



# Impact Evaluation

United States Agency for International Development

## REDUCING URBAN AND INDUSTRIAL POLLUTION IN THE PHILIPPINES

*During 1992–97, USAID introduced pollution-prevention strategies to 143 industrial companies in the Philippines. The immediate result: pollution decreased, and companies increased revenues. But few firms have sustained the benefits, and the strategies have not been institutionalized.*

### SUMMARY

**I**N OCTOBER 1999, USAID's Center for Development Information and Evaluation (CDIE) fielded a five-person team to assess the impact of the Industrial Environmental Management Project. Implemented in the Philippines during 1992–97, IEMP worked with the government and private sector to introduce concepts of waste minimization and pollution prevention to small and medium-size industrial firms located outside metropolitan Manila. The project's principal goal: improve human health.

More than 2,600 people participated in IEMP training seminars. Many others took part in a series of public-private dialogs on new regulations—some of them based on policy studies prepared with IEMP financial support. A central feature of the project was the pollution management appraisal (PMA), a simple assessment of opportunities for reducing industrial pollution through low- or no-cost techniques as well as capital investments in equipment that could increase production and simultaneously reduce waste and emissions.

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### CONTENTS

Summary .....	1
Background .....	2
Program Elements .....	5
Impact .....	7
Program Performance .....	11
Lessons Learned .....	14

PMAs were done for 143 companies throughout the country. The appraisals identified opportunities for the firms to reduce costs, increase revenues, and reduce water pollution. The firms invested a combined total of \$27 million to implement PMA recommendations. This resulted in annual net benefits of \$33 million. Water pollution, gauged by biochemical oxygen demand (a standard measure of organic pollution in wastewater), decreased by 29 percent on average.

Most participating companies realized reduced production costs and increased revenues, and the country benefited from lower pollution levels. The project confirmed that industry-led economic growth can be compatible with environmental protection in the Philippines. Companies tended to adopt low- and no-cost PMA recommendations with a short payback period rather than measures requiring a large capital outlay and a long payback period. Though not a panacea, pollution management appraisals can be effective tools in helping reduce pollution at the company level.

The prospect of cost savings was the main factor motivating companies to adopt waste-minimization programs. However, command-and-control measures were also critical. To be effective, regulations must be enforced, and penalties for noncompliance must be severe. This was often not the case in the Philippines because of resource constraints. Market-based instruments for pollution prevention are an important complement to command-and-control approaches. Such instruments use economic incentives (and disincentives) to influence companies' behavior.

But the PMA process has not been institutionalized in the Philippines. The benefits of waste minimization have not been sustained at many participating companies. And neither the PMA process nor PMA recommendations have spread to nonparticipating firms. Why not?

Perhaps some plant owners and business managers viewed the cost savings estimated in the PMAs with skepticism. Or firms may simply have been buying time to avoid compliance problems rather than seriously trying to improve operations. As for replication, companies generally did not voluntarily share information with competitors about ways to cut costs.

Program performance, including sustainability and replication, may be enhanced and strengthened by forging closer working relationships with industry trade associations and top management of individual companies as well as by ensuring that reliable data are available to measure costs and benefits and monitor change.

## BACKGROUND

Urbanization in the Philippines has increased dramatically in recent years. In 1993, only one third of the country's 73 million people lived in urban areas; by 1995, it was more than one half. The Philippines' economy has also grown substantially since 1993. The industrial and service sectors have led that growth. Not surprisingly, urban and industrial growth has led to increased air and water pollution.

In many countries, there is a natural tension between industrial development and environmental protection. This is true in the Philippines, though fortunately, the situation has begun to change. USAID has contributed to that change in part through the Industrial Environmental Management Project implemented during 1992–97. In October–November 1999, a five-person CDIE team assessed the impact and effectiveness of USAID's pollution-prevention and -control programs in the Philippines.

### Urban and Industrial Pollution In the Philippines

The Philippines' industrial sector is a major source of water and air pollution. Given the size of the

Philippines and the magnitude of its pollution problems, air- and water-quality monitoring data are relatively limited. As of 1996, the Department of Environment and Natural Resources (DENR\*) was monitoring air quality at 185 stations. In the Metro Manila area, suspended particulate matter at 200 micrograms per cubic meter was more than double World Health Organization guidelines. Manila's air is among the most polluted in the world.

Almost half of DENR's 400 water-quality monitoring stations show that pollutants exceed the worst official Philippine classification of water bodies. DENR ranks most rivers with a "C" or a "D" on a scale of A to D. The major water pollution problem is discharge of domestic sewage and industrial organic wastes. Most industrial effluent goes untreated or only partially treated and is discharged into inland and marine waterways. This results in low dissolved oxygen levels.

More than two thirds of the country's industrial facilities are located in Metro Manila, where all four major river systems are biologically dead. The largest polluting industries by volume of effluent are coconut and vegetable oil, sugar milling, distilleries, textiles, iron and steel, mining, and cement. The most toxic pollutants are smelters, petroleum refineries, petrochemicals, pesticide and wood preservative industries, gold amalgam processes, industrial chemical industries, and fertilizer plants.

In 1989 the National Statistics Office listed 10,000 medium- and large-scale manufacturing

firms in the Philippines, of which 8,000 generated wastewater. All together, they produced 2.5 million metric tons of biochemical oxygen demand (BOD) in 1990. BOD material uses oxygen in the water, which can threaten aquatic life. In 1992, industry accounted for 29 percent of total BOD nationally; domestic sources, 44 percent; and surface runoff, 27 percent.



Water pollution from all three sources cost the nation over \$86 million in 1992. Of this, \$37 million (in 1992 prices) was from health losses, including lost workdays, lost earnings from premature death, and costs of medication. The other \$49 million was in fisheries losses. Industry generated \$25 million of total losses.

### **USAID Industrial Environmental Management Project**

Unlike many industrial pollution programs, which stress *treatment* of waste, IEMP stressed *prevention*. It was designed to reduce pollution at its source by improving “industrial housekeeping,” changing industrial production processes, and reducing and reclaiming industrial waste. It also encouraged adoption of cost-effective pollution abatement technologies. Funded by USAID at \$13.2 million, the project operated from July 1992 through June 1997. It had three components: pollution reduction (30 percent of project funding), policy studies (28 percent), and capacity building (42 percent).

To prevent pollution at its source, industrial corporations must be convinced that prevention is financially beneficial. Companies do not intend to harm the environment, but they are in business to make a profit. If low-cost, environmentally sensitive investments and changes

\*DENR is the government agency primarily responsible for protecting and enhancing environmental quality and for formulating environmental standards.

# 4

in production processes will reduce costs and increase profits, they may take action. And if they do, the companies will reduce their costs, the country will suffer less environmental damage, and public health will improve.

IEMP used pollution management appraisals to identify ways to realize savings, typically by using fewer raw materials and less water and energy in the production process. This in turn helps reduce waste treatment and disposal costs. There is another incentive. The government can fine or shut down businesses that violate pollution standards. Under the project, however, companies that initiated PMAs were given a one-year exemption from complying with those standards—a valuable incentive to participate.

A pollution management appraisal identifies waste-minimization opportunities ranging from no- or low-cost options to those that are more capital intensive. It estimates how much a company would save by adopting alternative options as well as the rate of return and payback period. Pollution-prevention options may involve 1) minimizing industrial waste, 2) reclaiming and reusing waste, and 3) using new technology to reduce waste. To build management support, businesses are often encouraged to start with no- or low-cost measures. Then they can decide whether to make more costly investments that could yield even greater returns.

An important tactical question concerns what types of business should be selected for a PMA. One could select the *worst* polluters. Though they would seem obvious candidates, their senior management may be inept or uninterested in reducing pollution. Alternatively, one could select the *best* performers. Such companies are likely to implement and sustain PMA recommendations. But they are already relatively clean, so selecting them will have little environmental effect. Finally, some businesses produce a unique product or have a unique pro-

duction process. Such companies, if principal sources of toxic waste, may be good candidates for PMAs. But they are poor candidates for replication since there are few businesses that could adopt similar pollution measures.

Under IEMP, no selection criteria were used. Instead, any small- or medium-size firm located outside Metro Manila that wanted to participate could do so.

The project used education and training programs to introduce the PMA concept to more than 400 companies and a variety of industry trade associations, nongovernmental organizations (NGOs), and professional associations. Of the 400 firms, 143 volunteered for PMAs. The IEMP end-of-project report (July 1997) indicates that over 90 percent of them implemented pollution-prevention measures. A quarter of the companies each invested less than \$2,000 in such measures; the remaining 75 percent each invested more than \$2,000. Total combined investment was reportedly \$27 million. This investment generated annual net financial benefits of \$33.1 million. The payback period was less than 10 months. The reduction in pollution load (BOD) averaged 29 percent at the 143 firms.

The Philippines has had a long tradition of centralized command and control. The government sets the rules; industry is expected to follow them. An exhaustive set of environmental rules and regulations had been in place, but enforcement was lax and uneven. To help deal with this problem, IEMP supported 6 major policy studies and 11 public-private dialogs on pollution issues. It also worked with DENR to rationalize regulations and standards. Action programs were developed by IEMP and adopted by DENR for environmental impact assessments, market-based environmental instruments, air- and water-quality management, enforcement of fines and penalties, and management of hazardous wastes and toxic chemicals.

Finally, IEMP trained more than 2,600 people from both the public and private sectors in environmental management skills. By strengthening institutions and creating a pool of qualified experts in pollution management, IEMP tried to ensure program sustainability.

## Program Elements

Many USAID-funded urban and industrial pollution programs support interventions in one or more of five areas: economic policy reform; environmental regulations and standards; education and awareness campaigns; institution building; and technological change. This was the case in the Philippines.

### Economic Policies

A well-designed economic policy environment can be a powerful tool. Key economic policy issues include pricing, market-based instruments, and financing.

#### *Pricing*

Most of the IEMP industries were relatively water intensive (for example, agriculture processing and textiles). Thus, any reduction in water use would theoretically yield significant cost savings for the company—but only with realistic pricing policies. This is not the case in the Philippines. Water from municipal systems is inexpensive, and groundwater is free. Thus, there is little incentive to conserve water. For example, a company might decide it was financially more attractive to invest in a well for tapping “free” groundwater than to pay for piped municipal water. Yet, tapping groundwater lowers the water table, which can deplete aquifers. It can also result in saltwater intrusion.

Energy pricing policy is also important. In the Philippines, power purchased from the electric utility is generally a significant cost of production. Companies tend to conserve energy by reducing their demand for electricity. The util-

ity burns less fuel, reducing pollution. However, alternative power sources are often environmentally less desirable. For example, firms can “save” on electricity by investing in less efficient (and highly polluting) diesel generators. Unless energy pricing policy encourages use of cleaner fuels and power sources, or of energy-efficient technology, companies will continue to use energy sources that are least expensive to them—irrespective of social cost.

#### *Market-Based Instruments*

The Philippines’ traditional approach to pollution control has relied primarily on command and control—creating regulations and then enforcing them. By contrast, market-based approaches impose fees and provide incentives to achieve the same objective. In economic terms, pollution discharge fees imposed on the polluter equate private and social costs of pollution.

An IEMP policy study analyzed the merits of several market-based instruments. Of these, user fees were singled out for more study, the results of which became the basis for establishing a “polluter pays” emissions fee system for the Laguna Lake Development Authority. Companies are assessed fees on their effluent discharge into the lake or tributary streams. Companies that reduce waste generation are rewarded with lower fees and penalties. This was the first time a fee-based system had been used in the Philippines, and the program appears to have succeeded. It has contributed to measurable improvements in the quality of Laguna Lake—a major freshwater body adjacent to Manila and long an important source of fish and means of livelihood for local people. Buoyed by the success at Laguna Lake, DENR plans to introduce similar fees nationwide.

#### *Financing*

Investing in pollution prevention and waste minimization is a relatively recent practice, for

# 6

both Philippine businesses and financial institutions. Companies are unaccustomed to making bankable cost calculations, just as bankers are unaccustomed to reviewing loan requests for these purposes. However, the IEMP policy study “Financial Resources to Fund Environmental Investments” examined the major issues and provides an agenda for government and financial institutions to explore the topic. Working in partnership with DENR, the Land Bank of the Philippines and the Development Bank of the Philippines now target small and medium-size firms for concessional loans to finance pollution-prevention and waste-minimization efforts.

## Government Regulations And Standards

Environmental laws, standards, and regulations—and government’s capacity and willingness to enforce them—are pivotal factors in the relative success of pollution-prevention projects. In the Philippines, enforcement has a poor track record, partly because of unreasonably strict laws, uneven enforcement, and corruption. One principal objective of IEMP was to provide DENR with technical assistance and advice on a range of issues concerning regulations for industrial environmental management; policy studies were an important mechanism to achieve this objective. DENR already had a five-year agenda for such studies when IEMP began—an indication of the demand for expert advice.

The results of some of these studies were applied quickly as departmental administrative orders or regulations: the Standards for Republic Act concerning toxic materials, for example, and the Guidelines for Social Acceptability. Other studies have provided major input for the Clean Air Act, passed in early 1999, and the Clean Water Act, expected to be passed.

## Education and Awareness

IEMP supported a significant training component designed to build environmental awareness and technical knowledge in both the private and public sectors. The training was aimed at environmental consultants, managers and technical staff from industry, and government staff at both the national and local levels. Training modules were developed in six technical areas. In addition, the project supported a series of seminars and roundtables for private-public sector dialog. The sessions provided a valuable forum for public debate on proposed reforms in environmental policy. Special workshops were held to respond to requests from DENR’s Environmental Management Bureau.

The project consciously “Philippinized” the content of the courses and trained Filipino instructors as rapidly as possible. This made the courses more appropriate and effective for the participants and had the advantage of developing a corps of Filipino technical trainers. The project also strengthened the technical capability of local consultants engaged by IEMP to conduct pollution management appraisals. Several are known to be active in industrial environmental consulting today. Pollution-control officers from factories and elsewhere in the private sector also participated in the training. The central and local offices of DENR employed the largest share of trainees. Unfortunately, DENR’s personnel office was unable or unwilling to organize follow-on programs, even though all the materials for the training modules had been developed by the project.

Finally, various publications produced under the project had far-reaching impact. A series of success stories—concise write-ups reporting PMA results for individual IEMP companies—was bundled into a publication (“Philippines Industry’s Response to Waste Minimization”) for DENR and widely circulated. Many in the government, private sector, and international

agencies referred to it, both in Manila and during site visits. Another series that appears to have received wide distribution is “Pollution Prevention Guidelines,” prepared for several of the industry sectors covered by the project.

## Institution Building

Strong public and private institutions are indispensable to ensuring clean air and water in the Philippines. Among governmental agencies, DENR has the primary mandate of setting standards for emissions and enforcing them. The Department of Trade and Industry has a strong promotional role—facilitating the expansion of Philippine industry. The Department of Science and Technology supports development and adoption of technology. There is duplication and conflict among these mandates; DENR, in particular, has a role in all these areas. The picture of government institutions in the Philippines is further complicated because all these agencies work at both the national and local levels, the latter through local government units.

IEMP specifically focused on DENR, a sprawling regulatory bureaucracy responsible for forests, fisheries, watersheds, and protected areas as well as industrial environmental regulation through the Environmental Management Bureau. The leadership of DENR has changed several times since the project began, and staff turnover has been considerable. Both within and without DENR there is debate on its proper role in working with industry. Should it simply wield the stick and be a hard-nosed command-and-control regulator? Or should it also offer industry carrots? Whatever the outcome of this debate, it should be noted that IEMP assisted DENR mainly at the local level. This was consistent with the gradual shift of responsibility and authority from Manila to the provinces.

## Technological Change

The Industrial Environmental Management Project, as its name suggests, emphasized management. The PMAs themselves were a new management technique—a simple and systematic procedure for assessing opportunities for minimizing waste and preventing pollution. IEMP was concerned mainly with the process of technological change and only indirectly with the specific technologies used. However, it aimed to influence decisions about which technologies would be selected and how factory managers and workers would apply them.

PMAs usually recommended capital investments in equipment that would be cleaner or more modern and efficient. Those recommendations were typically part of a package that included low- and no-cost measures, such as sweeping solids from the shop floor before hosing it during cleanup. The appraisals also always recommended establishing an in-plant team to identify additional opportunities for improving management techniques and new technologies on an ongoing basis. However, unless the company’s management accepted the concept of waste minimization and encouraged the team to act, few improvements were undertaken.

## IMPACT

Urban and industrial pollution-prevention programs can have at least three effects: environmental, health, and financial. Under IEMP, waste-minimization efforts often involved operating changes *internal* to the business. The effects of these changes were almost immediate and easily measured in physical reductions in pollution and changes in costs and revenues. Reduced water pollution can also affect aquatic animals and plant life. These *external* effects are difficult to measure and usually are not valued. In some cases, external effects are immediate. In others, they take longer. It may take years,

for example, after a factory has stopped polluting a river for aquatic life to return. Activities that involve institutional strengthening or changes in policies, laws, and regulations take even longer to manifest themselves in ways that can be measured.

## Environmental Impact

IEMP targeted various industries but mainly those discharging organic wastes, especially biochemical oxygen-demanding material. (BOD lowers dissolved oxygen levels to the point where, at the extreme, the water cannot sustain life.) The project also helped reduce suspended solids, which reduce water quality and silt up coral reefs, reducing their productivity. Suspended solids also have adverse effects on agriculture, and high concentrations increase the cost of treating water for human consumption and industrial use. Reducing levels of heavy metals and toxins is important because they have a direct, harmful effect on human health. In addition to reducing loads of these and other pollutants, IEMP identified ways industries could reduce input requirements, thus saving water and energy.

Although the PMAs for individual companies developed data for many of these pollutants, the data were aggregated for only one pollutant (BOD) and for wastewater discharge reductions (see table 1). The CDIE team estimated reductions for two other pollutants: total suspended solids (TSS) and toxic metals (also reported in table 1). Thus, water use was reduced by an estimated 36.9 million cubic meters per year; BOD material, by an estimated 43.5 million kilograms annually; TSS, by 31.7 million kilograms per year; and toxic metals, by 696,000 kilograms per year.\* These results can probably be attributed to the project. Of course, similar environmental results would occur if the company's output declined, because less water would be used and less total pollution would be produced.

The table shows that a single industry, sugar milling, accounted for the largest share of water-use reduction (77 percent), BOD reduction (69 percent), and TSS reduction (31 percent). These reductions were spread rather evenly over all 15 participating firms of the sugar industry. The second largest source of BOD reduction occurred in the starch manufacturing industry, mainly from a single firm. Over 85 percent of total BOD reduction occurred in only 17 of the 143 companies. Thirty of the companies registered no BOD reduction at all, and some of those were in industries characterized as BOD heavy. The veneer and plywood industry accounted for most of the reduction in toxic metals (84 percent); however, as previously indicated, data were not available for many of the dirtier industries.

A key assumption underlying these annual reductions in pollution load and input use is that plants continue to implement PMA recommendations each year, even after the project ends. On this score results were mixed. Some companies no longer followed all PMA recommendations. Others were implementing pollution reduction measures that had not been recommended in the PMA and therefore were not captured in the end-of-project report. Still others appear not to have implemented the recommendations at all, or at least not as planned. Thus, environmental impacts are reported only for the first year of adoption. In addition, the companies interviewed indicated they did not collect the detailed data necessary to measure these results. For example, the PMA for International Pharmaceutical, Inc., stated that additional data would be needed to determine the pollution reduction load and that "IPI should arrange to obtain this data." However, IPI

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\*According to interviews with former project staff, BOD load was estimated using standard BOD coefficients for each industry. The team used the World Bank's Industrial Pollution Projection System to estimate total suspended solids for the industries. Reductions in toxic metal could not be estimated for many of the "dirtier" industries because of insufficient data.

**Table 1. IEMP Environmental Results, the Philippines, 1992–97**

Industry	Water Use Reduction (millions of m <sup>3</sup> /yr.)	BOD Reduction (millions of kg./yr.)	TSS Reduction (millions of kg./yr.)	Toxic Metal Reduction (kg./yr.)	% BOD Reduction
Tuna canning and seafood	.435	1.010	2.041	—	28
Desiccated coconut	.210	1.378	1.513	614	15
Pulp and paper milling	2.671	.317	.511	181	9
Vegetable and animal oils	1.022	.146	5.239	10	25
Sugar milling	28.320	29.878	9.908	—	44
Distilled spirits	.471	1.398	2.513	—	6
Starch manufacturing	.623	3.202	3.800	6,653	27
Seaweed processing	.322	.052	.057	—	8
Fruit and vegetable canning	.708	1.710	1.879	762	20
Hog raising	.192	.334	.938	3,928	22
Industrial chemicals	.069	.363	—	94,638	30
Slaughtering	.224	.156	.178	1,836	27
Veneer and plywood	.943	1.755	3.129	587,517	28
Soft drinks	.167	.001	.002	—	12
Tanneries	.004	.005	.009	10	5
Metal finishing	.057	—	—	—	—
Synthetic resins	.032	—	—	—	—
Cement manufacturing	—	—	—	—	—
Others	.453	1.765	—	—	6
Total	36.923	43.470	31.717	696,149	29

Source: "IEMP End-of-Project Report" (1997), p. 5–3.

indicated to the team that it still does not collect such data.

## Health Impact

The principal goal of IEMP was to improve human health. However, the project did not concentrate on those industries having the most direct impact on health. This is not to suggest the project had no health impact. It did. But it was typically indirect and difficult to measure. The project contributed to significant reductions in biochemical oxygen demand and total suspended solids, two pollutants that damage aquatic life. If these reductions are sustained, and perhaps replicated, water quality is likely to improve, aquatic life will resume, access to marine protein will increase, and nutrition will improve. Thus, this project would indirectly improve human health since many Philippine communities depend heavily on fish protein.

The project also helped reduce air pollutants. For example, interventions at cement plants reduced emissions of suspended particulate matter. The effect of reduced emissions at the local level can be substantial, depending on the direction of the prevailing winds and the proximity of the population to the plant. In addition, many PMA recommendations identified ways to reduce the demand for energy. Reduced energy use in turn contributes to reduced emissions of particulate matter, sulfur dioxide, and other pollutants that endanger human health. Unfortunately, the data necessary to establish these linkages and quantify their positive effects were not available.

## Financial Impact

The key hypothesis underlying waste minimization and pollution prevention is that many, if not most, of these measures are financially

**Table 2. IEMP Financial Results, the Philippines, 1992–97 (millions of pesos)**

Industry	Capital Investment	Increased Revenue	Cost Savings	Total Net Benefit	% of Net Benefits
Tuna canning and seafood	28.989	64.184	6.783	57.832	7
Desiccated coconut	4.464	21.150	11.599	30.976	4
Pulp and paper milling	26.239	5.614	14.499	16.840	2
Vegetable and animal oils	7.328	14.012	2.706	14.721	2
Sugar milling	61.597	44.980	23.376	54.707	7
Distilled spirits	82.379	—	12.654	12.229	2
Starch manufacturing	3.168	218.442	.966	218.827	27
Seaweed processing	12.713	22.522	20.482	42.466	5
Fruit and vegetable canning	10.442	.826	2.867	2.707	0
Hog raising	23.674	.234	24.112	23.811	3
Industrial chemicals	.457	4.467	5.478	9.917	1
Slaughtering	.541	1.608	1.167	2.566	0
Veneer and plywood	17.460	80.250	11.946	35.496	4
Soft drinks	5.037	—	6.208	5.959	1
Tanneries	.674	.003	.303	.274	0
Metal finishing	5.383	—	9.728	9.387	1
Synthetic resins	.752	.088	2.444	1.642	0
Cement manufacturing	381.948	277.400	.090	276.190	33
Others	1.400	6.203	4.506	10.087	1
<b>Total</b>	<b>674.645</b>	<b>761.983</b>	<b>161.914</b>	<b>826.634</b>	<b>100</b>
Millions of US\$ <sup>a</sup>	26.457	29.882	6.350	32.417	
Millions of US\$ <sup>b</sup>	16.866	19.050	4.048	20.666	

<sup>a</sup>\$1 = 25.5 pesos (1992 exchange rate).  
<sup>b</sup>\$1 = 40.0 pesos (1999 exchange rate).  
Sources: "IEMP End-of-Project Report" (1997), p. 5–3 (for capital investment and total net benefit data); Eighteenth Quarterly Progress Report (1997), appendix C (for revenue and cost savings data).

beneficial to the company that adopts them. This can occur in three ways: first, by lowering input costs (through recovery of raw materials or increased efficiency); second, by lowering compliance and enforcement costs (by reducing waste and therefore treatment costs or fines); and third, by increasing revenues (through recovery of product or sale of what was formerly waste).

Table 2 presents the project's reported financial results. Increased revenue, cost savings, and net benefit are reported on an annual basis. Total net benefit is defined as increased revenue + cost savings – increased costs. Total net benefits for the first year, when the exchange rate was 25.5 pesos to the dollar, were estimated at \$32.4 million. Two industries (and one com-

pany in each of those industries) accounted for most of the net benefits. Cement manufacturing accounted for 33 percent; starch manufacturing, 27 percent. A single industry, cement manufacturing, accounted for 57 percent of capital investment.

Net benefits are due primarily to increased revenue rather than cost savings. In fact, the reported contribution from increased revenue (\$29.9 million) is nearly five times that of cost savings (\$6.3 million). However, revenues may have been overestimated, thus inflating the value of net benefits. Interviews with former project staff indicated that revenue calculations included "foregone" revenue to represent how much the company would have lost had it been shut down by a cease-and-desist order. There

are two problems with including foregone revenue. First, both DENR and industry representatives indicated that the average plant shutdown in response to a cease-and-desist order lasted only a few days. By contrast, IEMP calculations assumed it lasted for a relatively long time. Moreover, many plants under the threat of shutdown are issued temporary lifting orders so that they never shut down. Second, the correct measure of the effect of a cease-and-desist order on a business is forgone profit, not forgone revenue.

Excluding the two companies in the cement industry and the four in the starch industry, net benefits fall from \$20.7 million to \$8.3 million at the 1999 exchange rate. The net benefit to the average business is more than halved from \$145,000 to \$61,000. More telling is that only six firms (4 percent of the total) account for 60 percent of total net benefits. Thus, aggregate data mask what is happening in individual industries and individual plants within those industries.

Another problem with interpreting the financial impact of the project is that the financial data, like the environmental data, appear to be estimated rather than actual. In some cases, data for revenue, operating costs, and cost savings are identical to PMA estimates. This suggests they do not reflect actual plant level experience. In other cases, reported results are inconsistent with information obtained during plant interviews. For example, neither the pollution management appraisal for International Pharmaceutical, Inc., nor the interview at IPI indicated increased revenue resulting from PMA interventions. However, the IEMP performance-monitoring matrix indicated additional revenue totaling 540,000 pesos per year (\$13,500 in 1999 prices)—large enough to turn a loss into a gain. Experience has shown that PMAs conducted by nonindustry experts routinely undervalue costs and overvalue benefits. This factor, coupled with the use of estimated results

rather than actual results, brings into question the reliability of the data.

Finally, economic events and factors exogenous to the project can affect BOD load. During the period of project implementation, there was significant variation in industrial output in the Philippines and, therefore, variation in water use. These changes can be dramatic. For example, sugarcane production decreased by 28 percent from 1994 to 1995, and export levels fell for most commodities from 1995 to 1996. It is impossible to determine how much of the decline in BOD reported in table 1 was due to lower industrial output and exports (and therefore lower water use) and how much was due to IEMP interventions.

These measurement problems notwithstanding, the reported data indicate that the project has been a financial success. However, as indicated in the next section, many of the companies that benefited financially from implementing waste-minimization measures have stopped using them. Moreover, these measures have not spread to non-IEMP firms. Why should this be the case? The answer probably lies with 1) the unreliability and poor quality of the data, 2) the disproportionate number of companies selected for IEMP that had poor pollution-compliance records, and 3) adverse macroeconomic conditions and other external problems.

## PROGRAM PERFORMANCE

Program performance is normally assessed in terms of 1) effectiveness, 2) whether benefits were sustained after donor funding was terminated, and 3) the extent to which activities were replicated beyond the project.

### Effectiveness

Effectiveness is a measure of how appropriate an intervention was in meeting program objectives. Were benefits significant? Were they

generated through a strategy that worked with the right people? Was the approach the best way to use USAID resources to get the job done? The job in this case was promoting sustainable economic growth, reducing environmental degradation, and improving public health.

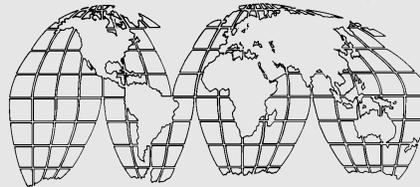
The project concentrated on small and medium-size industrial firms. This was a good choice, because larger companies are typically already aware of the importance of waste minimization and clean production. They are often connected to multinational corporations and the export market, which makes them savvier. Often they are already using modern, less-polluting technology. In addition, they are highly visible, making them easy targets for environmental controls.

By contrast, smaller firms often lack the technology, resources, and knowledge to deal with pollution. They are often in “dirty industries” located outside the major cities. The World Bank’s Metropolitan Environmental Improvement Program covered companies only in Metro Manila, and the USAID–ASEAN Environmental Improvement Project covered “leader” companies from several industries such as iron and steel. Small and medium-size firms outside Manila were an ideal target for IEMP. They were not receiving assistance and could effectively use new approaches to reduce pollution.

The pollution-reduction component of the project centered on pollution management appraisals. PMAs were allocated 30 percent of total project resources, or \$4 million. Assuming the \$4 million was shared equally among the 143 participating companies, each PMA cost \$28,000, on average. As noted already, finan-

cial benefits for all companies (excluding the six in the cement and starch industries) were high enough (\$61,000 per company, on average) to justify this cost. Implementation of PMA recommendations also generated a 29 percent reduction in biochemical oxygen demand. That was significant.

But one of the project objectives was to improve health, and while high BOD levels discolor water, give it a bad taste, and can kill fish, they do not directly affect human health. By contrast, heavy metals, harmful bacteria, and industrial chemicals are a health problem, but changes in levels of these pollutants were not measured. High BOD levels may indicate high levels of other pollutants, thus serving as a proxy for pollutants affecting human health. But it is not clear if that was the case in the Philippines.



**“High BOD levels may indicate high levels of other pollutants, thus serving as a proxy for pollutants affecting human health.”**

IEMP’s capacity-building component provided pollution-prevention training for 2,600 people, mainly staff from government, industry, NGOs, and local government units. The training helped make it possible to complete PMAs, draft environmental directives, and

improve environmental monitoring.

IEMP was a pilot effort to introduce pollution management appraisals to the Philippines. A pilot can be expensive, but if the new techniques are widely adopted, sustained, and replicated, then the initial investment is justified. If a pilot does not expand and take hold beyond the original companies, it is often ineffective. Many of the businesses that volunteered for PMAs had environmental compliance problems. They were among the Philippines’ “dirty dozen” or so heaviest polluters, and the one-year waiver of pollution fines was a major reason they were eager to join the program.

According to DENR and trade group representatives, these firms were often lax in maintaining PMA interventions. In one region, 3 out of 14 PMA companies were out of business shortly after IEMP ended, and half of the remaining companies ended up in violation of pollution regulations.

## Sustainability and Replication

Sustainability concerns the extent to which a program continues to deliver benefits after development assistance ends. The IEMP project paper makes a strong case for the need to curb industrial pollution in the Philippines but does not dwell on sustainability. The underlying assumption is that businesses will continue to use pollution management appraisals and adopt PMA recommendations because of the financial benefits realized.

In 1994, however, an independent evaluation concluded that neither enhanced business profitability nor the demand created by IEMP capacity building was likely to keep PMA recommendations going strong. The evaluators pointed out that because sustainability had not been stressed in the original design, “options for project sustainability were quite limited.” They cited potential problems with baseline data for the PMAs and no real increased capacity within DENR to sustain project benefits—once IEMP ended. They offered a few recommendations to improve PMAs such as conducting more complete and verifiable appraisals.

In 1997 the USAID-supported consulting firm that implemented the project identified several indirect indicators suggesting that “the benefits of IEMP are being sustained, or are sustainable.” These indicators included DENR’s plan to monitor PMA companies, requiring PMAs as one condition for lifting a cease-and-desist order, annual industrial recognition awards for companies showing significant waste-minimization progress, pilot-testing a pollution charge sys-

tem based on user fees at the Laguna Lake Development Authority, and plans by two Philippine development banks to offer concessional rates for loans to support clean production. But the same IEMP implementing contractor also raised concerns that “the limited capacity of DENR may prevent full support of PMAs at the regional level, delay effective utilization of IEMP training programs, and slow [recommended] policy reforms.”

The CDIE team examined the extent to which pollution management appraisals continued to be used by visiting a sample of former IEMP companies, interviewing regional and local DENR officials, and meeting with representatives of a wide range of Philippine trade associations, professional groups, and other key individuals. The team visited seven sites covering a mix of industries in two locations: Cebu (Visayas) and Davao (Mindanao), two of the five geographic locations where PMAs were highly concentrated.

The site visits revealed a mixed picture about the sustainability of PMA benefits following project phasedown. Some companies simply did not adopt the PMA recommendations. Others adopted the recommendations initially but later dropped them. A few companies had suspended or closed plant operations, making a determination impossible. There was little or no evidence that any business had conducted additional PMAs after the end of the project. In-depth interviews uncovered a range of reasons: a natural resistance to change plant operations that already “seem to work well”; the time and effort required to monitor and collect baseline data to “sell” the PMA approach to plant owners; the effort required to keep PMA recommendations in force; and lack of support by company owners. Since most PMA recommendations at the seven sites were either no or low cost (rather than capital intensive), the sustainability of more demanding PMA recommendations was considered extremely low.

Success was also dependent on replication by non-IEMP companies. After all, IEMP was only a demonstration project. With over 10,000 “brown sector” companies in the Philippines (many of them small enterprises), it was clear that replication of the PMA approach beyond the 143 participating firms would be needed.

Plant interviews at all seven IEMP sites consistently described replication as either nonexistent or negligible. At a number of sites, plant managers were asked directly if they would share PMA information with others, and the general response was “why would we?” Some plant managers regarded the PMA as proprietary. Others indicated there was no real forum where this might be discussed. At one of the larger meat-processing plants in Davao, the plant manager questioned why replication was expected. He thought plant managers might not be willing to divulge PMA results with other plant managers—since that would signify a major compliance shortcoming or perhaps an impending pollution cease-and-desist order. A low spread effect might indeed be expected if companies participated in IEMP mainly to avoid a cease-and-desist order.

Local DENR staff in Cebu and Davao knew of no replication of PMA recommendations in their regions. No replication was occurring through word of mouth, local seminars, or other formal or informal means. These findings were consistent with the views of professional and trade groups as well as Filipino environmental practitioners. Interviews with those groups also revealed a similar—almost uniform—judgment concerning weak sustainability.

It is clear that sustainability by IEMP companies and replication by non-IEMP companies were extremely low—much lower than expected. Weak sustainability and replication only two years after project phasedown does not bode well for the future.

Low sustainability and replication in the face of high initial adoption rates casts doubt on a broad assumption underlying the PMA approach—that is, it appears that neither the financial benefits resulting from PMA recommendations nor government and private sector demand for PMAs generated sustainability. But why?

There is probably no single explanatory factor. However, the most likely explanations are as follows: the cost savings estimated in the PMAs were not convincing to plant owners and business managers. Perhaps real costs were underestimated or benefits were overestimated, or both. Even if cost savings were estimated accurately, the estimates failed to take into account uncertainties and risks associated with future needs or the unique business climate. Cost savings aside, the company was not serious about changing operations in the first place but was simply buying time to avoid compliance problems.

Other explanations include a natural resistance among some plant operators (even when shown real cost savings) to change their business practices: “If it works, why change it?” After all, there may be a strong profit incentive for the owner, but not necessarily for the plant manager or the shop floor workers—who will have to implement changes on a day-to-day basis. Alternatively, the plant manager or owner may not know the consultants or may doubt their credibility or industry competence. Finally, there remains a general reluctance by some Philippine businesses to adopt untried measures (even potentially cost-savings ones) as long as they are not facing compliance issues or an uncertain business climate.

## LESSONS LEARNED

In the Philippines 143 industrial companies reportedly invested a combined total of nearly \$27 million in waste minimization and other pollution-reduction measures under the Industrial Environmental Management Project.

These investments resulted in annual net benefits of \$33 million to participating companies. At the same time, water pollution (measured by biochemical oxygen demand) decreased by 29 percent. Most companies realized increased profits and efficiency, and many reduced their waste volume and improved their compliance with government BOD pollution standards—not to mention, their corporate image—demonstrating that industry-led economic growth and environmental protection can be compatible. What lessons emerge from this assessment?

**1. Pollution management appraisals.** *PMAs can be effective in helping reduce pollution at the company level.*

Pollution management appraisals (assessments of the production process) identify opportunities for businesses to minimize, reclaim, and reuse industrial waste and to use cleaner technologies. Companies are motivated to adopt PMA recommendations by the prospect of reduced production costs and increased revenues. The country benefits from lower pollution levels and better resource allocation.

If conducted by industry specialists, rather than by generalists, PMAs are likely to have greater credibility with senior managers and technicians. It is more cost-efficient to conduct PMAs industry by industry rather than randomly among industries, because industry-specific expertise can be provided all at one time. That approach also helps strengthen relations with established trade associations. PMA recommendations—including what they can and cannot achieve—must be explained carefully to the company's managers. After all, PMAs are not a panacea, nor can they guarantee compliance with environmental standards.

**2. Technology.** *Companies are likely to adopt low- or no-cost techniques that have an immediate effect on pollution reduction and cost savings rather than*

*measures that require a large capital outlay and a long payback period.*

Most companies are more likely to adopt clean production techniques and waste-minimization measures that are simple and that will save resources and generate profits relatively quickly. They will make large capital investments only when they are building a new factory or introducing a new production technology.

**3. Regulation.** *Cost savings may not be sufficient to persuade companies to implement and maintain waste-minimization and pollution-prevention programs.*

Command-and-control measures—such as environmental regulations and pollution standards—are effective if strictly enforced and if penalties are severe. Often this is not the case in the Philippines. Monitoring and enforcement are lax because of insufficient resources in the Department of Environment and Natural Resources. Many businesses go without routine monitoring, so the probability of getting caught is slim. Moreover, cease-and-desist orders are issued only for the most egregious, obvious offenses; and penalties and fines are relatively low. Nonetheless, the cease-and-desist order is an important tool. *Both regulation and cost savings are important in motivating companies to take action.*

**4. Market-based instruments.** *Market-based instruments for pollution prevention are an important complement to command-and-control approaches.*

Market-based instruments use economic incentives to influence a company's behavior by encouraging the company to act in its own self-interest. Imposing pollution charges, for example, on companies that discharge effluents into the environment effectively internalizes the costs of their pollution. IEMP concentrated on market-based instruments.

**5. Institutionalization.** *While PMAs can help a company save money, increase revenues, and reduce pollution, a way must be found to institutionalize the process to provide continuity once the project ends.*

In the Philippines, continuity was weak. Donors might improve it by working more closely with trade associations, a government agency, or private companies that have a financial interest in waste minimization. If a government regulatory agency is selected, businesses most likely to benefit are those facing compliance problems. Conversely, if trade associations are selected, most beneficiary companies are likely to be progressive and successful.

**6. Sustainability.** *A pilot project is an excellent way to show companies the benefits of waste minimization, but the project needs to ensure that benefits are sustainable.*

IEMP assumed that waste-minimization techniques, once adopted, would generate substantial benefits and that the company would sustain these techniques over time. That was not always the case. Contrary to expectations, some companies may not have realized the financial benefits estimated in the pollution management appraisal, thereby jeopardizing the credibility of the overall process. Other companies faced shutdown orders for violating environmental standards shortly after participating in IEMP. Senior management of other companies may not have been committed to waste minimization. PMAs often were not accorded appropriate follow-up.

Sustainability seems to take root most often in large international companies—where corpo-

rate image counts and managers reinforce the goal of cleaner production and pollution prevention. Constant support and vigilance from top company management may be the key to sustainability.

**7. Replication.** *Replication of pollution-prevention measures is normally not in the best interests of individual businesses that have already reduced their costs by successfully adopting such measures.*

In a dynamic private sector, firms compete to win market share and increase profits. Generally, they will not voluntarily share information with their competitors about ways to minimize costs. That makes replication difficult. Replication may be improved by working not just with individual businesses (the retail approach) but also with industry trade associations (the wholesale approach). Trade associations can be neutral in sharing information among their members.

**8. Measuring results.** *Sustainability within the company and replication beyond it depend on the availability of reliable data and information.*

Data collection is essential to establish a baseline against which to monitor progress and measure results. Involving factory staff in collecting and analyzing data has advantages because management is more likely to believe, and therefore use, its own data and analysis. However, collecting data for inappropriate indicators will yield irrelevant results. An important goal of IEMP was to improve human health by reducing water pollution. But the pollutant that was measured, biochemical oxygen demand, does not directly affect human health.

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