An Overview of the Experiences and Activities of the Environmental Pollution Prevention Project (EP3)

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EP3 Is Sponsored by the
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About the Project

Why Pollution Prevention?

Rapid industrialization and urbanization in developing countries have led to severe pollution problems: water that is unfit for drinking or bathing, extreme levels of air contamination, and growing quantities of municipal and hazardous wastes that are disposed improperly. Initial efforts to manage urban and industrial pollution have concentrated on "end-of-pipe" treatment which, in many cases, is not only costly but ultimately unsustainable. This is especially true in developing countries, which can ill-afford to divert increasing amounts of scarce resources from economic development.

Experience in the United States and other countries has demonstrated that in the long run, pollution prevention through waste minimization and cleaner production is more cost-effective and environmentally sound than traditional pollution control methods. Pollution prevention techniques can be applied to any manufacturing process, and range from relatively easy operational changes and good housekeeping practices to more extensive changes such as the substitution of toxic chemicals, the implementation of cleaner, more efficient technology, and the installation of state-of-the-art recovery equipment. Pollution prevention can improve plant efficiency, enhance the quality and quantity of natural resources for production, and make it possible to invest more financial resources in economic development.

What Is EP3?

The Environmental Pollution Prevention Project (EP3) is a five-year program sponsored by the United States Agency for International Development (USAID) to address urban and industrial pollution and environmental quality in developing countries. The objectives of the program are:

- to establish sustainable pollution prevention programs in developing countries
- to transfer urban and industrial pollution prevention expertise and information
- to support efforts to improve environmental quality.

EP3 was launched in spring 1993 and utilizes three principal mechanisms to provide technical assistance: a contract with Hagler Bailly Consulting, Inc. and 16 subcontractors, a cooperative agreement with the Water Environment Federation (WEF), and an interagency agreement with the U.S. Environmental Protection Agency. Activities in developing countries are initiated through agreements with USAID country missions. The first country to host EP3 activities was Chile, where an EP3 office was established in fall 1993. Since then, EP3 offices have opened in Tunisia, Egypt, Ecuador, Indonesia, and Bolivia. An additional office is planned for Paraguay. EP3 offices in these countries develop partnerships with environmental non-government

organizations, government agencies, and industry associations. In addition to its country programs, EP3 is conducting training and focused technical assistance activities in Sri Lanka, Peru, and Mexico.

EP3's objectives are achieved through several activities:

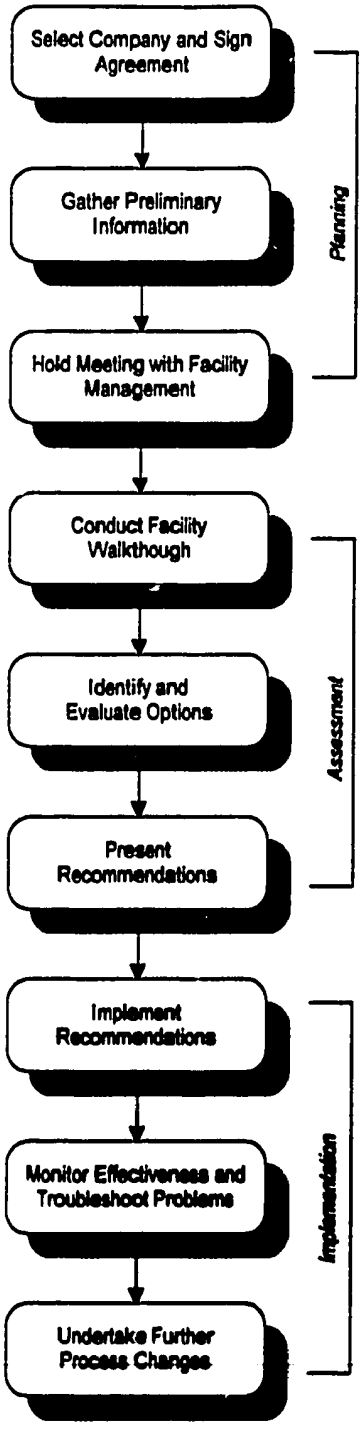
- on-site industrial assessments to identify pollution prevention opportunities
- institutional support to help industry and governments develop and implement programs to manage industrial waste and pollution
- an EP3 headquarters clearinghouse and in-country clearinghouses to disseminate pollution prevention-related materials
- training for environmental professionals.

EP3's pollution prevention assessments for industrial facilities are conducted by teams of U.S. industry process specialists, pollution prevention experts, and local environmental consultants. The U.S. experts are made available on either a paid or pro bono basis. To provide this expertise, the Alliance for International Environmental Solutions and WEF have worked with EP3 to develop an extensive network of environmental and industry experts who are available to participate in these assessments. Through their interaction with facility managers and local consultants, these experts help to build pollution prevention knowledge in the host country.

The pollution prevention assessments are conducted in such industrial sectors as textiles, leather tanning, food processing, metal finishing, printing, and paper/paperboard. Generally, EP3 targets its assessments in small- to medium-sized facilities that present pollution prevention opportunities. The assessment's recommendations focus on low- or no-cost management practices and operational improvements, and on medium-level capital equipment and process modifications with projected cost savings and environmental benefits. Local EP3 staff help facilities implement these recommendations. EP3 then uses training workshops and seminars to transfer the results of facility assessments to the remainder of the industrial sector.

Inherent in the goals of EP3 is the creation of demand for pollution prevention in the industrial sector. EP3 achieves this objective by demonstrating the environmental and economic benefits of pollution prevention and developing a supply of local professionals trained in pollution prevention techniques. Industry management and local environmental professionals are trained in the principles of pollution prevention, environmental cost accounting, and facility assessments. Through its network of clearinghouses, EP3 also provides access to pollution prevention and clean technology information.

The Assessment Process:



Planning the Assessment: During the planning phase, EP3 determines the facility's suitability for a pollution prevention assessment. If it is suitable, EP3 enters into an agreement with the company to carry out a pollution prevention program. Following this, local EP3 staff collect the data necessary to establish an effluent and production baseline. EP3 uses this information to identify appropriate U.S. and local experts and helps them prepare for the assessment.

Assessment: During the assessment, a team of U.S. and local experts in both pollution prevention and the facility's industrial process spend several days in the facility observing operations and collecting detailed information on the sources of pollution. The team then analyzes its findings, identifies opportunities for reducing pollution, and presents these findings in a report to the facility's management. The report typically includes cost savings, implementation costs, and payback times for each pollution prevention opportunity. The assessment generally takes one week to complete.

Implementation: In this phase, EP3 in-country representatives work with the facility to implement the actions recommended in the assessment report. For example, EP3 can help develop measurement and tracking mechanisms, identify equipment vendors, troubleshoot problems, and assist with staff training. EP3 asks that the facility measure its cost savings, reductions in pollution, and improvements in product quality. Further, EP3 trains plant personnel in pollution prevention techniques so that they will not only implement the recommended actions but will continue to find ways to prevent pollution in their facility.

INDUSTRY ASSESSMENTS COMPLETED BY SECTOR

Sector	Chile	Ecuador	Egypt	Indonesia	Tunisia	Total
Appliance Manufacturing			1			1
Automobile Assembly		2	1			3
Batteries					1	1
Electroplating	2				2	4
Furniture Production			1			1
Hospitals	3					3
Hotels					2	2
Leather Tanning	3	3			2	8
Meat Processing	3					3
Metal Finishing		1		6		7
Mining/Minerals	4					4
Paint Manufacturing	2					2
Paper/paperboard		2				2
Porcelain Enameling		1				1
Printing	3			1	2	6
Ship off-loading	1					1
Soap/Edible Oils					2	2
Sugar			1		1	2
Starch and Glucose			1			1
Steel Production			2			2
Textiles	4	2	3		1	10
Total	25	11	10	7	13	66

Training Activities:

To support the goal of creating sustainable programs in host countries, EP3 emphasizes training in a variety of areas that facilitate the incorporation of pollution prevention into the way companies do business. These areas range from general training in the principles of pollution prevention to the "how-tos" of conducting a pollution prevention assessment, including measurement techniques and financial analysis of pollution prevention opportunities. A key responsibility of all of the U.S. experts EP3 sends on an assessment is to transfer their expertise to the local staff and consultants. EP3 is expanding these training activities and conducting formal training workshops and seminars in countries to disseminate knowledge about pollution prevention and clean technologies. To facilitate this process, EP3 has developed training manuals and is translating them into host country languages.

General Pollution Prevention Training: To stimulate demand for pollution prevention services, local EP3 staff use a variety of approaches, including workshops, presentations, and one-day training sessions, to communicate to industry, government, and academia the importance and benefits of pollution prevention.

Train-the-Trainer: To help develop the capacity to provide training in pollution prevention, EP3 held a pollution prevention "train-the-trainer" course in Washington, D.C. in May 1994. The course was attended by EP3 staff, consultants, government representatives, and university professors from Chile, Egypt, Ecuador, and Tunisia. In addition, representatives from Argentina, India, Kenya, the World Bank, and the United Nations Environment Programme attended the course. This week-long course introduced "trainers" in these countries to pollution prevention concepts and interactive training techniques. Following the course, these individuals returned to their countries equipped to incorporate pollution prevention into existing environmental training courses or offer similar training. Several consultants who have worked with the EP3 program in Chile and attended the course have held successful "for-pay" training sessions as a result of attending this course. The EP3/Tunisia office also held a "train-the trainer" session in January 1995, based on the Washington model. The response was so positive that EP3/Tunisia is planning to hold training on a regular basis.

Assessment Training: To develop in-country pollution prevention technical expertise, EP3 relies on "on-the-job" training for local staff and consultants. While performing an assessment, U.S. pollution prevention experts train local engineers in the techniques of pollution prevention. The trainees are part of the team and are required to perform various tasks during the assessment and assist in writing the report. As a result of this training, local engineers will develop the skills necessary to provide pollution prevention services after EP3 has ended.

Implementation Training: The process for identifying pollution prevention opportunities is only the first pollution prevention skill developed by the local engineers. Through implementation training, EP3 provides local engineers the tools and skills to enact the suggested changes.

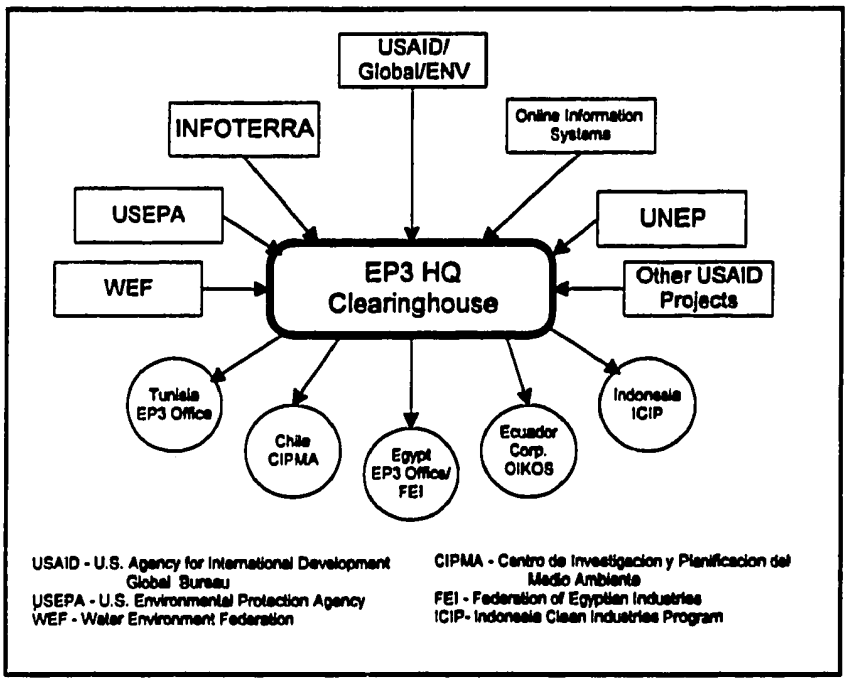
Working with U.S. experts, the local consultants learn how to provide technical assistance and how to remove the management and organizational barriers that might impede implementation.

ISO 14000/Environmental Management: The international standard for environmental management (ISO 14000) is due to be ratified in early 1996. With this standard in place, many companies in developing as well as developed countries will be faced with new competitive challenges. EP3 is developing training material to show these companies how pollution prevention will help them attain ISO 14000 certification and the associated competitive advantages.

Total Cost Accounting: It is often true that pollution prevention benefits are not adequately identified with traditional accounting methods. EP3 is developing training material to help companies better track the true cost of their material usage, and in turn show the true benefits of pollution prevention activities in light of these costs.

Industry Specific: General information is not enough to ensure that people have the proper tools to prevent pollution in industrial settings. Thus, EP3 is developing industry-specific training modules to promote specific opportunities for pollution prevention in various industries. To date, EP3 has developed modules in metal finishing and textiles. The development of modules for printing, food processing, pulp and paper, and tanning are planned for 1996.

The Pollution Prevention Clearinghouse Network:



A major component of EP3 is an information clearinghouse that was established to provide EP3 country programs with one easily accessible source of information on pollution prevention. The EP3 headquarters (HQ) clearinghouse is the project's information source and distribution point. The clearinghouse's catalogue includes approximately 2,000 items focusing on industry-specific applications of pollution prevention techniques. The clearinghouse actively uses the Internet to both access and disseminate information. Technical information is downloaded from the Internet, and EP3 employs the WorldWideWeb to exhibit project information (http://www.habaco.com). Through its linkage with INFOTERRA/USA, the HQ clearinghouse has access to several hundred databases, United States Environmental Protection Agency documents, and many other information sources.

The HQ clearinghouse responds to requests for pollution prevention information from industrial facilities and governments in EP3 countries and from USAID missions throughout the world. But in-country pollution prevention information skills will not be sustainable if the project relies on Washington for its informational needs. To develop these in-country informational skills, clearinghouses have been established in Tunisia, Chile, and Ecuador, and are in the process of being set up in Egypt and Indonesia. The HQ clearinghouse is linked via Internet with its counterparts in Tunisia, Chile, Ecuador, and Indonesia. Plans are underway to establish a clearinghouse in Bolivia. The Tunisia clearinghouse has also established its own gopher server to disseminate pollution prevention information.

See EP3 Country Addresses for the contact information for all EP3 Clearinghouses.

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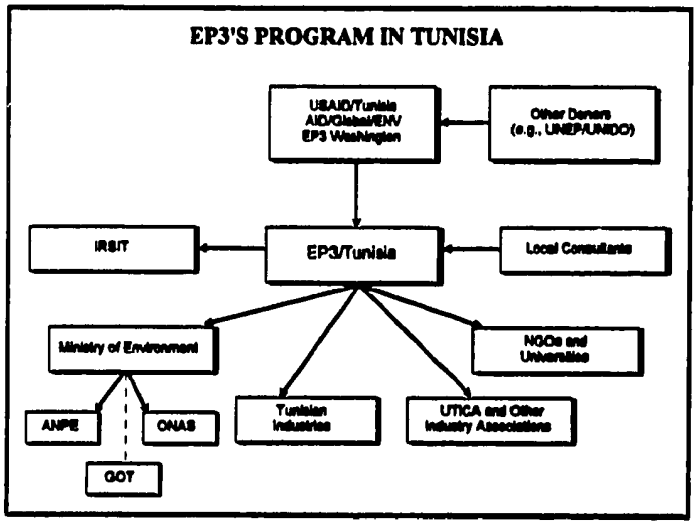
Tunisia

EP3 in Tunisia:

Tunisia was one of the first countries to host the EP3 program and will be the first to make the transition from an EP3 program to an independent entity providing pollution prevention services in Tunisia. The EP3 Tunisia office was established by USAID/Tunisia and the PRIDE project of USAID's Near East Bureau. The office became fully functional in October 1993. With a staff of three (a private sector specialist, a pollution prevention engineer, and an information specialist), EP3/Tunisia has become a leader in the field of pollution prevention and clean production technology in North Africa. Its primary focus has been on marketing and training to develop awareness and interest in pollution prevention. Over the course of the project, EP3/Tunisia established close working relationships with industry federations and chambers of commerce, government, consultants, and NGOs, which will help to ensure a continued emphasis on pollution prevention after the project ends. The primary organizations EP3/Tunisia has worked with are the Ministry of Environment and Land Use (MEAT), the Union Tunisienne de l'Industrie du Commerce et de l'Artisanat (UTICA), and the Institut Regional des Sciences Informatiques et des Telecommunications (IRSIT).



To continue the work of EP3 in Tunisia, EP3/Tunisia project staff have established an environmental consulting company, Centre de Production Plus Propre (CP3), which will provide pollution prevention assessments as well as offer related environmental services. The United Nations Environmental Programme also plans to locate a National Cleaner Production Center (NCPC) in CP3 to build on the successes CP3 staff have achieved since 1993 and provide implementation support to industry.

Technical Assistance:

Assessments have been completed at 13 facilities in eight industrial sectors: electroplating, printing, leather tanning, edible oil/soap processing, battery manufacturing, textiles, sugar, and hotels. Tunisia is the only program that has done PPDAs for the service sector (hotels). Although the assessments for the two hotels did not yield cost savings of the same magnitude as those identified for some of the industrial facilities, numerous opportunities for water and energy

savings were identified, and the hotels are implementing many of the recommendations. The assessment process used by EP3/Tunisia follows the procedure developed by EP3. This consists of a planning phase in which EP3 staff gather initial information, sign a Memorandum of Understanding with the facility, and assemble a team of experts; the assessment phase in which the team spends a week at the facility identifying pollution prevention opportunities and preparing a report; and the implementation phase in which EP3/Tunisia staff assist the facility in implementing the recommendations. **Figure 1** illustrates the types of pollution prevention opportunities that have been found at the various industrial facilities in Tunisia. (This exhibit does not include recommendations for the hotels or sugar beet facility.) For those facilities listed in Figure 1, it is estimated that implementing all 185 of EP3's recommendations will cost about US$1 million, but these investments will reduce operating costs by about US$3 million annually. These savings are due largely to reductions in water and energy consumption. It is estimated that these measures will save at least: 230,000 m^3 of water; 600,000 kwh of electricity; 500,000 m^3 of gas; and 120,00 liters of fuel oil.

Figure 1: Number of Pollution Prevention Innovations in Various Industries Audited, By Type of Pollution Prevention Technique

Industry	No. of Facilities Audited	Materials Substitution	Process Modifications	Energy Conservation	Water Conservation	General Housekeeping	In-Process Recycling	Total
Battery Manufacturing	1	0	15	6	3	7	4	35
Oil Extraction and Refining	2	3	20	5	6	3	3	40
Leather Tanning	2	1	4	2	4	5	5	21
Electroplating	2	4	11	3	4	6	5	33
Textile Dying	2	2	8	11	5	13		39
Printing	1	3	1			11	2	17
Total	10	13	59	27	22	45	19	185

Case Studies:

Battery Plant: Lead Dust Reduction

Problem: One of the facilities that was assessed in Tunisia manufactures lead-acid batteries. Because lead poisoning is a significant health hazard to humans, one of the goals of the assessment was to reduce the lead dust inhaled by employees and the lead is the wastewater from the facility, which seeps into the groundwater.

Recommendation: EP3 recommended a number of actions to reduce employee exposure to lead dust, reduce energy and water use per unit of output, reduce the amount of lead purchased, reduce lead-contaminated wastewater, and improve product quality. While these actions require a capital investment of $523,000, the expected financial benefits are estimated to be about $1.5 million per year.

Electroplating Industry: Replacing Toxic Solvent with "Soap and Water"

Problem: Trichloroethylene (TCE), a highly toxic and expensive degreaser, is commonly used in the electroplating industry. TCE has been linked to liver cancer and ozone depletion.

Recommendation: During an assessment of an electroplating facility in Tunisia, EP3 recommended replacing TCE with an aqueous alkaline solution (essentially soap and water). This substitution can reduce the facility's environmental impacts, improve worker health and safety, improve product quality, and save money. EP3's proposal was estimated to cost the facility $5,000, while saving it $12,000 per year by eliminating solvent purchases.

Training:

Since October 1993, EP3/Tunisia has conducted an impressive number of outreach seminars and training workshops. More that 500 participants have taken part in these activities, including more than 200 from industry, 80 from government, and 200 consultants and engineering students. Five outreach seminars were conducted in different parts of the country to introduce the EP3 program and promote pollution prevention among industry, government, and NGOs. In addition, seven technical workshops focusing on the concept and practice of industrial pollution prevention were given. Two were targeted at engineering students from the École Nationale de Ingénieurs de Tunis and the École Nationale des Ingénieurs de Monastir, one for the employees of MEAT and the Agence Nationale de Protection de l'Environnement (ANPE), and the others for industry managers, government officials, and professionals. In addition, in January 1995, the EP3/Tunisia office offered a three-day train-the-trainer course for pollution prevention trainers. Twenty-two participants from consulting, government, and academia paid to participate in the course. The course covered both basic training skills and pollution prevention concepts. EP3 Tunisia staff have also participated in more than 15 conferences and seminars on pollution prevention topics both in Tunisia and abroad.

Clearinghouse Activities in Tunisia:

EP3/Tunisia established a clearinghouse that has become the primary source of pollution prevention information in Tunisia. Not only does the clearinghouse contain more than 200 publications and reports on pollution prevention, but linkages have been established with the clearinghouse headquarters in Washington and various other sources of clean technology information such as the USEPA and UNEP, enabling the clearinghouse to draw from a broad network of information sources. In addition, EP3/Tunisia, working with IRSIT, has designed the Tunisian Environmental Information System (TEIS) which contains three main components: 1) a catalogue of documents available in the EP3/Tunisia library; 2) a local area network which links users in Tunisia with the EP3/Tunisia clearinghouse; and 3) an international information system, which links EP3/Tunisia to international pollution prevention databases using the Internet. This system is still under development.

The Future of EP3/Tunisia:

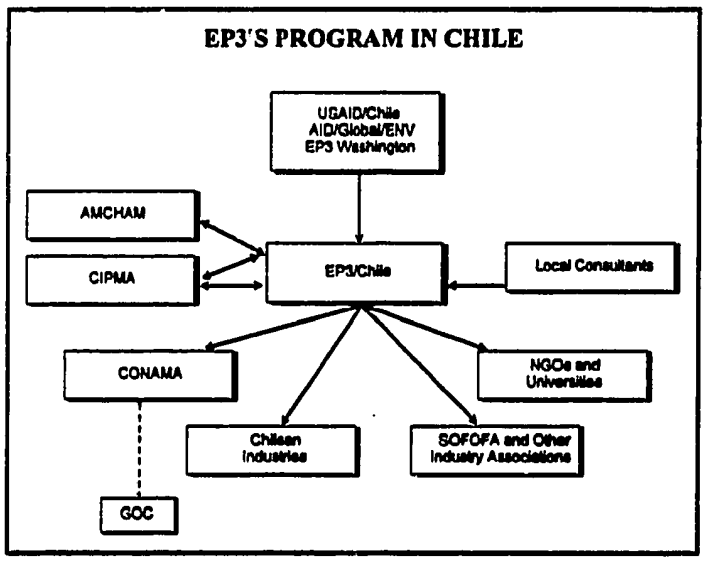
EP3/Tunisia is the first EP3 program scheduled to make the transition from a USAID-funded project to an independent entity. Now that the essential elements of a sustainable pollution prevention program have been put in place, it is anticipated that EP3 has created enough interest in pollution prevention so that the newly formed CP3 will be able to carry on pollution prevention activities, funded by a mixture of public and private sources. In addition, UNEP/UNIDO plan to support certain pollution prevention activities in Tunisia beginning in early 1996.

Environmental Pollution Prevention Project

Chile

EP3 in Chile:

The three-year EP3 program in Chile began in September 1993 and has just entered into its third and final year. It operates along a fundamentally market-based principle: to simultaneously develop the supply of and demand for pollution prevention knowledge, expertise, and technology. To meet this objective, EP3 connects U.S. suppliers of industrial and pollution prevention expertise to those that require this expertise in Chile with the long-term objective of developing local pollution prevention capability.



EP3/Chile was launched through a cooperative agreement with the American-Chilean Chamber of Commerce (AMCHAM). USAID/Chile and AMCHAM oversee EP3 project activities, which are implemented by a Chilean consulting firm. The relationship with AMCHAM has given EP3 insights into the local economy, business practices, and political sensitivities. AMCHAM also provides a credible forum through which to disseminate pollution prevention success stories. Over the long term, this relationship will be instrumental in promoting EP3's goal of sustainability because it provides a local base from which to launch pollution prevention business activities once the nascent market has been developed.

As with all EP3 country programs, hiring and training local staff are essential for developing a cadre of knowledgeable pollution prevention experts in Chile. The EP3/Chile director is a highly experienced Chilean engineer, who through EP3 has been trained in pollution prevention techniques. He has expanded the base of in-country pollution prevention expertise by involving local consultants and consulting firms in EP3 activities. Currently, 16 Chilean consultants are involved in the EP3 program, providing both technical and training services. These consultants are being encouraged to include pollution prevention concepts in their existing business activities. By the end of the first year, three different Chilean full-service consulting companies were offering pollution prevention consulting services beyond the scope of the EP3 project. Furthermore, one company has committed to establishing a pollution prevention division. It is anticipated that the demand for pollution prevention consulting services will grow as a result of successful demonstration projects and increased dissemination of pollution prevention information.

Technical Assistance:

One of the key components of the EP3 program is conducting facility assessments to identify pollution prevention opportunities at participating facilities. The assessment process consists of several steps. These include a planning phase in which EP3 staff gather initial information about a facility, sign a Memorandum of Understanding with the facility, and assemble a team of experts; the assessment phase in which the team spends one week in the facility to identify specific pollution prevention opportunities; and the implementation phase in which local EP3 staff and consultants work with the facilities to implement the suggested recommendations. The team of experts typically consists of a U.S. industry expert, a pollution prevention expert, and one or two local consultants who receive "on-the-job" training in the assessment process. At the end of each assessment, the team produces a report for the plant managers recommending implementation of specific waste reduction measures.

Twenty-three facilities in eight sectors have received assessments in Chile, including textiles, leather tanning, mining, printing, paint processing, metal finishing, foundry operations, and meat slaughtering and processing facilities. EP3/Chile has also moved into the urban sector and conducted two pollution prevention diagnostic assessments in hospitals. Two additional assessments in mineral processing and flexographic printing will be completed by the end of 1995. Key achievements from selected assessments in Chile are given in **Figure 1.**

Figure 1: Capital Costs and Financial and Environmental Benefits of Recommendations

Industry	Capital Costs*	Financial Benefits**	Selected Environmental Benefits
Textiles	$5,000	$23,000	reduce water use by 25%
Textiles	$13,000	$36,000	reduce fuel consumption by 7%
Tanning	$34,000	$55,000	reduce chromium in wastewater
Printing	$1,400	$4,700	reduce solvents in wastewater
Painting	$61,000	$76,000	eliminate mercury and heavy metals
Painting	$14,000	$46,000	reduce soil and water contamination

* One-time capital costs to be paid by the Chilean firm
** Financial benefits per year resulting from capital expenditure

Every facility receiving an EP3 pollution prevention assessment in Chile also receives follow-up assistance for a full year (or less if all of the recommendations are completed). Consultants are scheduled to visit the facility at least once each month. During the first visit, the consultant works with the facility to develop an implementation plan for all recommendations resulting from the EP3 assessment. This approach not only provides the facility with needed support, but also provides training in developing and following an implementation plan, including managing the obstacles that implementation presents.

Case studies:

The Tanning Industry: Reducing Chrome Wastes

Problem: Chrome usage is an industry standard for tanning cattle hides. After the cattle hides are washed, they are placed in a solution of salt and acid followed by the chrome tanning agent. When tanning is complete, the leather is washed, producing a wastewater that contains chrome. While chromium is a valuable raw material in the tanning process, it is a toxic substance in drinking water.

Recommendation: At this facility, the EP3 team recommended adding alkali to the chrome-laden wastewater to precipitate the chrome out of the solution and reuse it in the tanning process. This tannery has introduced this process and is not only saving on raw material costs but has also reduced the chrome concentration in the wastewater from 1 gram/liter to 0.3 gram/liter.

Printing Industry: Using Centrifuge Technology to Recover Used Solvent

Problem: While conducting assessments at Chilean printing companies, EP3 discovered that most printing companies in Santiago use disposable wipes and rags for cleaning operations. At present, these rags and wipes are disposed in public dumps and landfills without restriction. It is estimated that in one shop alone 30,000 liters of organic solvents are sent to the municipal landfill each year through the disposal of solvent laden rags. There are approximately 40 significant-size printers in Santiago that contribute to the total amount of solvents disposed in landfills and dumps.

Recommendation: It would be less costly and more environmentally sound for these companies to purchase cotton rags and launder them instead of disposing of them. However, if they are simply laundered after use, the solvents they contain would be discharged into the sewer. The pollution prevention assessment determined that these rags could be put in an explosion-proof centrifuge to remove the solvent prior to being laundered. The solvent could be reused for less-demanding cleaning uses or sold to a local solvent redistiller. This technology is being used in the state of Minnesota, which is recovering over 11 liters of solvents for each 220 rags processed. EP3 recently received funding from the US Environmental Technology Initiative to demonstrate this technology in Chile.

Training:

To institutionalize pollution prevention in Chile, EP3 is training a cadre of professionals at various levels (e.g., executives, plant managers, process operators) and from diverse institutions (e.g., government, consulting companies, universities, NGOs). To this end, the EP3/Chile program has set a target of having 1,500 Chileans trained in pollution prevention methods. Following up on the "train-the-trainer" workshop held in Washington, D.C. in May 1994, EP3/Chile, in cooperation with CONAMA (the Chilean Environmental Protection Agency), held

a "train-the-trainer" workshop in June, in Santiago. This workshop trained approximately 25 individuals from various regions in Chile and representing a variety of disciplines (engineers, academics, consultants, and industry representatives) on pollution prevention and training techniques. As part of the program, each participant was asked to conduct two pollution prevention training sessions in their region on a pro bono basis to further extend exposure to pollution prevention concepts and the value of clean technology. This program has been very successful.

Pollution prevention training modules and course materials have been developed by EP3 Washington staff and specifically tailored for use in Chile. This includes translating materials into Spanish, including specific economic characteristics of the regions where training is provided, and providing industrial or urban sector examples from Chile.

Clearinghouse Activities in Chile:

While access to the Washington-based EP3 clearinghouse is available through a number of avenues, a major component of the project is to develop the local capacity to provide pollution prevention information. To accomplish this, EP3 signed a Memorandum of Understanding with the Centro de Investigación y Planificación del Medio Ambiente (CIPMA) in August 1994. CIPMA is an environmental NGO that already has an environmental information center in Santiago. The center is linked to eight regional network nodes that effectively serve the major industrial and urban areas of the country. EP3 is working with CIPMA to develop a local library of pollution prevention information material and to link CIPMA electronically to key pollution prevention databases. CIPMA will also play a major role in managing EP3 training activities in 1996.

The Future of EP3/Chile:

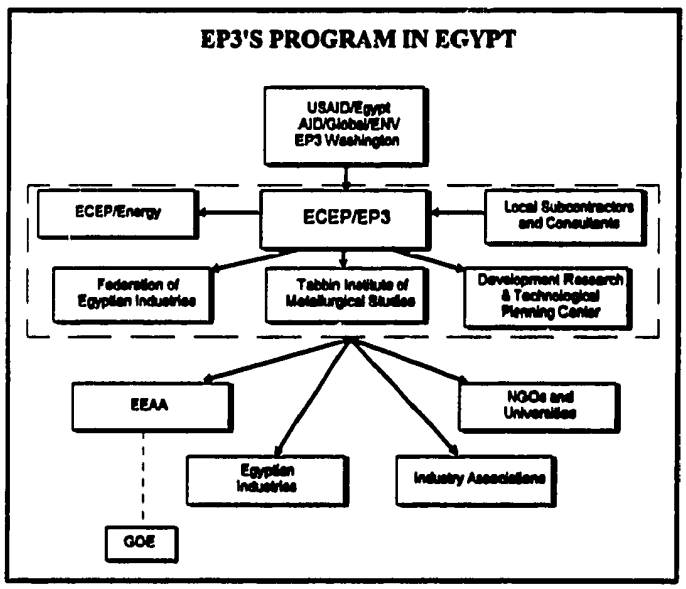
Based on the success of the first 18 months of EP3 activities, the USAID/Chile Mission decided to provide additional funding to continue the project. The project was originally slated to end in December 1995 but will now continue until September 1996, when the USAID/Chile Mission is scheduled to close. By the end of 1995, 25 assessments will have been completed. Subsequent EP3 activities will be geared more toward follow-up and implementation support as well as marketing and outreach. The consulting firm managing EP3/Chile plans to continue offering pollution prevention services at the end of USAID funding.

Environmental Pollution Prevention Project

Egypt

EP3 in Egypt:

EP3 activities in Egypt began in August 1994, and officially got underway in October with a "kick-off" meeting to introduce the project to local industry and government officials. In contrast to EP3's earlier programs, EP3 in Egypt has developed partnerships with several Egyptian institutions in an effort to ensure that pollution prevention concepts will be institutionalized in Egypt when EP3 completes its activities in Egypt.



The EP3 Egypt office is part of the USAID Energy Conservation and Environmental Protection Project (ECEP). As with all country programs, hiring and training local staff are essential for developing an in-country source of knowledgeable pollution prevention experts, but while other EP3 country programs have relied primarily on in-house staff to market pollution prevention concepts, EP3's office in Egypt also relies on the skills and expertise of a large cadre of Egyptian engineers from ECEP/EP3 partner institutions.

Three local institutions work with EP3 to carry out the program: the Federation of Egyptian Industries (FEI), the Tabbin Institute for Metallurgical Studies (TIMS), and the Development Research and Technological Planning Center (DRTPC). Each of these institutions has assigned staff specifically to work on EP3 activities. Under this arrangement, FEI is responsible for training, technical communication, and information dissemination. TIMS provides technical expertise with the public sector (which accounts for 60% of Egypt's industrial output), and DRTPC brings experience with Egypt's private sector to the project. At the conclusion of the project, it is expected that in addition to the staff in Egypt's EP3 office, TIMS and DRTPC will continue to offer pollution prevention services to Egyptian industries.

Technical Assistance:

In developing the technical assistance component of the EP3 program, Egypt benefited from the experiences of the EP3 country programs that were established earlier. One of EP3's first activities was to identify the industrial sectors the project would focus on; these include textiles, food processing, metal finishing, paper and paperboard, soap and detergents, and chemicals. The assessment process follows the procedures that were developed by EP3 Washington. This

consists of the planning phase in which EP3 and ECEP staff gather initial information, sign a Memorandum of Understanding with a facility, and together with EP3/Washington assemble a team of experts; the assessment phase in which the team spends a week at the facility identifying pollution prevention opportunities and preparing a report; and the implementation phase in which EP3, DRTPC, and TIMS staff assist the facility in implementing the recommendations. During the first year, 19 assessments were completed in metal finishing, textiles, and food processing. Implementation of low-cost and no-cost technologies at over half of the plants is already underway. TIMS and DRTPC, with technical support from EP3 staff, are working with the facilities to implement pollution prevention opportunities.

In 1996, EP3 plans to conduct between 2-3 pollution prevention assessments per month. These will include assessments in the chemical, pulp and paper, ceramic, and oil and soap industries.

Training:

As part of its ongoing training activities, EP3 conducted two training programs for EP3 and ECEP staff: one to assist them in learning how to select facilities for pollution prevention assessments and another to train them in how to conduct effective assessments. A third course, which will stress implementation, is planned for early 1996. The first training program focused on training EP3 staff and TIMS and DRTPC engineers to identify facilities for later pollution prevention assessments. These experts trained local staff in the criteria and evaluation process used to select industries and facilities that can serve as good models for pollution prevention activities in Egypt. The team visited 35 facilities and after each visit discussed the pros and cons of assessing the facility. U.S. experts and Egyptian trainees jointly decided whether a pollution prevention assessment would be a good investment for ECEP and EP3.

The second training program focused on how to conduct a pollution prevention assessment. A U.S. team spent two weeks teaching the Egyptian trainees how to conduct assessments, including how to measure and account for process inputs and outputs, where to look for opportunities, and how to evaluate options and quantify costs and benefits. As part of this training, ECEP and EP3 staff conducted assessments jointly with U.S. experts at two of the selected facilities. EP3 plans that over the two-year project, EP3 staff and TIMS and DRTPC engineers will assume increasing responsibility for conducting assessments independently.

During 1995, EP3 offered a series of two-day training workshops for Egyptian plant managers. These included a workshop on pollution prevention concepts and applications conducted in April, one in July on pollution prevention in the metal finishing industry, and one in September on pollution prevention in the textile industry.

During March 1995, EP3 staff participated in a conference in Cairo entitled "Technologies for Energy Efficiency and Environmental Protection," presenting papers on the benefits of implementing pollution prevention programs. In addition, EP3 participated in and facilitated a four-day seminar in July 1995 on "The Role of Cleaner Production in Meeting the Challenges of a Changing World Economy." This seminar was designed to introduce senior Egyptian plant

executives and government officials to the economic benefits and competitive advantages that can be gained from implementing pollution prevention/cleaner production programs.

During 1996, EP3 plans to conduct additional training workshops on pollution prevention in the chemicals, food processing, and oil and soap industries; a training course on pollution prevention implementation; and a conference on "Cleaner Production Technologies." Finally, EP3/Washington, with the assistance of EP3 personnel from other countries, plans to provide additional clearinghouse training and implementation training to the EP3 staff in Cairo.

Clearinghouse Activities in Egypt:

During 1995, EP3 staff developed a data base structure designed to be compatible with the EP3/Washington clearinghouse and at the same time have the capability to deal with additional sources of information. In developing this structure, EP3 staff evaluated other libraries and information centers in Egypt. Access to the Internet and information systems such as PIES, EPA's Pollution Prevention Information Clearinghouse, and PPRC, the Pacific North American Pollution Prevention Research Center in Seattle, Washington was also established during 1995.

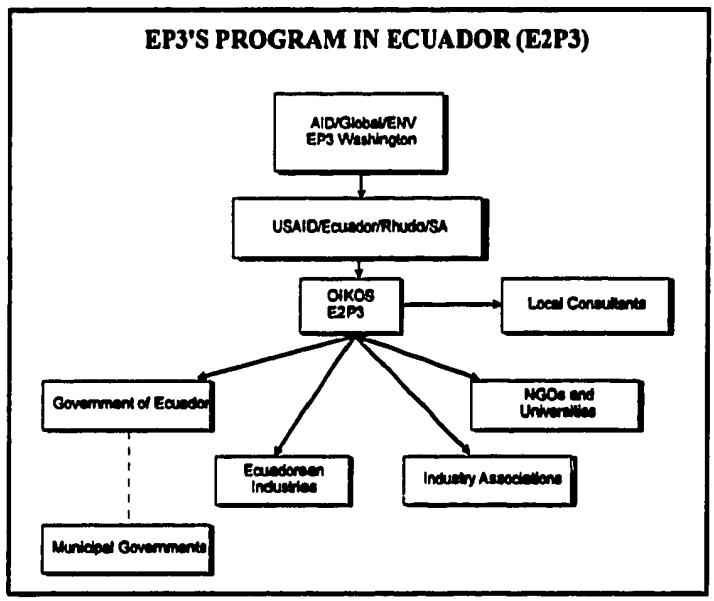
The Future of EP3/Egypt:

EP3 activities are slated to continue well into 1997. An additional 2-year project focused on 10th of Ramadan City is planned, as well as another project focused on expanding EP3's activities with the Alexandria and Cairo Wastewater Treatment Authorities.

Ecuador

EP3 in Ecuador:

With a "kick-off" meeting in late November 1994 attended by over 120 representatives from industry, government, and NGOs, Ecuador became the fourth country to establish an EP3 office.



EP3 in Ecuador (E2P3) is housed in Corporación OIKOS, a local NGO that was established to provide urban and industrial environmental awareness and technical assistance to Ecuadorian industries. While the EP3 Ecuador office has its own staff (3 staff members including a coordinator, a pollution prevention engineer, and an information specialist), it is integrated into the structure of OIKOS. It is anticipated that OIKOS will develop the expertise to carry on pollution prevention activities in Ecuador after the completion of the EP3 program in 1997.

Technical Assistance:

E2P3 staff, with some assistance from U.S. experts, have conducted over 50 pre-assessment visits to plants that present opportunities for full pollution prevention diagnostic assessments (PPDA). From these, a number of facilities were selected for full assessments. The first assessment was done in November 1994 at a leather tanning facility. Other assessments include two additional tanneries, two car assembly plants, two textile manufactures, a metal finishing facility, two paper manufacturing/recycling facilities, and a manufacturer of porcelain bathroom fixtures. In addition, PPDAs will be conducted at sugar mills and vegetable oil processors. The assessment process follows the procedures developed by EP3 Washington. It consists of a planning phase in which EP3 staff gather initial information, sign a Memorandum of Understanding with the facility, and work with EP3 Washington to assemble a team of experts; an assessment phase in which the team spends a week at the facility identifying pollution prevention opportunities and preparing a report; and an implementation phase in which the E2P3 staff assist the facility in implementing the recommendations. All three leather tanneries assessed are implementing the recommended changes. One has already installed a mechanism to remove hair from the waste stream which, once precipitated out, can potentially be resold to rendering operations.

Training:

Initial "on-the-job" training for the E2P3 engineers took place during the pre-assessment process, in which E2P3 staff performed several assessments alongside U.S. experts who trained them in the methodology. The local staff were then able to perform pre-assessments on their own. Based on an assessment done in a leather tanning facility, E2P3 staff, aided by U.S. experts, presented a seminar on pollution prevention in the leather tanning industry. This seminar was well attended and relevant to the tannery groups that comprised the majority of the audience. Based on the success of this seminar, following each PPDA the U.S. experts present a one-day seminar/workshop attended by the industrialists from the sector involved. E2P3 staff attended a pollution prevention "train-the-trainer" workshop in Chile in May 1995. In September, the Water Environment Federation conducted a series of orientation workshops for industry and government leaders in Quito, Manta, Cuenca, and Guayaquil. In April 1995, OIKOS's EP3 staff also participated in the National Pollution Prevention Roundtable meeting in Austin, Texas.

Clearinghouse Activities in Ecuador:

The E2P3 clearinghouse is located in the OIKOS office and has pollution prevention information available for facilities and others that request it. OIKOS is developing the capability to access pollution prevention information through the use of computer technology such as the Internet and CD-ROM.

The Future of EP3 in Ecuador:

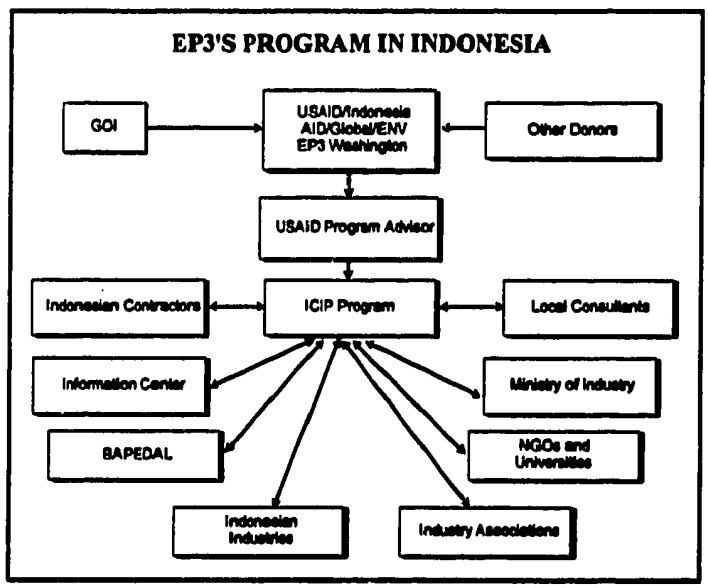
OIKOS will continue to play a critical role in conducting PPDAs at industrial plants, and in developing pollution prevention expertise in Ecuador. EP3 has also initiated several related projects in Ecuador that will build on the experience of the EP3 project. Under a project funded by USEPA, EP3 is demonstrating alternative technologies for purifying drinking water at a public hospital and two rural communities in the Province of Manabi, Ecuador. The objectives of the program are to demonstrate technology that is affordable to install and operate, sustainable (e.g., that it will continue to be operated after the project ends), and replicable (e.g., that it can be used in other areas). At the end of September 1995, EP3 staff and technical experts from the U.S. technology firm that was selected to participate in this program visited the sites in Ecuador to evaluate the potable water supply systems in place. Based on these findings, specific drinking water technologies were recommended for each site. These recommendations are currently being reviewed.

Under USAID's Sustainable Cities Initiative, EP3 is also developing a sustainable cities program in Cuenca, the third largest city in Ecuador. In September 1995, EP3 staff met with government, industry, and NGO representatives in three candidate cities to evaluate their suitability for hosting this program. This program will begin a participatory process for addressing pressing environmental problems in the city. This entails working with the municipality, industry, and community groups to identify the issues they wish to address, develop an action plan, and take steps to implement the action plan. Activities are expected to begin in early 1996.

Indonesia

EP3 in Indonesia:

EP3 activities in Indonesia began in February 1995 with the staffing of the Indonesian Cleaner Industrial Production (ICIP) program office. Supported by EP3, the ICIP program forms the umbrella organization under which all USAID/Indonesia Mission cleaner production activities take place. ICIP offers a coordinated and consolidated contact point for Government of Indonesia organizations, industry and industrial trade associations, non-governmental organizations, and citizens groups interested in cleaner production. In Indonesia, EP3 has opted to use the terminology "cleaner production" because it is more readily accepted by industry. The ICIP professional staff consists of a project coordinator and two pollution prevention engineers. A kick-off meeting was held in June 1995 to introduce the program to industry, NGOs and government representatives.



In conjunction with the program's technical assistance component, EP3's activities in Indonesia emphasize two major areas: policy and regulatory support to the Government of Indonesia, and technology demonstration and transfer to the private sector. EP3 provides assistance to the Ministry of Industry, Ministry of Environment, BAPEDAL (an office of Indonesia's Ministry of Environment which is similar to USEPA), and other Indonesian organizations to help build an infrastructure that encourages pollution prevention and cleaner production.

Technical Assistance:

EP3's first activity was to undertake an analysis of the industrial sector in Indonesia in order to target facilities that would be suitable candidates for cleaner production diagnostic assessments and clean technology demonstrations. The initial industry sectors targeted include printing, paint manufacturing, metal finishing, pulp and paper, battery manufacturing, and coating applications including wood furniture finishing. ICIP staff, both in conjunction with U.S. experts and on their own, are screening facilities in these sectors to identify candidates for assessments. The criteria for selecting facilities include the potential for large monetary savings and significant reductions in environmental impacts as well as management's commitment to implementing a cleaner

production program. U.S. experts participated in screenings for the printing industry in February 1995 and for painting, metal finishing, and printing in September 1995. ICIP staff are also holding meetings with industry representatives from the targeted sectors to generate interest in the program and identify additional candidates for screening. These sector meetings have proven to be very successful.

Once facilities are selected, ICIP conducts a facility assessment using the procedures that have been developed through EP3's experience in other countries. This process consists of a planning phase in which ICIP staff gather initial information, sign a Memorandum of Understanding with the facility, and work with EP3/Washington to assemble a team of experts; an assessment phase in which the team spends a week at the facility identifying cleaner production opportunities and preparing a report; and an implementation phase in which ICIP staff assist the facility in implementing the recommendations. In addition to approximately 5-6 full assessments that are planned for each targeted sector, ICIP plans to conduct "quick diagnostics" for an additional 15-25 facilities in each sector based on the information gathered in the full assessments. Local consultants will provide follow-up assistance to all these facilities in implementing the recommended cleaner production measures.

Under EP3's guidance, ICIP has already conducted seven cleaner production opportunity assessments in Indonesia, one in a facility that prints flexible packaging and six in metal plating facilities. The assessment of the flexible packaging printer identified the potential for over US$1 million in savings from less than US$400,000 in capital investments. EP3 has used these assessments to train local consultants in the assessment methodology and cleaner production techniques.

Training:

A number of training activities took place during 1995 and others are planned for 1996. The program's main emphasis to date has been on training ICIP staff and local consultants in the EP3 methodology. In February 1995, a team of U.S. experts conducted an analysis of industrial sectors in Indonesia, and during the course of this analysis, trained ICIP staff in the screening and facility selection process. In March, another EP3 team trained local staff and consultants in EP3's assessment methodology.

In addition to training staff and consultants, ICIP is engaged in various training activities for the Government of Indonesia, NGOs, and specific sectors of private industry. EP3 is facilitating and supporting an environmental exchange program between the U.S. Environmental Protection Agency (USEPA) and BAPEDAL and has at least one exchange program planned for each quarter. Through ICIP, EP3 is also making contacts with NGOs to develop appropriate training and awareness programs for specific audiences. Finally, ICIP is holding awareness and introductory training programs for every sector of private industry in which the program works. These introductory seminars are for management level decision makers in facilities to introduce them to the economic and productivity benefits of cleaner production. After full assessments are conducted, training courses are offered to production managers from facilities in each sector.

Through this process, facility managers and operations supervisors gain a better understanding of the specifics of cleaner production, which often leads to higher implementation of innovations in facilities. To further promote cleaner production, EP3 will develop cleaner production "train-the-trainer" workshops targeted for different audiences and for different regions of Indonesia.

Clearinghouse Activities in Indonesia:

A clearinghouse is being planned for Indonesia that will create a reliable and recognized source of cleaner production information. Once an institution has been identified to house the clearinghouse, EP3/Washington will provide a core set of pollution prevention documents to provide a strong base for this activity. The clearinghouse will identify sources of local and Asia-specific information to respond to requests from environmental professionals in Indonesia and will be linked via internet to the Washington-based EP3 clearinghouse as well as other information sources.

The Future of ICIP:

A major emphasis of the ICIP program will be building local capacity in applying cleaner production assessment techniques in the industrial sector through the assessment process. ICIP will also examine other industrial sectors that provide good candidates for cleaner production opportunities. Through ICIP, EP3 will provide increased assistance to BAPEDAL in developing regulations and market incentives that promote cleaner production.

New Country Programs

Bolivia

In Bolivia, EP3 has embarked on a two-year program to promote pollution prevention and develop local expertise to implement EP3 activities. EP3/Bolivia officially launched the EP3 program with a "kick-off" meeting in December 1995. The project is housed in the National Chamber of Industries (Cámara Nacional de Industrias) and is staffed initially by a project director and a project engineer. In mid-October 1995, EP3 staff presented the objectives of the EP3 program to local industry groups and government officials and began working with the industries to identify candidate facilities for pollution prevention diagnostic assessments. Initially, the EP3 program in Bolivia will focus on the textile and leather tanning industries. In January, U.S. pollution prevention experts will work with EP3/Bolivia staff to screen a total of 20 facilities in these industries to determine which facilities present the best opportunities for pollution prevention. Facility assessments are scheduled to begin in February 1996. Project staff are also currently evaluating local organizations in which to house a pollution prevention clearinghouse. This clearinghouse will disseminate general and technical information on pollution prevention topics. It is planned that this clearinghouse will be connected electronically with the Pollution Prevention Clearinghouse located in the EP3/Washington office and to other pollution prevention databases.

Peru

In Peru, EP3 is assisting with two initiatives: 1) determining what pollution prevention possibilities exist at the copper mines in Cerro de Pasco and the downstream effects on Lake Junin; and 2) assisting fish meal processing plants in the Paracas/Pisco area. These industries are the most important to Peru's economy, and Paracas and Junin are important, biologically diverse ecological regions.

In late October 1995, a team of mining and pollution prevention specialists spent one week at the Cerro de Pasco mines and visited several mines and locations around Lake Junin. The team observed extraction and concentration activities and waste material management in the area to identify opportunities for employing pollution prevention techniques in all facets of the mining operations, and specifically those that can be integrated into the mines' plans for complying with government requirements and privatization efforts. The team also visited locations where tailings and other waste materials have been placed to determine the feasibility for metals recovery and/or pollutant stabilization.

In early November 1995, a second team spent two weeks first visiting several state-of-the-art fish

meal processing plants in Chimbote and then conducting pre-assessments at seven plants in Pisco. The team conducted pre-assessments at the seven plants in order to select two for full assessments, which will take place early next year. This project is intended to demonstrate how clean technology can be used to address environmental problems in sensitive ecological areas. Preliminary results from both activities should be available in December 1995.

Mexico

EP3 is working with the USAID Mission in Mexico to develop a program focusing initially on the U.S.-Mexican border area near Matamoros and Reynosa. At the end of October 1995, project staff met with industry associations and governmental officials in these two cities to determine the industrial profile of the region including both the *maquiladora* (foreign-owned assembly plants along the border) and non-*maquiladora* sectors and to assess the environmental problems associated with industrial activity in this area of the border. Based on this assessment, EP3 will develop a program to help facilities in the region identify pollution prevention opportunities that provide cost savings, and coordinate a process for working with facilities to implement these recommendations. A unique aspect of the program in Mexico is that EP3 will team with USAID's Energy Efficiency Project (EEP) to highlight opportunities for energy savings as well as pollution prevention. EP3 will work with local organizations such as The Center for Environmental Quality of the Monterrey Technological Institute (ITESM) and other groups to conduct the pollution prevention assessments and support implementation-oriented activities.

Paraguay

EP3 is launching its newest program in Paraguay. In November 1995, project staff evaluated potential counterpart organizations and met with industrial and government representatives to generate interest in, and support for, pollution prevention activities in Paraguay. Based on these meetings, a counterpart organization will be selected. The local counterpart will not only carry out EP3 activities in Paraguay but also work to ensure the sustainability of pollution prevention activities locally. It is likely that EP3 will focus initially on the meat processing and leather tanning industries.