack Philippines, Inc.; and Toyo Ink (Phil.) Co., Inc.

17) Philippine Food Processors and Exporters Organization, Inc. (PHILFOODEX)

PHILFOODEX was established in 1986 and has over 200 food manufacturing members, ranging from small to large enterprises. It committed to BA 21 because of various reasons: prestige, good salesmanship of PBE, concern for environment and compliance with regulations, possible business opportunity, and marketing. It has committed to conduct awareness and basic environmental seminars for small and medium food processors, and reported that it is on track. The management of BA 21 commitment is through its Environmental Committee, led also by the association's chairman. Three part-time staffs are involved to implement BA 21. Members do not contribute financially for BA 21, but for sustainability, fees are charged for workshop seminars, utilizing the in-house expert trainer. The association does not monitor the members' BA 21 activities, but assesses that members need more encouragement to commit to BA 21. Among the needed incentives to encourage more participation are funds, training/technical assistance and information materials.

18) Semi-conductor and Electronics Industries of the Philippines (SEIPI-AESSEP)

Among the commitments of SEIPI for BA 21 relate to waste segregation, data base and waste minimization, use of alternative materials, education, advocacy and networking. It has 83 members, 25 of which are Filipino-owned. Seventeen of its members are ISO 14001 certified. Its progress on BA 21 commitment are:

- Strategies for hazardous waste disposal shared among members and adopted by companies

- Enhanced compliance of member companies to discharge permit and other regulations
- Implementation of DAO 37: multi-partite monitoring teams and environmental monitoring fund
- Participation in forums on Clean Air Act Implementing Rules and Regulations
- Collaborated with USAEP on Joint EMS Program. Eleven members participated in the program. Two are scheduled for ISO 14001 certification while two are committed to pursue certification.

The economic downturn has made the association vow to strengthen the competitiveness and viability of the industry.

19) Philippine Institute of Certified Public Accountants (PICPA)

PICPA is the national organization of accountants in the Philippines, with more than 100,000 members. It is responsible for the continuing professional education of Filipino accountants in commerce industry, public practice, education and government. As part of its BA 21 commitment, it is actively promoting Environmental Management Accounting (EMA) and Cleaner Production through continuing professional education courses, integration in the undergraduate accountancy curriculum, and dissemination through written materials, conferences, networks, etc. It offers a two-day course which focuses on the tracking and assessment of environmental costs within a company as a tool for implementing Clean Production Projects. It has completed case studies on six companies (metal finishing, iron piping, electronics, flexible printed circuits, meat products, flexible packaging, and corrugated box production, showing profits from Cleaner Production. Its plans include partnering with the government in exploring policy options for the promotion of EMA/CP, and working with other accountancy organizations in the Asia-Pacific region for EMA/CP related training.

1.2.1.2 Individual Companies

a) Company A (food industry)

Company A has about 100 plants and 500 other affiliated plants in the Philippines. Among these plants, 3 plants have obtained ISO 14001 certification; 9 are in the process of being certified, and 4 are preparing for it. At first, the management level officers were not supporting EMS, but the award given to one of the plants that established its EMS was an eye opener for them. Aside from social recognition of good environmental practice, internal benefits in terms of improved productivity was appealing to the management level officers as well as plant level officers. Since then, the environmental unit has been busy for training the staff from different sections of the company on EMS; in-house staff is actually establishing EMS in their plants. According to their experiences, there are some common hurdles in establishing EMS: difficulty in adopting new system and convincing highest manager at the plant. There is no specific incentive to establish EMS for each plant; introduction of EMS remains in the hand of the plant manager. Specific environmental challenge that they are facing now is to comply with the emission standards provided by Clean Air Act. Most of the plants are using bunker oil (grade C) for fuel. The bunker oil has high sulfur contents (3%), and end of pipe approach would result in substantial financial burden on the company. Company A is considering establishing a bunker oil desulfurization facility so as to reduce sulfur content of the fuel before burning. However,

they lack technical capability to assess what would be the best technology to reduce air pollutants from their stacks.

b) Company B (food industry)

Company B is manufacturing daily foods at 4 factories in Luzon and 1 factory in Mindanao. It is also operating 6 mineral production plants under its subsidiary in Luzon. Major products are instant coffee, instant noodle, daily products for infant, Ice cream and confectioneries. The company is implementing environmental management under its parent company's policy in Switzerland. Consequently they are not certified by ISO 14000, however they are audited by its own policy that they claimed is of better quality than ISO standards.

A total of 6 people are in the environment and safety management at present under supervision of Central Office. They report to their Central Office monthly as well as yearly bases. Their major concern is recycling of used cups from vending machines.

c) Company C (car industry)

Company C conducts welding, painting, and assembling of cars, but not machining, plating, and foundry. Basically, there is no pollutant from the factory except painting sludge, which is treated by a sub-contractor. Twenty people are engaged in the environment and safety unit under directives of its parent company. The environmental management is operating under Manufacturing Division and responsible to report to vice-president every day. The factory has obtained ISO 14001 certification in 1999 and ISO 9002 in 2000. DMAIC (Define, Measure, Analyze, Improve and Control) is now in progress. Major concern at present is conversion to 100 % lead-free paint by 2002, but there is some reluctance due to a local supplier who is not capable to manufacture lead-free paint yet.

d) Company D (pharmaceutical industry)

Company D started its production in 1962 with only 8 employees but is now operating by 150 professional staff and over 400 workers in Canlubang. Company D's Environmental Management Policy is directed by its parent company in Germany in compliance with its own developed Policy and Guideline that have more strict criteria than ISO. For Company D, environmental protection means safety, which means product quality, which achieve business profitability. The company is now dealing with the following environmental subject: solid waste, liquid waste, wastewater, odor production improvement, recycling, waste minimization, employee's participation, effective environmental and waste management, cost saving. Current concern is ban on incineration by CAA; the incinerator that they have will be no longer effective next year. Company D is very much interested in the model integrated hazardous waste treatment facility that has been studied by the JICA Study Team and will be a future client.

e) Company E (power generation)

Company E generates electricity and earned annual income of P8 billion in year 2000. Combustion of coal fuel and materials handling are the major industrial processes. The company has an environmental unit with 7 professional staff, concerned with worker health and safety, social engineering, and public health. It has completed its EMS and currently securing ISO 14001 certification. The certification is driven by the global initiative of its parent company. A local consultant assisted them to complete EMS, and among the key recommendations that they are resolving are strong management commitment, and awareness of everybody in the company including the contractors. The company is optimizing the use of operation chemicals, and this led to reduced treatment costs and

compliance risks. The staff is satisfied with the outcome of the EMS initiative, and learned the importance of planning. PCAPI awarded the company for its success on environmental stewardship.

f) Company F (inkjet manufacture)

This company deals with the manufacture of inkjet cartridges and employs 905 people. Its environmental unit with 9 staff focuses on environmental management in accordance to the established ISO 14001 standards. The company has already implemented an EMS but is yet to conduct a Pollution Management Appraisal. The company expects ISO 14001 certification by April 2003. On April 25 of this year, PEZA awarded the company as an Outstanding Environmental Performer.

Among the reasons for adopting EMS are:

- credible basis for deciding on priority environmental aspect and environmental investment
- improve operations while reducing pollution prevention costs
- eliminate risk of litigation from regulatory bodies
- influence suppliers, contractors, vendors and other business partners in sustaining long term environmental management goals
- basis for responsible reporting to public & stakeholders on environmental concerns and compliance
- establish a strategic position in the global market

The following key recommendations were given though the EMS implementation:

- Waste minimization and recycling
- Improve operational controls at Facilities area
- Enhance hazard labeling
- Energy conservation

Majority of the Environmental Management Programs were approved for implementation and were provided with subsequent funding by management. The cost of investments is approximately greater than P8M for CY2002. Savings: The generation rate of wastewater was reduced by 80.5% with the full utilization of the Electric Evaporator for dewatering. The generation rate of process-contaminated solid wastes was reduced by 61.5%, the ordinary solid wastes by 18.6%, used oils/fuels by 52.2%, the energy utilization by 16.3% and potable water by 32.6%. The payback period for investments was realized in about three months. Overall, management is quite satisfied with the EMS implementation.

The company's staff from different levels has attended various seminars and trainings: CEO: ISO 14001 principles, P2/CP; other company managers: ISO 14001 principles, P2/CP; Shop-floor workforce: Basic EHS Principles and Practices

Seminar topics that proved to be very useful for the company are: Pollution Prevention, Chemical Handling, Hazard Analysis and Communication, Hazwopper, 5S/Housekeeping, Spill Response. Recommendations for training include concrete examples and hands-on exercises, and more information on Industrial Hygiene and OSHA compliance.

The company considers recognition and awards given by prestigious organizations to be the most effective incentive for improving environmental performance. Space limitations and

infrastructure for solid waste disposal hinder better environmental performance of the company.

1.2.2. Current Practice of Environmental Service Providers

Environmental Service Providers (ESPs) comprise those organizations that offer environmental services to two main users/markets, namely industry and government. At one end of the spectrum, they comprise industry associations that provide a conduit for information and knowledge, without generating it themselves, and at the other end, suppliers of equipment and other forms of hardware. Other organizations, such as banks, may also offer environmental referral services and also undertake internal review of proposals as part of their due diligence practice. The industry associations and banks are dealt with elsewhere in this report. This section will concentrate on those ESPs that offer more specific environmental knowledge and services for sale to the users. Section 1.2.2.1 below discusses the activities of the associations representing ESPs, and Section 1.2.2.2 reviews the market for these services.

1.2.2.1 Identification of Current Practice of Environmental Service Industry

This section reviews the activities of the associations of ESPs. In general, the purpose of the associations is: i) to improve the knowledge of their members and offer courses and guidelines to train them in specific techniques related to the association's area of focus, ii) where appropriate, to establish standards and codes of practice for the professional conduct of their members, and accreditation schemes, iii) to participate in policy formulation by government, iv) to raise awareness on environmental issues and actions in civil society, v) to inform the client base of their members, other professional organizations and the broader public on the activities of their members, and vi) to represent the interests of their members, including levels of remuneration for services. Part time or voluntary staff who have paid positions in other companies runs most associations. There are four main associations in the Philippines, each representing different facets of the service industry. They are discussed below.

a) The Philippine Association of Environmental Assessment Professionals (PAEAP)

PAEAP was formed in 1994 during the development of the EIA system in the Philippines. Its original purpose was to inform and train consultants in the EIA approach and procedures which are needed when applications are made for DENR clearance by proponents of development projects (proponents include both private and public sector developers). It has membership categories for individuals and for firms, and members pay dues to the association. It now has about 100 members, drawn mainly from the professions of engineering, planning and architecture. It has one national chapter, but no regional chapters.

Its original focus on EIA has broadened to cover environmental auditing, environmental risk assessment (ERA), and environmental management systems (EMS) for industries and commercial enterprises. It is a signatory to the BA 21, organized by PBE and has prepared a detailed action plan that it is now implementing. It is actively involved in networking with DENR and its client base in formulation of laws and regulations. It has established an accreditation system for EIA preparers, and is pursuing a similar measure for environmental auditors. It currently runs 1 to 2 one-day training seminar a month for its members (attendance typically 15 to 20), and publishes a newsletter.

Trends and Issues

- Demand for training has been growing, especially during the recent economic downturn, when firms had more time to participate
- There are difficulties in getting SMEs to undertake environmental management actions, or to register with DENR. A possible approach would be to decentralize responsibility for registration and enforcement to LGUs, since they are better informed on activities in their jurisdictions, and environmental measures (including EIA and EMS) can be incorporated at the same time as SMEs obtain their business registrations with the LGU. Simplified guidelines and procedures on EIA and EMS are also needed for SMEs. The approach of connecting SMEs in specific areas with joint wastewater collection and treatment systems may not be viable due to their dispersed locations. There may be exceptions, where certain similar types of industries are concentrated together.
- Industries have complained that they were not consulted during the formulation of the Clean Air Act, but this is not actually so. DENR tried to involve them, but many were not really interested to cooperate. After the Act was passed, they realized that they should have taken more interest. They have subsequently been much more involved in discussions on the Toxic and Hazardous Wastes Act and on the upcoming Clean Water Act.

b) Pollution Control Association of Philippine Industry (PCAPI)

PCAPI was founded in 1980 and represents the Pollution Control Officers (PCOs) who are employees in individual industrial firms. The law requires that firms above a certain size employ PCOs which must be part of the higher management staff and are required to report both to the firm's CEO and to the DENR. The PCOs are joint and severally liable with the CEO for infractions of the pollution laws and regulations. In many cases the PCOs are not full time, but also hold another position within the Company. They must have professional accreditation in environmental engineering, and PCAPI is working on measures for the qualifications to become more stringent. There are about 2000 PCOs.

PCAPI has about 200 institutional members (fees paid by the Company), 200 individual members, and 60 life-time members. Its 15 member Board of Directors represent the 15 industry clusters which comprise its membership. It has chapters in 7 regions of the country. It is supported mainly by members' dues, supplemented with grants from foundations and international donors. It contributes a member to the DENR's Pollution Adjudication Board (PAB).

PCAPI is a signatory to BA 21 and has an active program comprising i) continuing education of PCOs, particularly in the areas of CP technology and waste minimization, ISO14001, EMS and marine and freshwater ecology - the education comprises seminars and 'hands-on' workshops and field visits (1800 trained in 15 workshops); ii) information dissemination and awareness-raising-to LGU staff (through training seminars), and small polluting industries (through simplified designs of treatment and operational systems), industry awards; iii) policy development and networking - with DENR, LLDA on government policies and programs (the 'Kapihan Forum', and several position papers on upcoming laws and regulations), with its members through an Assistance Center and Library, with the public through a pollution and accidents telephone hot-line; iv) on worker health and safety - through education on materials management techniques and safety standards and procedures; and, v) development and promotion of environment-friendly substances (starting with inks).

Trends and Issues.

- Industrial sites were first established in thinly populated areas. As urbanization expanded, these have become surrounded with settlements, and their community groups are increasingly complaining about pollution. Institutional measures are needed to organize and involve the communities in a positive way to solve pollution problems, caused not only by industry, but also by the communities themselves.
- There is a need to involve LGUs in monitoring and enforcement, and for DENR to provide LGUs with financial compensation and incentives for this.
- PCAPI is interested for collaboration with EMPOWER to develop case studies on the costs and benefits of CP, particularly for SMEs in the animal, food and beverage industries.

c) Philippine Environmental Industries Association (PEIA)

PEIA was established in 1995 and has a nationwide coverage. The organization is composed of organizations involved with consulting, laboratory packaging, chemicals and food manufacturing. The three contributing factors that led to PEIA's commitment to BA 21 are concern for the environment and environmental regulations, and prestige. Its activities include advocacy information and education, data base gathering and maintenance, and monitoring and networking. Its current environmental activities are: advocacy on environmental issues as well as concerned education and training of members; networking with other environmental organizations, and close coordination with government agencies. Member associations make financial contributions to BA 21. PEIA staffs involved in BA 21 are its President, Secretary, Treasurer, and Directors. Cooperative action is maintained among member organizations by means of regular meetings, seminars, and conferences. Aside from contributions given by member organizations, collecting seminar fees also raises funds for BA 21.

Suggested incentives for greater participation are awards, training and technical assistance, and provision of information materials. The Association's future plans and schedule include: more extensive information campaign for members and the business and industrial sector, assistance in the training of persons involved in environmental law compliance and monitoring; close coordination with concerned agencies in monitoring compliance with environmental laws, rules and regulations; and strengthening network initiatives.

d) Management Association of the Philippines (MAP)

MAP's membership is drawn from the CEO's of the top organizations in the country. It has formed an environmental unit in its organization, and is a signatory of BA 21.

MAP's main activities are; i) education - to promote sound corporate environmental management among its members and promote understanding and compliance with environmental laws and regulations and strengthen environmental awareness in industry; ii) advocacy - to promote CP and the 3R principle, sustainability of natural resources, environmental health, safety and risk management, ecolabeling and understanding of the environmental impacts of trade liberalization; iii) leadership - work with government to develop appropriate laws and regulations on trade and environment, linkages with community organizations, facilitate green technologies through helping to develop databases of green technologies, patents and improving technology transfer, help prepare local industries for international environmental standards, and discourage the proliferation of dirty industries; and iv) network with government and other regional and international organizations to further improvements in environmental quality and resource conservation.

MAP has prepared videos showcasing the members' environmental efforts, which indicate industries' interest to promote the CP approach. MAP also runs a yearly environmental conference among its members for them to describe the CP methods they have introduced. It also publishes a newsletter highlighting the environmental activities of their members.

MAP is very influential among industry circles, and is able to raise funds without much problem. However, many CEOs lack time to pursue interests and issues.

1.2.2.2 Market Relevant to Environmental Management

a) Overall market for Environmental Service Providers

Demand for all forms of service has increased from the early 1990s following the passage of EIA laws and regulations, in particular since the passage of DAO 92-21. Further stimulus in demand has come from directed credit programs from government finance institutions, sourced by multilateral and bi-lateral development banks. Large projects (power plants, chemical, refining, mining and infrastructure) provide the most demand. Demand for services in toxics and hazardous wastes are starting following the passage of RA6969.

There are about 50 firms offering these services (excluding equipment suppliers). Most have corporate ownership. About half are fully Filipino-owned, 20% have Filipino-foreign ownership, and 30% are owned by multi-nationals. An analysis undertaken on service providers indicated that scope exists for transfer of more environmental functions from government to the private sector, particularly in the area of monitoring and testing, with government retaining only the review, decision-making, certification and permission powers.

Among the users of environmental services, government is a major player, and is likely to use more services from the private sector in areas that are inadequately addressed at present, particularly monitoring and testing, and to some extent in policy analysis. The other main user is, of course, industry, where the potential market consists of over 92,000 establishments, requiring environmental services from consultancy to certification. Of these, about 10,000 large and medium/large firms are more environmentally conscious, undertake environmental management projects, and can afford to employ service providers. Their demand fluctuates according to i) the overall economic environment, ii) public concern over environmental degradation, iii) introduction of new legislation and regulation, iv) international consumer and regulatory demands (leading to ISO certifications), and v) introduction of new technologies. Strong competition among firms within and industry is a significant market driving force. Competition may be in the form of low price, product identification, or quality of output. The increasing costs to industry of environmental compliance, whether driven by C & C or use of MBIs is gradually moving industry towards a waste-minimization and cleaner production approach, reducing the demand for end-of-pipe technologies, and opening demand for EMS, TQM, LCA approaches and clean technology-related equipment.

There are potentially substantial increases in business for most environmental service providers (see separate sections below). Due to a host of constraints, however, growth in this sector has not been fully realized. Issues underlying these constraints relate to i) policy, ii) operations, and iii) the economy/market.

With regards to policy, the major constraint lies in the weakness in monitoring and testing by DENR, leading to lack of knowledge and weak enforcement. A related weakness is the lack of policy and mechanisms to focus on priority environmental problems and sources, and to relate these to ambient quality goals. The potential power of MBIs has not been exploited. Secondly, until recently, industry has not been encouraged to look for cost-effective pollution control approaches. Thirdly, inconsistent interpretation of environmental regulations and enforcement policies gives rise to uncertainty and resentment among industries which do not feel they are being treated to a level playing field. Some of these problems could be reduced by devolution of some functions to local governments (with associated budget). Many of the problems of DENR stem from lack of funding for the EMB. There is a need to establish an adequate and consistent funding source for EMB independent of the vagaries of the public sector budget. Over the past 2 to 3 years, these problems have been recognized by government, and some moves are underway to address them. However, the progress is halting, and hampered by inadequate human and financial resources.

Operational problems for providers relate to the lack of a consolidated source of information for environmental investment. Much still cannot be accessed electronically. Recent initiatives through the PRIME and IISE projects are attempting to remedy some of these problems through provision of 'portals' which can give access to various databases. However, the need for electronic recording of and access to studies and analyses remains.

Market-based issues relate primarily to access to finance for technical assistance and investment capital projects. While much of the funding for environmental services comes from the companies' internally-generated funds, the use of institutional finance has been growing. These matters are covered in more detail in section 1-2-4 'Financing Industrial Environmental Management'.

b) Environmental Consultancy and Advisory Services

Local Consultancy/Advisory firms offer services to the private sector in EIA, baseline studies, EMS, CP, Environmental Risk Analysis (ERA), compliance audits, hazardous wastes management, site assessment, legal advice, and assistance in securing permits. They also provide services to government on surveys, policy, management and technical studies.

Market conditions for these types of services can best be gauged by the growth of EIA studies, since other services tend to be tied or related to it. DENR data show an actual demand of 6% year growth in EIA. In relation to GNP and industrial growth rates, this represents about 43% of potential demand, the difference being explained by the lack of enforcement, and the lower priority place on smaller companies and schemes. Interest in CP/EMS is growing rapidly, however, spearheaded by DBP and LBP and their special environment funds, and this service may outpace the growth in other services. Demand for advice on air emissions and hazardous wastes management is being suppressed at present due to uncertainties regarding emission and wastes standards. Actual yearly demand for consultancy and advisory services is expected to double over the next 10 years (from 2.5 to 5.0 billion pesos), with potential demand being almost twice as high. Part of this demand may be realized if the regulatory efficiency is improved.

Competition among these providers is strong. Among the factors influencing competition are, i) Threat of Entry - experience and quality among existing providers is good, and new entrants will have to bring high quality and/or specialized skills to be successful, ii) Economies of Scale - can be achieved through undertaking several EIAs in the same

municipality and/or sector and building up an information base. Foreign-associated firms may have an advantage in the market for multinational firms and international aid agencies, iii) Cost Advantage - local firms are highly competitive because of their low cost charges and strong connections with the government and business communities, iv) Government Policy/Practices - limitation of equity investment by foreign professionals, and DENR's list of accredited EIS preparers, and v) bargaining power of service users.

c) Environmental Engineering Services

Engineering services include design, construction, operation and management of environmental facilities meant to reduce, eliminate or treat industrial pollution to render it less harmful to the environment. A wide range of technologies and processes may be involved, covering water, air, and solid wastes, and requiring a wide range of technical skills.

In the water sector, water supply has been a major growth sector (at about 15% per year), and is likely to continue for a few more years as the construction and privatization of municipal water systems continue. However, the major backlog for capital investments is likely to be satisfied in 5 to 10 years, and requirements are likely to shift to maintenance and gradual expansion of networks. Wastewater treatment systems, however, are likely to be needed for many more years to come, and the demand may increase as rising incomes make these systems more affordable, as environmental controls tighten, and as industrial growth continues. Estimates of the overall market size of this sector are estimated at about US\$220 million/year, of which the current market share of local firms is about 20%.

In the air sector, however, market conditions have not favored opportunities for pollution control. This is likely to change, however, with the passage of the Clean Air Act. Initially, demand may pick up for vehicle emission control, and later for industrial emissions, after the law has been clarified on the use of incinerators and emission standards.³

Municipal solid wastes offer a potentially large market. However, this sector is bedevilled with political problems and citizen complaints, which are likely to be continuing problems. Nevertheless, solid wastes have become a critical problem in the country, and local governments are being pressed to act to improve wastes reduction and recycling, and construction of landfills. No hazardous wastes treatment plant has yet been built, but following the passage of RA6969, hazardous wastes management has considerable potential, especially for the designers and suppliers of large, centralized plants. However, the use of high temperature incineration needs to be clarified (see above). Monitoring and enforcement will also have to be tightened considerably to ensure a reliable supply of hazardous wastes to ensure the viability of treatment facilities.

There is considerable interest in the cleaner production (CP) approach to pollution control instead of EOP by government and international agencies, and moves are underway to stress this approach through more use of EMS, ISO certification and ecolabeling. This is likely to spur interest among industrial firms in process control management and equipment at the expense of EOP.

In terms of influences on the market, the following are significant:

- i) Threat of Entry - large, established firms with substantial capital and with good connections to international suppliers of equipment who provide 35% to 90% of equipment used, have a significant advantage, as do proprietary systems, and

- connections (or ownership of) consultancy firms which undertake the initial EIS who tend to indicate technology types or even proprietary brands
- ii) Government Policies - weaknesses in the regulations which depresses demand for the environmental engineering services include DAO 35 which allows continuing operation of industries that fail to meet BOD standards, continuing permission for 'controlled' dumpsites, and import tariffs on products and equipment ranging from 10-50%
 - iii) Market differentiation - probably 10% of all firms in the Philippines are large and medium-large firms which can afford investments to comply to standards and are under the gaze of the monitoring agency, but the remaining 80% are SMEs which will only invest in controls under extreme pressure.

A number of policy issues are relevant to the constraints on expansion of the environmental engineering services market:

- Lack of enforcement by DENR (see above)
- Weaknesses in Standards - especially in relation to links between ambient quality and effluent/emission standards, absence of quality standards for environmentally-friendly products, absence of technology verification or accreditation to guide industry investments
- Inadequate Incentives - including non-fiscal incentives from DENR, inadequacy of tax relief incentives for environmental equipment, lack of policy on effluent/emission charges which could act as a driver for IEM (this is being partially addressed in the forthcoming Clean Water Act), and lack of a policy defining liability of service providers
- Operational Issues - limited DENR resources, inadequate responsiveness in the banking industry to loan finance for environmental investments, and the lack of experts who are oriented to industrial process techniques instead of the current reliance on treatment technologies.

d) Laboratory Services

These services involve sampling and analysis of environmental samples, which are integral requirements for EIA and ERA work, site assessment, compliance audits, pollution prevention and monitoring and environmental quality studies. Existing regulations define key analytical parameters and standards, which in turn indicate the types of equipment needed for a laboratory company's operations.

A demand projection has been made⁴ on the volume and value of samples needed, indicating about 500,000 samples/year, with a value of about 281 million pesos /year. Over half of this total is for water sampling analysis. However, the passage of the Clean Air Act is likely to stimulate the demand for gaseous emissions and air quality analysis, and the upcoming Clean Water Act will further stimulate demand for wastewater and ambient water analysis. Users of this service include state enterprises, industrial estates, large private factories, and a smaller demand from SMEs. The capital requirements for water analysis equipment has been estimated at US\$ 80 million⁵, and for point source air analysis in the NCR of US\$ 1.1 million⁶. Vehicle emission monitoring constitutes a promising market. Although small at present it is estimated to grow at 36%/ per year, with LGUs and the Land Transportation Office being the main users.

With regards to the providers of laboratory services, some larger industries have in-house capabilities to analyze samples for limited parameters such as temperature, pH, TDS and others that they need for quality control in their operations. Private laboratories service the rest of industries' needs for compliance monitoring. The industries' environmental officers usually do the collection of water samples as per DAO 35.

The LLDA laboratory is capable of analyzing a wide range of parameters as part of its regular inspection of industries. The DENR/EMB central laboratory undertakes analysis for pollution adjudication cases and from companies on a limited basis for compliance monitoring purposes. It employs 15 staff, can analyze most water parameters and some air parameters, and analyzes about 3000 samples/year. There are plans for it to be upgraded to a 'Hub' laboratory with additional ability for calibration and supervision. Under the DAO 98-63 it currently operates on the ISO Guide 25 for laboratory certification. The DENR regional offices have very limited analytic capability, although new regional laboratories are currently being built. At present there are 23 laboratories accredited by EMB, in addition to the DENR/EMB laboratories. With the enactment of the new legislation noted above, potential demand for services, both at the existing and for new laboratories is expected to be strong, although the effects of the influences noted below (especially item (ii)), are expected to somewhat dampen prospects unless there are changes in policy.

The following factors influence the market of laboratory services:

- i) Threat of Entry - new entrants to the market must be: able to offer a wider range of analytical services, equipped with automated high-precision equipment requiring less labor and material costs, and able to pass/exceed the ISO 25
- ii) Bargaining Power of Users - many firms prefer to have their samples analysed by EMB to ensure that they are acceptable to the regulator. In addition, LLDA does not recognize analyses by other laboratories, and requires industries under their jurisdiction to submit samples to their own laboratory
- iii) Operational Issues - DENR/EMB has limited capacity in equipment and manpower to conduct compliance monitoring (especially for air quality), and some of the methods of sampling and analysis are outdated.

e) Environmental Training Services

Environmental training aims to enhance the capacity of key actors in addressing environmental requirements and challenges, and for IEM is directed mainly to government officials, private firms, financing institutions and academe, although others, such as politicians and community organizations may need basic awareness exposure. Training is particularly needed in activities entailing resource extraction, production, distribution and use, in which CP plays a major role. Methodologies used include interactive case studies, workshops and fieldwork, among others. In technical training, hands-on learning is preferred. Training topics include EIA, Site Assessment, EMS, Risk Assessment, Audit, Monitoring and Sampling. In addition, sector-specific training in engineering methods is in high demand among firms that do not have their own training programs.

Suppliers of training include the consultancy groups that provide the other services noted above as well as individual experts in specific fields. Sponsors that have a particular interest//mission mediate much of the training. These include industry associations, projects initiated by international aid agencies in conjunction with government departments, and academic institutions. The sponsors who may organize the logistics while hiring individual specialists or consultancy firms to provide the substance then package training. Equipment suppliers will also offer training to those who will operate and maintain it.

With regards to demand, training in IEM in the Philippines is now quite extensive, much of it initiated by the supply interests of government and donors. Nevertheless, attendance at training courses for industries is good, and the attendees usually pay fees to cover some of the costs (the balance often being covered by aid agency grants). The most common training needs appear to be awareness of environmental regulations and compliance requirements, and training of companies' Pollution Control Officers (PCOs). An indicator of interest in IEM is the emergence of courses in academic institutions, some of which now offer special course in their curricula (for example, UP, La Salle, Ateneo).

Among the conditions facing entrants and practitioners in the training market are: i) Threat of Entry - the high capital costs for new entrants, especially for 'one-off' seminars, and the lack of a track record in training are major impediments, ii) Economies of Scale - whereby a course can be repeated several times, offers substantial economies in training materials and logistics, ii) Class Size - the numbers of participants is an important matter - too few, and the course will not be feasible, too many and the learning level and interest will be lower, and iii) Scope and Focus - despite the current extent of training, the un-met need is still enormous, particularly among SMEs and banking institutions. Training is also often weak in the economics of IEM, an area that is essential for appropriate policy formation, as well as for financial viability of firms. This latter aspect needs to have a substantial number of case studies prepared for different industrial sectors and firm size to use as practical training materials for industry managers. Some progress is being made in expanding the access to knowledge in IEM through the linking of local and international databases through 'portal web-sites being introduced by a variety of sponsors.

f) Environmental Certification Services

The major environmental certification underway at present in the Philippines is ISO 14001. The certification calls for appraisal for a company's service or product manufacturing processes, resource use, waste streams, wastes management, plant location and physical site situation, and organization structure and personnel orientation and training. The standard calls on firms to show commitment to continuous improvement for environmental protection without altering legal or regulatory requirements. The ISO certification is a procedure whereby a recognized third party (certifying body) gives a written assurance to the ISO that a company's services, products or processes and internal operations conform to the specified requirements of ISO for environmental management systems. Companies intending to be certified to ISO 14001 have to register with a certification body or registrar.

Driven by environmental concerns among consumers and political parties in developed countries, and also the interest of industries to reduce their impact on the environment and offer higher quality products, ISO 14001 is becoming an important factor for global competitiveness. Since its formal introduction in 1996, over 7,800 firms have been certified in East Asia alone (as of year 2000), the great majority in Japan. There is some discussion in the European Union as to whether ISO 14001 should become a legal requirement for trading with the EU in some product sectors.

At present, there are six certifying bodies, all subsidiaries of international organizations, with home offices abroad, mostly in European countries. The local subsidiary offices are established in the countries to verify and eventually certify with the registration agencies (UKAS, RVA or RAB) which accredit them.

With regard to demand, certification assessment is relatively new in the Philippines and its demand is highly dependent on the growing interest of companies to go beyond mere

compliance with environmental regulations, by seeking ISO certification. At present, there are over 85 companies certified to ISO14001 in the Philippines. Several of these certified companies are in the electronics business, foreign owned or subsidiaries, and strongly oriented towards the export market. Many of these firms are now pressing their main suppliers to undergo an EMS, though not yet requiring them to be ISO 14001 certified (although this may come in due course). An effort to extend ISO certification to SMEs and to demonstrate to them the feasibility and advantage of doing so has been undertaken by the IISE project. While 200 firms undertook EMS training, only 5 industrial firms (and about 15 other service companies) obtained ISO certification (much fewer than expected), indicating the difficulty and cost for SMEs of obtaining certification

Nevertheless, demand for ISO 14001 certification continues to grow rapidly, and even if firms do not go as far as applying for certification, it is a stimulus for them to undertake an EMS.

1.2.3 Measures Taken by Public Organizations to Promote Environmental Management in the Industry Sector

Table 1 summarizes the authority, role, and capacity of the key government agencies involved in industrial environmental management. Annex 1 presents a summary of JICA Study Team's survey findings about measures taken by public organizations in promoting IEM.

A total of 11 agencies were studied with regard to their activities on promoting environmental management in the industry sector. Initial survey showed that all agencies, except DILG are actively promoting IEM in different ways. Seven agencies (BOI, DENR, LLDA, NEDA, DOST, DOE, DOH and PEZA) formulate, implement and provide technical assistance on environmental policies, laws and regulations. Three of the eight agencies (DENR, LLDA, DOH) assess environmental impact and risks, and oblige the appointment of legally authorized officers for pollution control and energy conservation. Except for PEZA, all the agencies in the group conduct policy research. LLDA is the only agency implementing a market-based instrument to reduce industrial pollution, although DENR/EMB has a pending policy on EMS incentives. BOI, PEZA and DOE offer incentives for environmental investments. EMB and BOI are the only agencies advocating and implementing an environmental management system, although DOE, DOH and PEZA are also encouraging their clients to adopt the system. Five agencies (DENR, LLDA, DOST, DOE and DOH) have science and technology research, monitoring and laboratory analysis, and issues environmental certification and permits. Most of the agencies have limited funds to promote environmental management. LLDA and DOST provide assistance and introduce innovations because of assistance from donor agencies.

The following paragraphs discuss the latest and current measures taken by key public organizations to promote IEM.

a) Department of Trade and Industry - Board of Investments (DTI/BOI)

The Office for Industrial Policy (Environmental Matters Division) of the Board of Investment is DTI's focal point on environmental issues. Five persons devote their time in implementing special or bilateral projects on Environment. BOI has no budget for environmental management except for staff time and incidental expenses for trainings/seminar.

BOI offers an incentive package (EO 226) on IEM to registered firms. These are tax exemptions (income tax holiday for new projects, expansion and modernization projects), additional deductions from taxable income, and non-fiscal incentives (employment of foreign nationals and simplification of customs procedures for the importation of equipment, spare parts, raw materials, and supplies, and exports of processed products).

BOI was the lead implementor of the PRIME project. As such, BOI succeeded in forging partnerships between industry, regulatory and policy-making agencies, environmental service providers and academe towards improved industrial environmental management. BOI also gathered an inter-agency task force that drafted the “Green List”, a procedural guide for investors on environmental requirements for industry. The Investments Priority Plans for the past 3 years or so included environmental infrastructure projects thereby qualifying such projects for BOI incentives. BOI also implemented the “Green Aid Plan” which provided awareness and training to industry personnel on various IEM concepts and tools.

Through the IISE, BOI agreed to implement an environmental management system, and eventually get an ISO 14001 certification. However, its reorganization and lack of budgetary support put on hold the EMS implementation.

BOI is implementing UNDP’s new shell program on environmental management for industry competitiveness. The program will consolidate BOI efforts in promoting IEM among industry and other partners from government, academe and civil society.

b) Philippine Economic Zone Authority (PEZA)

PEZA’s mandate is to operate, administer and coordinate special economic zones in the country. The Administrative Services Division manages environmental matters; however, no special budget is allotted for environmental management. Two staff members are directly involved in environmental activities. PEZA building inspectors take note of waste management of industries. Each industrial zone is required to maintain a centralized wastewater plant. PEZA invited speakers from government agencies such as Environmental Management Bureau of the Department of Environment and Natural Resources to talk about hazardous waste management and occupational health and safety. PEZA recognizes locators with Best Environmental Performance, and coordinates training/awareness on ISO 14001.

c) Environmental Management Bureau/Department of Environment and Natural Resources (EMB/DENR)

Under the IISE Project, EMB initiated the Philippine Environmental Partnership Program with the Board of Investments, Department of Science and Technology, Land Bank, and Development Bank of the Philippines. The program will give industries greater ease in attaining their environmental objectives through environmental management system approaches, cleaner production technologies, innovative policies, regulatory assistance and various support systems. The program is pending until the approval of the Department Administrative Order. A task force is studying the processes and legalities on allowing industries’ self regulation.

The Environment Quality Management Division provides information to industries on how to attain Environmental Compliance Certificate. It has signed a Memorandum of Agreement with the organization of oil companies in order to facilitate ECC applications.

d) Pollution Adjudication Board (PAB)

PAB is a quasi-judicial body that hears and resolves pollution cases submitted by the DENR/EMB. EMB serves as secretariat for PAB. PAB adjudicated around 80 cases in Year 2001, mostly in the food, beverage and agri-industrial industries. Its role in promoting IEM has been to provide an even playing field by prosecuting violators of the Pollution Control Law. PAB also approves environmental mitigation and other pollution management measures of violating industries and has sent signals to the industry supporting pollution prevention and clean production measures

e) Laguna Lake Development Authority (LLDA)

LLDA is an agency of the Department of Environment and Natural Resources tasked with the management of Laguna de Bay and its watershed. Its rallying call is “Conserve our Lake Resources, Cradle of Biodiversity, Treasure of our Future!” Hence, it closely monitors industries located along Laguna de Bay. It implemented the Environmental User Fee program which forces polluters to reduce and abate water pollution while instituting remedial measures within their establishment. The program resulted in marked improvement in the control of industrial waste in the lake. BOD reduction was recorded from 55% in 1997 to 73.6% in 1999. Reduction was due to actual treatment, adoption of full recycling and voluntary closure or plan relocation. LLDA has collected over P6 million from the fee and using it for technical assistance and staff training.

f) Department of Interior and Local Government (DILG)

DILG has no environmental unit; project on water supply monitors current environmental issues. Local government units independently conduct environmental activities and DILG do not monitor such activities. IISE technical assistance has resulted in the EMS certification of the provincial government of Bohol in the Visayas, while Negros Oriental is preparing for it. The Clean Washington Center and the United States Asian Environmental Partnership are promoting EMS to city governments such as Tagaytay, Antipolo and Mandaue.

g) National Economic Development Authority (NEDA)

NEDA is the socio-economic planning arm of government. NEDA does policy research and advocacy and serves as secretariat to various inter-agency undertakings, such as the Philippine Council for Sustainable Development (PCSD) and the Investment Coordination Council (ICC).

The PCSD is a multisectoral body composed of representatives from government and civil society including NGOs/POs, business and labor. PCSD provides a consultative forum for sustainable development issues and policies that can be brought directly to the President during quarterly meetings and at any given time. Industrial environmental management issues are regularly raised by the civil society representatives, which public sector representatives generally respond to positively.

The ICC evaluates all project proposals intended for official development assistance, including industrial environmental management projects. Among the NEDA units in charge of industrial environmental management policies, plans and programs are the Natural Resources Division of the Agriculture Staff as well as the Trade, Industry and Utilities Staff.

NEDA does not implement projects except for piloting new policies, such as “Governance and Philippine Agenda 21”. NEDA has recently evaluated a DTI proposed shell program on environmental management for industrial competitiveness that builds upon the public-private partnerships built by PRIME (see also Section 1-1-2).

h) Department of Health (DOH)

The National Center for Disease Prevention and Control is in charge of the Environmental and Occupational Health Office. The office has three programs: Environmental Sanitation, Occupational Health, and Health Impact Assessment. It conducts trainings on hospital waste management, environmental health impact assessment, sanitary management and occupational health.

i) Technology Livelihood Resource Center (TLRC)

TLRC established the TLRC Environmental Management Program Office (TEMPO) on December 1, 1999. TEMPO is mandated to spearhead a center-wide environmental management program that will integrate environmental management into the culture, processes, operations and decisions of the Center as they affect its personnel, clients, beneficiaries as well as its local and international development partners. It offers SMEs guidance in Environmental Management System (EMS) implementation, ISO 14001 certification, pollution prevention and waste minimization techniques, development of an integrated solid waste management system, and Environmental Compliance. It helps clients design and produce environmental information and resource tools such as CD-ROMs on EMS, EIS, etc.

j) Department of Science and Technology (DOST)

The Industrial Technology Development Institute is concerned with applied research on industrial technology. It has an environmental program with 18 staff. ITDI offers technical assistance to small and medium enterprises with focus on food processing, paint manufacture, textile, pulp and paper, and electroplating. Pilot scale plant will be set up in two companies (pulp and paper and food processing) to showcase wastewater treatment. Current partners include Pollution Control Association of the Philippines, Inc., Air and Waste Management Association, Cavite Export Processing Zone, Cagayan de Oro Chamber Service Center, Philippine Business for Social Progress, and Philippine Business for the Environment.

ITDI also manages one of DOST’s flagship project, the Integrated Program on Cleaner Production Technologies (IPCT), which has an annual budget of P10 million. The Center offers seminars and trainings for SMEs (Basic Ecology and Economics; Clean Production Assessment, and Waste Minimization in Automotive Repair Shops), technical assistance (technology review, feasibility study, sampling, analysis and monitoring, and fund sourcing), and information from CP technology database.

k) Department of Energy

The Environmental Protection and Monitoring Division (EPMD) provides technical inputs affecting the energy sector and assist in the review of environmental policies related to energy sector. It has three sections dealing with environmental management, environmental quality monitoring, environmental impact assessment permitting assistance, and environmental planning and policy studies. Nine staff members are involved in environmental management. Staff training consists of environmental management audit, environmental management for thermal power plant, oil spill prevention, control and response seminar, environmental impact assessment operationalization network; and seminar on safety, health, and environment for small toxic and hazardous waste generators.

DOE offers tax holiday and tax exemptions for equipment as incentive for environmental management. It reduces or suspends subsidies to the use of raw materials, fuels and other natural resources, and imposes taxes upon the use of non-renewable natural resources. These market-based instruments are one of the projects under the Philippine Climate Change Mitigation Program. To promote IEM, DOE is involved in introduction of EMS, environmental performance assessment, environmental accounting, life cycle assessment of products, promotion of environmental action plans by industry groups, environmental conservation agreement with LGUs and communities, and public relations/dissemination. Since 1995, the EPMD regularly conducts an awareness training on oil spill prevention/control and response for refineries, oil industries and power plants. Its IEC program includes power patrol, road transport patrol and information campaign, "O-Ilaw, (Oh Light)," octane rating, and renewable energy sources.

Lessons learned from IEM work indicate the need to integrate environment to the plans, programs, and activities of the department. Awareness and support of higher management is critical to the success of environmental management. Budget and other logistical support must be allocated to EM activities. The cooperation and willingness of industries must be sought to ensure success. For other government agencies, there should closer coordination and exchange of information and data.

1.2.4 Measures Taken by Financial Institutions

The main thrust for the environment in the financial sector has come through a partnership between Government Financial Institutions (GFIs) and multi-lateral and bi-lateral banks and institutions. The main GFIs involved are the Development Bank of the Philippines (DBP) and the Land Bank of the Philippines (LBP). International bank assistance started in 1992 with a structural adjustment loan for the industry sector which was made to DBP and which included measures for DBP to improve its environmental performance and internal procedures. Similar assistance was provided to LBP. Since then, considerable progress has been made (see sections (a) and (b) below). Assistance from other development agencies for lending and technical assistance for IEM followed (including Germany, Japan and Sweden, the ADB, and additional assistance from WB). Both banks now have operational environment units which i) develop environmental policy, ii) offer financing of environmental projects through dedicated 'loan windows', and provide review and assistance to borrowers. Both banks are also signatories to the UNEP Statement by Financial Institutions.

Other banks in the country have joined in a signing of a statement on the environment. However, with the exception of a few other large banks (Planters, Global and Metro), the other

approximately 160 banks in the country do not have any environmental requirements or assessments of their borrowers.

Issues.

The situation where only a few banks practice environmental 'due diligence' has led to a "free-rider" situation, where those banks practicing environmental diligence are penalized by potential borrowers going to other banks which do not have environmental requirements. Both DBP and LBP are concerned about this situation. Both suggested a possible remedy, namely, that Bank Sentral Pilipinas (BSP) establish a timetable for all banks to practice environmental due diligence, with appropriate policies, operating procedures and staff, and that BSP will supervise these operations in the same way it does for other banking activities.

A further matter concerns the situation of SMEs. Both DBP and LBP have a policy to focus their environmental lending on SMEs. However, the loan facilities have been underused by SMEs, leading the banks to lend to larger borrowers in order to disburse their funds. The reasons for reluctance of SMEs to borrow is put down to several factors (some of which are characteristics of the SME sector in general): i) cost of feasibility study (FS) and loan application not affordable, ii) cost of EMS preparation, especially if it involves foreign consultants, iii) complexity and delays in obtaining regulatory permission, iv) inability to meet rate of return requirements, v) credit risk and collateral requirements, vi) cost of facilities too high (especially for wastewater plants), vii) monitoring and enforcement weak, and viii) SMEs do not know the cost-saving advantages of CP and need presentation of more case studies showing the cost reduction, revenue potential and payback period. The banks' staff agreed that some measures could be considered to improve this situation. These might include: i) expanding the grant assistance for FS and rolling the cost of FS into the loan, ii) expand the numbers of service providers for EMS and FS through training, and thereby lower the cost of service, iii) establish 'one-stop shops' for assistance in obtaining permits, iv) soften rate of return requirements for IEM investments in view of their 'public good' function, v) include environment investments in the banks' micro-credit loan windows, and help industry associations for high-polluting SMEs to become credit associations to guarantee loans to their members, vi) include environmental loans under the Small Business Guarantee Finance Credit Corporation, vii) where the cost of individual wastewater plants is too high, encourage SMEs to collaborate in the planning and management of a joint wastewater collection and treatment facility, or even relocation to mini-industrial estates where such facilities could be provided (among others), and viii) case studies and demonstration projects should be prepared to illustrate the advantages of CP (This might form one of the pilot projects under the Study).

In addition to lending through GFIs, multi-lateral development banks have lent through government for specific projects (see below).

a) Development Bank of the Philippines

Background and Current Activities in Environment

DBP was created in 1958, and expanded its activities from agricultural and industrial rehabilitation work to include most other development sectors, and from 1986 emphasized economic re-structuring through medium and long-term financing with an emphasis on SMEs. DBP currently has 3,755 employees, 74 branches, and a current loan portfolio of about US\$2.6 billion. It also has a network of about 150 participating financial institutions (PFIs), most of which are other Filipino banks, who borrow from DBP's lines of credit to on-lend to their end borrowers.

DBP's environmental activities were first initiated in 1992 with assistance from a World Bank structural adjustment loan of US\$175 million for the industrial sector. The goal of the loan was to improve the competitiveness and efficiency of Filipino industry, including measures to improve environmental performance. From 1992 to 1997 DBP developed policies, guidelines and environmental assessment procedures for its staff to apply to the borrowers who applied for loans through this environmental loan window, and some staff training. During this period, the approach was mainly ad-hoc, with no formal management system. Take-up of loans for environmental projects was also slow.

In 1997, full-scale efforts were started to put in place an environmental management system (EMS). An environmental management unit (EMU) was created with full-time staff. The EMU reports directly to DBP's Industrial Restructuring and Special Programs Office (IRSPO) which consolidates all policy-based lending activities. The IRSPO reports in turn to DBP's President and CEO. The EMU can also report directly to the Board of Directors in critical cases of conflict. The EMU reviews all DBP's lending as well as those projects which are funded through the various environmental loan windows (see below). This has become especially important since the DENR's requirements for EIAs and ECCs were established. The EMU has increasingly taken a pro-active stand on environment by not only reviewing loan proposals, but actively assisting the proponents to analyse and design the environmental aspects of their projects. In addition to employing its own technical staff, it also provides financial assistance to proponents to employ consultants, and carries a data-base of qualified consultants. The EMU is guided by EMS steering and working committees.

A further major achievement is that DBP developed an overall environmental policy and organizational arrangements to promote environmental quality in the Bank's activities. The Bank's Management Committee approved an Environmental Policy Statement in 1997. Key aspects of this initiative include:

- Appointment of an environmental champion in each of the main departments
- Initial environmental review and audit of DBP's facilities (beginning at the corporate headquarters), and its business operations performance
- Compilation of corporate registers of significant environmental effects and associated targets
- Implementation of an environmental communications plan
- Publication of a quarterly environmental newsletter
- Completion of environmental law registers
- Publication of an externally-verified report, and
- Training of environmental management professionals within the Bank

DBP has recently obtained ISO14001 certification, both for its facilities and operations.

Environmental Lending Operations (in the industry sector)

DBP's support for IEM is currently assisted through four main lines of credit from bilateral aid agencies (the World Bank structural adjustment loan has now been disbursed). They are as follows:

Environmental Management Project (EMP3).

Source and Budget: SIDA. SEK 8.75 million, plus US\$0.35 million from DBP.

Thrust: Technical assistance to industry associations to prepare industry-specific guidelines, and to help their members develop and implement environmental management plans, self-monitoring and self-regulation; strengthening institutional capability in DBP and participating institutions.

Duration: 10/97-9/98

Environmental Infrastructure Support Credit Program (EISCP) I.

Source and Budget: OECF/JBIC: Yen 3 billion credit & Yen 147 million for TA.

Thrust: Credit and technical assistance to industrial firms, capability building of DBP, adoption of environmental due diligence for credit evaluation. Also environmental targets with incentives, such as pollution reduction in the loan agreement in exchange for a lower interest rate. The program includes funds to hire consultants to assess clean technology options for each industrial sector. The borrowers are required to install and implement a self-monitoring system. Financing available for i) pollution treatment, ii) pollution minimization/clean technology, iii) toxic and hazardous substance management, and iv) solid wastes management. Priority to industries which have been noted to account for the highest rate of pollution in the local environment.

Duration: 1/97 - 12/99

Industrial Pollution Control Project (IPCLP) II.

Source and Budget: KfW. DM 20 million credit, DM 1.7 million for TA and dissemination.

Thrust: Assistance to SMEs through investments for treatment plants and cleaner production methods and occupational health and safety.

Duration: Start 9/98.

Environmental Infrastructure Support Credit Program (EISCP) II

Source and Budget: JBIC. Yen 20 billion credit, Yen 529 million TA.

Thrust: Another policy-based credit facility that provides financing through wholesale (to DBP's PFI's) and retail lending to industry, mining and service sectors (with emphasis on SMEs).

Duration: Start 1999

Industrial and Support Services Expansion Program (ISSEP) II.

Source and Budget: JBIC. Yen 35 billion credit, Yen 350 million TA.

Thrust: Supports the growth and expansion of SMEs in both the manufacturing (tool and die makers, food and furniture industries) and non-manufacturing sectors (services and education). It also supports SME end-users of other DBP credit facilities in the improvement of production processes, quality management, marketing, enterprise management and environmental management.

Additional environment-related credit lines include domestic shipping (JBIC-funded), and urban water and sanitation (World Bank-funded).

The utilization of the credit lines was slow at first, but then picked up rapidly from 1998 through early 2001, with a drop-off from mid-2001 to the present. There are, however, indications that demand is increasing again due to some improvements in the Philippine economy. The first phase credit lines have almost been completely disbursed (between 2 to 2 years after schedule), and the second lines are also being accessed. A drop in the source interest rates for the second credit lines has caused some difficulty in completely disbursing the first credit lines that carry a higher rate of interest. DBP's terms for environmental loans

are currently about 11% to 12% (typically 2 to 3 percent spread above the originating cost), with terms of 10 to 15 years, including up to 5 years grace period.

The main sectors that have accessed DBP's environmental lending windows are industry (about 80%, of which most are in the animal production and agro-processing sector), energy (power plants), and mining.

For the next year, DBP intends to intensify the promotion and implementation of the TA projects through training, seminars, workshops and conferences, especially in view of the increasing interest in environmental matters from the PFIs (9000 person-days of training are scheduled over the next 5 years). DBP will also initiate a more vigorous information campaign to potential borrowers, and set up an electronic "one-stop shop" to help SMEs with the regulatory process and also to market their products and services.

Incentives

Incentives to attract potential borrowers to the environmental loan windows include:

- Assistance to prepare proposals
- Assistance with regulatory compliance
- Advice on IEM management and technologies (e.g. CP, EMS)
- Awards to PFIs having the best environmental performance
- Shorter processing time for firms who have completed an EMS (DENR waives the ECC requirement)
- Better lending terms for firms with an EMS (under consideration)

Issues

Lending for environmental projects to larger companies has been good, propelled mainly by the concern over regulatory compliance and DBP's requirement for completion of EIS and ECCs. However SMEs, particularly the smaller ones, still have difficulty/reluctance to obtain finance. Their reasons, with possible responses now being considered by DBP include:

- Cost of project feasibility study and loan application not affordable to many SMEs.
Response: DBP's TA facility offers low-cost assistance. However, these funds are limited. DBP might consider rolling the cost of the FS into the loan, so it could be repaid over a long time period
- Cost of EMS preparation, which often involves foreign consultants
Response: this is being addressed by efforts of IISE and other projects to increase the training for local consultants and thereby reduce costs through competition. DBP could also improve lending terms for firms with EMS (see above)
- Complexity and delays in obtaining regulatory permissions. These sometimes extend to over a year, and are an important disincentive to SMEs to act and invest in IEM.
Response. DBP will try to improve this situation through its "one stop shop" advisory service (see above)

- Inability to meet rate of return requirements. Many environmental investments are not revenue-producing, and many banks turn down applications on these grounds.
Response. DBP recognizes that there are important “public good” in these investments which the market does not capture. It is willing to soften the return requirements, providing the overall business operation is healthy. More work appears to be needed by the financial community on the value of reduction in risk emanating from IEM investment
- Credit risk and collateral - banks reluctant to lend to many SMEs.
Response: Industry sector associations, especially those which represent may small companies, might consider a scheme to guarantee individual member loans (along the lines of a micro-credit association). DBP will already accept joint and several collateral. DBP is now starting an micro-finance window, and environmental projects might be added to this operation. Another possibility would be to work with the Small Business Guarantee Finance Corporation (SMGFC), operated by DTI, to add environmental projects to their assistance.
- Cost of individual wastewater treatment plants too high for individual SMEs, even after CP process techniques implemented, and there is often not enough site area.
Response: more joint waste collection and treatment projects might be considered. Development of more “mini-industrial estates” for SMEs might be considered to help resolve the site area, facility expansion and operational efficiency issues, but care is needed in selecting sites and the relocation costs for enterprises, and the connections for SMEs to their markets and workforce.

While DBP and LBP have an active environmental program, many other banks do not, and there is an adverse incentive for polluting industries to become “free-rider” borrowers. An active and phased program of policy development and training in environmental management for the approximately 170 other banks in the country, starting with the DBP PFIs is needed. The support of Bank Sentral Pilipinas (BSP) is needed in this regard, to establish criteria for policy and training, a schedule for this to take place, and na eventual date for compliance of all banks. (Mr. Mildo (?) Salazar, one of the BSP governors who is very interested in environmental matters should be contacted in discussions on this matter.)

Potential areas of collaboration/assistance with EMPOWER

During the discussion Ms. Maghirang felt that the following areas are worthy of further discussion for EMPOWER’s Priority Projects:

Training. There is a great demand for training from the PFIs, which will not be satisfied with the currently-funded projects, and JICA assistance would be welcome (contact Milido Salazar - BSP, who is interested in this matter)

Case Studies. DBP is accumulating an increasing amount of information on the costs of IEM and compliance by firms. Some case studies in key polluting SME sectors which illustrate the costs, financial benefits and pay-back period for CP/EOP measures to achieve compliance is needed. This will help to convince SMEs to undertake IEM (see also next phase of PRIME).

Technical assistance to highly-polluting industries in “hot-spot” areas is needed, to try and get a coordinated response to compliance. This might include assistance for EMS, joint waste collection and treatment, mini-industrial estates, with institutional emphasis on area action with communities, local governments, industry associations and financial institutions. One important candidate for this activity might be the Mecayauan (?) municipality, where SME tanneries are highly-polluting, and the owners wish to act, due to pressure from EMB. Also the gold smelters in the same LGU. The mayor also wishes to take action.

b) Land Bank of the Philippines (LBP)

LBP was established in 1963 and is the largest source of credit for countryside development in the country. Its main areas of focus are small farmers and fishermen, small and medium enterprises (most of which are food processing and craft/service businesses), and mass housing (including settlements of the urban poor). It also finances agribusiness, land reform projects, and local government development projects which have a strong livelihood and economic dimension. It has recently extended into air pollution control in major cities with a facility financed by the ADB, an ODS (Ozone-depleting substances) phase-out program financed by the World Bank, and a small grants program from the UNDP for GEF schemes. Two other lines of credit from the World Bank (the Countryside Loan Fund Retail and Wholesale programs) focus on rural industry.

As with DBP, LBP is a GFI which operates both a retail credit facility, and a wholesale facility to about 100 PFIs. LBP's total portfolio as of December 2000 was US\$ 2.4 billion.

LBP's environmental activities were initiated in 1994 when an environment unit was established, which currently operates with 5 professionals. As with DBP, LBP's environment unit reviews all LBP applications (except very small ones and those with no environmental impacts) for due diligence. The unit also offers advice and assistance on environmental issues and permitting (EIA, ECC) to the applicants. It has been actively promoting EMS among applicants, and made arrangements with DENR to relax EIA/ECC requirements for firms which have undertaken an EMS. LBP is also in the process of developing an EMS for itself and as a procedure to improve its lending operations. It has also signed a MOA with DENR to undertake emission controls over its own fleet of diesel vehicles.

The environment unit manages the ADB, UNDP and WB environment lines of credit noted above (see below for description).

LBP undertakes an active program of training for its own staff (about 300 trained per year, plus some employees sent for external training) as well as for its PFIs (about 120 trained per year). Due to the economic slow-down and bank mergers and staff turnover, there has been less training in 2000 and 2001, but demand is beginning to pick up again.

A notable initiative of the LBP's environment unit is the operating policy guidelines for the implementation of the ODS project, together with the appraisal reports on specific sub-projects. These guidelines were cited by the World Bank and have become a model for application in other countries implementing the Montreal Protocol.

Environmental Lending Operations (in the industrial sector)

LBP's environmental lending in the industrial sector is currently operated through four lines of credit, and one joint-financing arrangement:

Countryside Loan Fund (RCF 1 and 2) - Retail Program

Source and Budget: World Bank. US\$ 24 million.

Thrust: To create a favorable socio-economic impact on the countryside. Eligible projects include those based in the countryside which cover: agriculture-related production activity, food or agro-processing ventures, manufacturing activities that create employment/exports, environmental protection projects, tourism projects, property development, and product distribution activities

Countryside Loan Fund (CLF 1, 2 and 3)

Source and Budget: World Bank. US\$ 430 million

Thrust: The CLF is used for the same objectives as the RCF, but for lending through LBP's PFIs.

Urban Air Quality Improvement Program

Source and Budget: ADB. US\$ 25 million

Thrust: for improvement in air quality in the Metro-Manila, Cebu and Davao airsheds. The facility can be used for purchase/installation of air quality monitoring and pollution control equipment, procurement of new processes and other source equipment, and for new and rehabilitation of a public transport fleet.

Duration: Approved in 1998

ODS Phase-out Program

Source and Budget: World Bank. US\$ 10.66 million

Thrust: A grant facility operated by LBP to assist industrial borrowers to convert to non-ODS technology in 12 industries involved in solvent-cleaning, refrigeration, foam blowing, and tobacco expansion.

GEF Small Grants Program

Source and Budget: UNDP.

Thrust: To identify and demonstrate effective community-based approaches which that can reduce threats to the global environment. Beneficiaries include bio-diversity related activities, but also development of alternative sources of energy such as solar, bio-gas, and hydropower to help reduce emission of greenhouse gasses. LBP finances the projects through its regular lending program for cooperatives, and the UNDP provides additional grant financing.

Issues.

The same issues as were raised at DBP emerged with LBP

Potential areas of collaboration with EMPOWER

As with DBP, LBP felt that assistance from EMPOWER for development of case studies of CP, and training of LBP's PFIs staff would be valuable. LBP also has an active micro-finance department, and assistance to them for guidelines for small industries could be useful

c) World Bank

The World Bank (WB) assists the Philippines through non-lending activities such as analytic studies on economic and management issues, technical assistance and training, and

also through lending operations, either directly to central or local governments, to government corporations, or to the private sector, through development finance institutions (DFIs) such as DBP and LBP. In many cases, the WB's lending operations will include non-lending components, which are assisted through co-financing with bi-lateral aid agencies.

Non-lending activities

The WB commenced activities in industrial environmental management in the Philippines in 1989, through the Metropolitan Environmental Improvement Programme (MEIP). This is a joint WB-UNDP activity to assist government and civil society activities in urban environmental management in major cities in Asia. The Merto-Manila operation, which concluded in 1996, worked through an intersectoral steering committee chaired by DENR, and a national programme coordinator. With regards to IEM, the MEIP undertook i) a metro-wide environmental management strategy, ii) preparation of the 'Industrial Environment and Pollution Control' (IEPC) investment project, iii) about 200 pollution management audits of polluting enterprises, with emphasis on CP, iv) several CP seminars and overseas study visits for industrialists, v) the "URBAIR" air quality study and action plan for Metro-Manila, vi) a hazardous wastes management strategy vii) a study on the environmental and economic impacts of pollution of Laguna de Ba'I, viii) a study on economic instruments for IEM, and xi) establishment of a 'Brown Fund' to assist small enterprises and communities in environmental management.

More recently, WB has assisted DENR to strengthen its enforcement and data management capability, review its institutional set-up, expand the wastewater users' fee pioneered by LLDA and establish a disclosure program, and strengthen the monitoring and evaluation of the EIA process.

Additional assistance has been provided to LLDA, to implement its wastewater users' fee, and to strengthen its institution.

Grant assistance has been extended to the LBP for ODS phase-out (see above)

Lending operations

Compared to its technical assistance, the Bank's lending related to IEM has been relatively small (compared to lending for water and sanitation which continues to be substantial). Its only activity in this area is a small loan (US\$ 5 million) to LLDA for sustainable management of the Laguna de Ba'i watershed, including establishment of river associations.

d) Asian Development Bank (ADB)

The ADB is taking considerable interest in IEM and CP, and has sponsored some studies into the subject (including one titled "Promotion of CP Policy and Strategy Development in DMCs", and a parallel study on financing CP). As with the WB, it offers non-lending as well as lending operations to its clients.

Non-lending activities

ADB is providing assistance to DOST to provide TA to SMEs to undertake CP. It also has a substantial TA component to assist the EMB to improve its monitoring and enforcement of air quality, and to the DOTC to establish vehicle pollution control procedures and training.

Lending Operations

ADB's major assistance in this area is the US\$ 25 million to install of air quality equipment etc for point and mobile sources of air pollution. The funds are being coursed through LBP (see above).

1.2.5 Measures Taken by Academic Institutions to Promote Environmental Management in the Industry Sector

The Academe plays the important role of molding the minds of hearts of business decision-makers and planners to understand, advocate and apply industrial environmental management concepts and tools in their business organizations. A good number of business schools and science and engineering institutions are already engaging in industrial environmental management and related courses. The following examples show how far business, science and engineering curricula are being "greened".

1.2.5.1 University of Asia and the Pacific (UAP)

The UAP is a premier business school that is much concerned about "greening the business curriculum". Its Schools of Management and Business Economics offer the following academic programs: 1) Master of Science in Management, 2) Bachelor of Science in Entrepreneurial Management, 3) Strategic Business Economics Program (for business executives). Modules on sustainable development and environmental management have also been integrated into various aspects of a business organization, such as management of strategic planning, operations, marketing, finance, human resources, business and social ethics, information systems and technology, and project analysis and management.

This has been made possible through an endowment fund for a Chair in Sustainable Development set up at the School of Management by the Shell Philippines Exploration BV (SPEX). The Chair holder participates in SPEX's Sustainable Development Council and in various community-based undertakings in municipalities and provinces directly influenced by the Malampaya Gas Project (the biggest single investment in the Philippines so far amounting to around US \$5 billion). The UAP has responded with a research and outreach program on sustainable development and environmental management led by the Chair holder.

1.2.5.2 Miriam College-Environmental Studies Institute (MC-ESI)

Miriam College is long noted for its environmental commitment and advocacy. As early as the 1970s, environmental concepts have been integrated into existing academic subjects. In 1986, the faculty of the College, then known as Maryknoll College, initiated P.E.A.C.E (Public Education and Awareness Campaign for the Environment). In 1998, Miriam P.E.A.C.E. found a new home in the Environmental Education Center. The Center recently converted to the Environmental Studies Institute (ESI). ESI now offers the following academic programs: 1) Doctor of Philosophy (PhD) in Environmental Education, 2) Ph.D. in Environmental Studies, 3) Master of Arts (MA) in Environmental Education, 4) M.A. in Environmental Management, 5) Master of Science in Environmental Science, and 6) Bachelor of Science in Environmental Planning and Management. MC-ESI has currently a partnership with DOTC and DENR on promoting clean air programs.

MC-ESI exemplifies an academic institution that builds leaders and citizens who are not only imbued with an environmental conscience but who will also work for an ecologically sound environment, equitable economic growth and people empowerment, the pillars of sustainable development. MC-ESI has an important role in promoting IEM through public advocacy and participation in public disclosure programs and partnerships with both public and private sector.

1.2.5.3 Ateneo de Manila University - College of Science and Engineering (ADMU-CSE)

Ateneo established an Environmental Sciences Program almost a decade ago. Now, it will partner with the PBE and a US-based university, with possible support from DTI's Shell Program proposed to UNDP, in offering a Master of Science in Environmental Management focusing on Industrial Ecology and other IEM concepts and tools.

Ateneo's Science and Engineering College also does research on water, atmosphere (through the Manila Observatory) and waste management and offers superior analytical testing services through its Philippine Institute for Pure and Applied Chemistry laboratories.

1.2.5.4 Asian Institute of Management (AIM)

AIM is considered since 1968 the top graduate school for business in Asia. It earned recently an ISO 14001 certification, the first and only educational institution to do so in the Philippines. It offers master's degree programs in business management, development management, and in entrepreneurship. AIM provides continuing education to both young and seasoned business executives. The current thrusts will expand the academic programs to health care management, education management, arts management and environmental governance. AIM is expected to produce business leaders advocating for environmental management system, and environmental governance in general, in their own organizations.

1.2.5.5 Other academic institutions and associations

The University of the Philippines Los Baños' School of Environmental Science and Management (UPLB-SESAM) is the country's leading school in the "green" environment. Recently, it started a program on industrial ecology and has an IEM outreach activity with several industrial firms located in the nearby provinces.

The De La Salle University (DLSU) is also active in the "green environment" and has also started activities dealing with IEM. It established an information center for Clean Production through a grant of the Council of State Government.

Institutions of higher learning have also organized and networked for environmental education and environmental science and management. These are the Environmental Education Network of the Philippines (EENP) and the Philippine Association of Tertiary Level Educational Institutions on Environmental Planning and Management (PATLEPAM).

AGENCY	SCOPE OF ENVIRONMENTAL RESPONSIBILITIES
Department of Environment and Natural Resources (DENR)	Created in 1987 through Executive Order (EO) 192 the main environmental management institution in the country. DENR is responsible for the conservation, management, development, and proper use of the country's environmental and natural resources. The Secretary has the authority to exercise the mandate and functions of the Department. The implementing arm for environmental policies is the Environmental Management Bureau.
Environmental Management Bureau (EMB)	Formed with the DENR through EO 192, EMB first served as an advisory body to the Secretary but later transformed to a line bureau through the Clean Air Act. EMB is responsible for environmental policy formulation; it develops, recommends and implements policies, rules and regulations on environmental management and pollution control. EMB also issues air and water quality standards, emission and effluent standards, and solid and hazardous wastes management guidelines. EMB is the secretariat for the Pollution Adjudication Board, the Air Quality Management Board and the Solid Waste Management Commission. EMB's Regional Offices are authorized to issue permits, monitor ambient environmental quality conditions, and take appropriate enforcement actions against violators of conditions in the permits and environmental standards. (Monitoring of point source discharges, however, is the responsibility of the enterprises themselves). The authority of the special regional development agencies (LLDA, SBMA, CDC, et al.) is thought to supersede those of the DENR and EMB in the former's areas of jurisdiction but this is being legally reviewed. In any case, DENR's existing policies, rules and regulations predominate over regional and local authorities.
Pollution Adjudication Board (PAB)	The Pollution Adjudication Board is a quasi-judicial body charged with adjudicating cases brought by EMB's Regional Offices against violators of environmental regulations. PAB may impose fines, issue cease and desist orders (CDOs) to polluting industries, and specify timeframes for compliance with the standards violated. EMB's Regional Offices are responsible for implementing PAB's orders. The powers and functions of the Board may be delegated to the Regional Offices.
Department of Trade and Industry (DTI)	The DTI is mandated to coordinate, promote, facilitate and regulate the country's trade, industry and investment activities; formulates plans and implements strategies on trade in consonance with broad national economic goals; promotes and regulates commerce and trade to protect the consumers; and undertakes licensing of firms. DTI's lead agency for promoting industrial environmental management is the Board of Investments (BOI) as part of its investment planning and promotions role.
Department of Interior and Local Government (DILG)	The DILG promotes legislation to assist LGUs and develop policies and programs designed to strengthen the capabilities of local government offices and personnel. It monitors, supervises and assists the LGUs in their operations. With the enactment of the Local Government Code of 1991, the DILG plays a critical role in monitoring the transfer of responsibilities from the national government agencies to the LGUs.
National Economic and Development	NEDA formulates, supervises and monitors the implementation of economic development plans at both the national and sectoral levels. NEDA also serves as the Secretariat for the Investment Coordinating Committee (ICC),

Authority (NEDA)	which reviews and evaluates major capital projects prior to implementation by the government. The projects subject to ICC evaluation are those that require investments in excess of PhP 800 million or foreign borrowing of US\$10 million or more. NEDA requires from projects submitted for ICC review to obtain an Environmental Compliance Certificate (ECC) from DENR.
Philippine Economic Zone Authority (PEZA)	Formulates and implements policies relating to industrial estates development, operations and abandonment. PEZA owns also 4 industrial estates. It has an environmental unit that monitors and inspects environmental compliance and reviews environmental performance of locators within the industrial estates as part of the annual permitting process.
Department of Health (DOH)	The DOH is mandated to promote, protect and preserve or restore the health of the people through delivery of health services and regulation of health service providers. DOH puts emphasis on public sanitation, control of community infections, education of individuals on personal hygiene and development of a waste management plan, including toxic and infectious hospital wastes. DOH is responsible for determining appropriate standards for drinking water quality and is instrumental in the evaluation of public health impacts from environmental pollution.
Housing and Land Use Regulatory Board (HLURB)	HLURB enforces, coordinates, streamlines and improves land use policies and regulations. HLURB is mandated to promulgate and enforce rules and regulations on land use and housing through a clearance/permit system that entails the processing, evaluation and issuance of locational/development permits for subdivisions and ULRZs/APDs. Based on signed MOA between the agency and DENR, issuance of locational clearance is predicated on the issuance of an ECC.
Department of Energy (DOE)	The DOE is responsible for the implementation of the overall energy program of the country. Its scope covers policy setting, planning and regulation of energy sector all focused towards meeting the energy requirement of the country as it industrializes. The DOE plays a significant role in controlling further environmental degradation as they can impose energy policies that takes into account environmental protection.
Department of Public Works and Highways (DPWH)	The DPWH is primarily responsible for development of the nation's infrastructure, especially national highways, flood control and water resources development systems, and other public works. DPWH activities are not limited to road building and reclamation but include the development and management of water resources and design and construction of solid waste transfer stations and sanitary landfills for Metro Manila. It is responsible for the maintenance and clean up of major waterways and sewerage (<i>esteros</i>).
Department of Science and Technology (DOST)	The DOST is responsible for development of indigenous technologies and the adaptation of foreign technologies to advance the socio-economic development of the Filipino people. DOST's efforts to select, assimilate, adapt and transfer appropriate technologies can contribute significantly to the protection and enhancement of the local environment. The lead agency is the Industrial Technology and Development Institute that is equipped with pilot industrial waste management facilities and manages a clearinghouse for environmental technology information and hosts the Cleaner Production Technology Center.

Annex 1

Summary of Partial Survey Findings on the Role, Status and Current Measures of Public Organizations in relation to Industrial Environmental Management

1. Institution's role in advancing the theory and practice of IEM

Services	Agency
Formulation and Implementation of Environmental Policies, Laws and Regulations	DENR, LLDA, NEDA, DOST, DOE, DOH, PEZA
Environmental Advisor	DENR,BOI, LLDA, NEDA, DOST, DOE, DOH, PEZA
Environmental Engineering	LLDA, PEZA, DOST, DOE
Environmental Training Services	DENR,LLDA, NEDA, DOST, DOE, DOH, PEZA
Environmental Certification/Permits	DENR (Environmental Consultants Accreditation) LLDA (Pollution Control Officer Accreditation) DOST DOE, DOH (Sanitary Permit for Hospital facilities; Operational Permit of Hospitals)
Policy Research	DENR, BOI, LLDA, NEDA, DOST, DOE, DOH
Science and Technology Research	DENR, LLDA, DOST, DOE, DOH (qualitative research)
Monitoring/Lab Analysis	DENR (environmental compliance of industries to ECC conditions) LLDA (Monitoring of effluent/waste water discharges) DOST DOE. DOH (occupational health monitoring)

2. Presence/Absence of organizational structure/unit dealing with IEM

Agency	Remarks		Status
	Present	Absent	
DENR-EMB-EIA Division			EIA Division directly link to the Office of the Director and Asst. Director
BOI/DTI	□		Environmental Matters Division under Office for Industrial Policy
LLDA			Environmental Quality Division directly link to the Office of the General and Asst. General Manager
NEDA			Agri-staff, TIUS
PEZA			Unit under the Support Services Dept.

DOST-ITDI			Environmental Division under ITDI
DOST-IPCT			
DOE			No response yet
DOH			
DILG			No specific environment division but created a special management office to implement various environmental related projects
ULAP-DILG			No response yet
League of Provinces-DILG			No response yet
PRRC			No response yet

3. Functions/roles, staff composition and expertise of the unit dealing with IEM

Agency	Composition	No. of Staff	Expertise	Major Roles and Responsibilities
DENR-EMB-EIA Division	Environmental Management Specialists, Environment Specialist	24 full time 15 contractuels	Chemical Engrs. Environmental Science Biologist Economics Geologist Computer Science	Policy formulation and implementation Review and Assessment of EIS documents Monitoring of Environmental projects
BOI/DTI	Management, Investment Specialists, Technical Assistant	4	Industrial Planning and Sector Development	Formulate and recommend policies for industry development
LLDA	Environmental Management Specialists, Environment Specialist			Assist industries around LLDA to comply with permitting requirements Conducts regular monitoring of the various industrial activities within the lake
PEZA	Environmental Management Specialist	2		Assist locators to comply with the various gov't permits Conduct occupational health and safety inspection
NEDA	Economist, Forester, Environmental	7		Evaluation of IEM project proposals for ODA

	Science Specialists (2), Devt Studies Specialist, Agri-Economist			
DOST-ITDI	Project Leaders Supervisors Researchers Analysts	1 PhD 4 MS 10 BS	Biology, Chemistry, Environmental Science, Chem. Engineering, Industrial Eng., Pharmacy	Conduct research and studies in waste treatment and utilization, environmental assessment, and industrial pollution Assist industry for the adoption of sustainable technologies
DOST-IPCT	Project Leader and Assistants	13	No answer	Assist SMEs in the adoption of CP
DOE	Environmental management and monitoring	13	No answer	Environmental quality monitoring, environmental impact assessment permitting assistance, environmental planning and policies, administrative
DOH				
DILG		1		Contact person only
ULAP-DILG	No response yet			
League of Provinces	No response yet			
PRRC	No response yet			

4. IEM trainings/seminars attended by the Staff

Agency	Trainings/ Seminars Attended
DENR	Environmental Compliance Monitoring, Environmental Risk Assessment, Environmental Audits, Training on EIA Techniques
BOI/DTI	Environmental Performance Indicator, EMA, EMS, CP, Hazardous Waste Mgt.
LLDA	Environmental Monitoring, Training on EIAs
PEZA	Awareness program on RA6969, Occupational Safety and Health Training Course
NEDA	
DOST-ITDI	Seminars on Environment Regulations, Conduct of environmental monitoring activities
DOST-IPCT	CP assessment, integrated CP concept in plant design

DOE	Environmental management audit; environmental management for thermal power plant; oil spill prevention, control and response; EIA operationalization network; Safety, health and environment for small toxic and hazardous waste generators
DOH	Seminars on Environmental Regulations, Solid waste Management, Environmental Health Risk Assessment, Occupational Health and Safety, Solid Waste Management, Environmental Risk Assessment
DILG	Seminars on Environmental Regulations, Solid Waste Management, Water Quality monitoring
ULAP-DILG	No response yet
League of Provinces-DILG	No response yet
PRRC	No response yet

5. IEM trainings/ seminars conducted by the agency

Agency	Trainings/ Seminars Conducted
DENR	Training on EIA Techniques, regulations
BOI/DTI	EMS and trainings in line with EMS implementation for employees
LLDA	Environmental water quality monitoring/PCAPI-PCO training
PEZA	Training on Environmental Regulations
NEDA	None
DOST-ITDI	Application of industrial wastewater treatment and reuse, software-based technologies; dioxin, furan and dioxin-like compounds,; environmental risk assessment
DOST-IPCT	Training on Clean Production and waste minimization for SMEs, feasibility study preparation
DOE	Oil spill prevention, control and response
DOH	Trainings/Seminars on Environmental Health Impact Assessment,
DILG	Solid Waste Management with the assistance of other gov't agency e.g. DENR, LLDA etc.
ULAP-DILG	No response yet
League of Provinces-DILG	No response yet
PRRC	No response yet

6. IEM information, education, and communication program being implemented

Agency	IEC Program
DENR	Environmental education, public awareness, video library, Regular publication of Phil Environment Report, Library services, Institutional coordination and documentation ,Event's organizing Environment Month/day exhibits, cultural presentations, rallies,

	production of IEC materials, primers, comics, newsletters, posters, radio program, documentaries, infomercials
BOI/DTI	PRIME, Green AID, EMS program for employees
LLDA	Creation of the LLDA IEC and Public Information Unit, IEC facilities acquisition, Establishment of audio-visual room, Regional Training Center, Event's organizing e.g. Laguna de Ba'I month, exhibits, cultural presentations, rallies, production of IEC materials, primers, comics, newsletters, posters, radio program, documentaries, infomercials
PEZA	Tool Kit development
NEDA	GOPA 21 (Localization of PA21)
DOST-ITDI	Event's organizing e.g. Science and Technology Week/Month, exhibits, cultural presentations, rallies, production of IEC materials, primers, comics, newsletters, posters, radio program, documentaries, infomercials
DOST-IPCT	CP technology database, books and other reference materials (newsletters, guidebooks for solid waste management)
DOE	Power Patrol, road transport patrol, octane ration, O-Ilaw
DOH	Events organizing e.g. Health month, exhibits, cultural presentations, rallies, production of IEC materials, primers, comics, newsletters, posters, radio program, documentaries, infomercials on hospital waste management, sanitation
DILG	Institutional coordination and documentation ,
ULAP-DILG	No response yet
League of Provinces-DILG	No response yet
PRRC	No response yet

7. Economic and Non-Economic incentives on IEM

Agency	Incentives	
	Economic	Non-Economic
DENR	None	None
BOI/DTI	EO 226: Low interest loan, tax reduction/exemption, Introduction to EMS	none
LLDA	MBIs	none
PEZA	Incentive for Export Zone Developers, economic zone locators	Awards
NEDA	None	None
DOST-ITDI	None	None
DOST-IPCT	None	Initial environmental

		review for auto repair shops
DOE	IR 1-94: Tax holiday, tax exemption	
DOH		
DILG		
ULAP-DILG	No response yet	
League of Provinces-DILG	No response yet	
PRRC	No response yet	

8. Availability of Funds for IEM

Agency	Availability of Funds for IEM	
	Yes	No
DENR	Small amount, there are a lot of plans but cannot proceed due to unavailability of funds	
BOI/DTI	Incidental expenses only	
LLDA	Through the assistance of donor agencies e.g. World Bank	
PEZA	There are some assistance from the locators	
NEDA	ODA for GOPA21; Limited regular budget for PCSD	
DOST-ITDI	ODA, e.g., World Bank ADB	
DOST-IPCT	Very small/limited	
DOE	Regular funding	
DOH	None	
DILG	Implement environment-related activities through the assistance of other gov't agencies	
ULAP-DILG	No response yet	
League of Provinces-DILG	No response yet	
PRRC	No response yet	

9. Measures implemented by the agency in promoting IEM

Category	Promotion Measures	Agency	Remarks
Regulatory Measures	Emission/Effluent control regulations (emission std. Setting, monitoring & inspection of the emission sources, etc)	DENR LLDA DOH DOE	

	Preparation of the emission/effluent sources inventory	DENR LLDA DOE	
	Environmental Impact Assessment (EIA)	DENR DOST DOH	
	Environmental Risk Assessment (ERA)	DENR DOST DOH DOE	
	Environmental Compliance Monitoring and Enforcement	DENR DOST LLDA DOH DOE PEZA	
	Obligation of the appointment of legally authorized pollution control officers and energy conservation officers to each factories	DENR LLDA DOH	
	Others, pls specify	DENR- EMB-EIA Division	Development of IEE checklist or various developmental projects Establishment of inter-agency MOAs to streamline implementation of the Philippine EIS system
MBIs	PRTR Emission/Effluent taxes and charges	LLDA	
	Financial/economic incentives for investment in IEM (low interest loan, tax reduction/ exemption)	LLDA PEZA BOI DOE	
	Establishment of the new fund for IEM	LLDA	
	Reduction/suspension of subsidies to the use of raw materials, fuels, and other natural resources	LLDA DOE	
	Taxation upon the use of non-renewable natural resources	DOE	
	Financial support to R&D of environmental technologies	LLDA DOE	
Voluntary Programs	Introduction of EMS (ISO 14001)	DENR DOH LLDA DOE	IISE Climate Change

		PEZA	
	Environmental Performance Assessment	DENR DOE	
	Environmental Accounting		
	Life cycle assessment of the products	DOE	
	Promotion of environmental action plans by industry groups	DENR DOST LLDA PEZA BOI DOE	
	Environmental conservation agreement (between the factories and surrounding residents or local government in-charge)	DENR LLDA PEZA DOH DILG DOE	
	Information disclosure/public relation/ Dissemination (data base, seminars, symposium, environmental awards, ecolabeling, etc.)	DENR DOH DOST LLDA BOI PEZA DOE	
Laboratory Services	Water Quality Monitoring and Analysis	DENR LLDA DOE	
	Air Quality Monitoring and Analysis	DENR DOE	
	Soil Quality Monitoring and Analysis		
Environmental Training	Environmental Impact Assessment (EIA)	DENR DOST DOH DOE	
	Environmental Risk Assessment (ERA)	DENR DOH DOST DOE	
	Environmental Compliance Audit	DENR DOH LLDA DOE	
	Environmental Management System (EMS)	DENR DOH DOST PEZA DOE	
	Hazardous Waste Management	DENR DOE	
	Environmental Monitoring and Analysis (Sampling)	DENR LLDA DOE	

	Environmental Site Assessment	DENR DOE	
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10. Lessons learned on the implementation of IEM

Lessons Learned	Agency	Remarks
Importance of Management Support	DENR DOH LLDA NEDA BOI PEZA	
Need for Cooperation and Commitment	DENR DOH LLDA NEDA BOI PEZA DOST	
Importance of Safe Working Environment		
Importance of Regulatory Compliance		
Importance of Protecting the Environment	DENR DOH LLDA NEDA BOI PEZA	
Value of Waste Reduction	LLDA DOH	
Importance of EMS in Industry	DENR	
Change in Management Style		
Essence of Time		
Preparedness		
Caring for Future Generation	DENR	
Old Habits are Hard to Break		

11. Future Plans and Budget

Agency	Future Plans	Budget
DENR	Manualization, Operationalization of inter-agency MOAs Preparation of IEE Checklist for various developmental projects Capability Staff enhancement through trainings abroad Hiring of additional staff Enhance the implementation of environmental compliance and enforcement activities on the Regional offices	Looking for available financial support from donor agencies/ Institutions
LLDA	Conduct of ecosystem-based planning and management of the lake resources that is sustainably balanced with economic vitality and social well-being of a wide spectrum of stakeholders Promote participatory and partnership approach in planning and implementation that recognizes the shared stewardship of the lake by the government, civil society, business enterprises and the local community Broadened market-based instruments that induces participation and partnership through economically sound resource-use fees and charges Restore water quality of the lake to a sustainable standard that satisfies the competing demands for lake water use	

	Develop and share knowledge with a wide range of stakeholders in order to develop competence and capability in co-management of the lake resources	
PEZA	Conduct more environment related trainings/seminars to its locators	
NEDA	Encourage investment with economic and environment sustainability	
DOST-ITDI	Provide technical assistance for the transfer and adoption of new and identified technologies	
DOST-IPCT		
DOE		
DOH	Continue implement programs on environmental health services, environmental health risk assessment, Development of IRR on Sludge Management	
DILG		
ULAP-DILG		
League of Provinces-DILG		
PRRC		