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1993 - A YEAR OF ACHIEVEMENT



US-AEP



United States-Asia
Environmental Partnership

ANNUAL REPORT FOR WORLD
ENVIRONMENT CENTER'S
COOPERATIVE AGREEMENT WITH
THE UNITED STATES - ASIA
ENVIRONMENTAL PARTNERSHIP
CA NO. AEP-0015-A-00-2055-00

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*The United States - Asia
Environmental Partnership (US-AEP) ...*

is a coalition of Asian/Pacific and American businesses, community groups and governmental institutions which fosters solutions to Asia's environmental problems using U.S. experience, technology, and practice. The US-AEP program coordinates the participation of 25 U.S. government departments and agencies, thousands of businesses and non-governmental organizations which work with 34 nations and territories in Asia and the Pacific. The United States Agency for International Development (USAID) is the lead agency for the US-AEP program.

OVERVIEW

The World Environment Center is very proud of its contributions to the US-Asia Environmental Partnership (US-AEP) and our achievements during 1993. WEC has traditionally worked to address industrial and urban environmental problems in developing countries and, from the very beginning, we recognized the huge potential represented by the US-AEP. In great measure, that potential has been realized. Through this cooperative agreement, WEC broadened its existing programs in India, Indonesia, the Philippines, and Thailand, and broke new ground in Hong Kong, Korea, Nepal, and Sri Lanka.

While Hong Kong, Nepal, and Sri Lanka were new geographically, in substance they served to reinforce old lessons. WEC brought the technical skills and practical insights of our volunteer experts to local tannery, paint, metal finishing, and canning industries. These projects demonstrated again what WEC has known for many years; volunteer experts working one-on-one with their industry counterparts in developing countries results in pragmatic problem solving that is highly effective. Reductions in both industry operating expenses and pollution were direct results of these projects, and the longer term institution building efforts set in motion with USAID/Sri Lanka and the World Bank hold even greater promise.

1993 was also witness to WEC successes in leveraging resources and building bridges between donor programs. Cooperative programs were undertaken with USAID/India's Trade in Environmental Services and Technologies (TEST) program, and with the World Bank's Metropolitan Environmental Improvement Project (MEIP). We also built on pollution prevention training activities funded by USAID/Indonesia; bringing participants to the U.S. to view leading technologies.

While short-term environmental impacts are often hard to measure, WEC activities under the US-AEP Cooperative Agreement contributed to the introduction of electric vehicles to in Bangkok and Kathmandu; helped Thailand's reforestation efforts by introducing U.S. technology that could increase seedling survival rates by 1,000 percent; introduced Indonesian industrialists to state of the art U.S. waste management technologies and methods; and, working with the World Bank, provided expert assistance for the development of national action plans to combat air pollution in Manila, and Jakarta.

During 1993, WEC completed a total of 82 Environmental Business Exchanges, as part of 34 projects in 8 countries. As part of the planning and implementation of these exchanges, WEC *in-kind* contributions to US-AEP totalled more than one million dollars. A complete list of participants in these exchange programs is provided at the end of this report.

WEC is grateful to have had the opportunity to participate in the US-AEP, and to work with its various partners. In 1994 we will work with renewed dedication to help solve environmental problems throughout Asia.

Antony Marcil
President and CEO
World Environment Center

DEVELOPING ENVIRONMENTAL BUSINESS EXCHANGES

To understand the nature of WEC activities under the US-AEP Cooperative Agreement, it is important to first understand the process and the players. The exhibit below depicts the project initiation, review, approval, and implementation process for Environmental Business Exchanges.

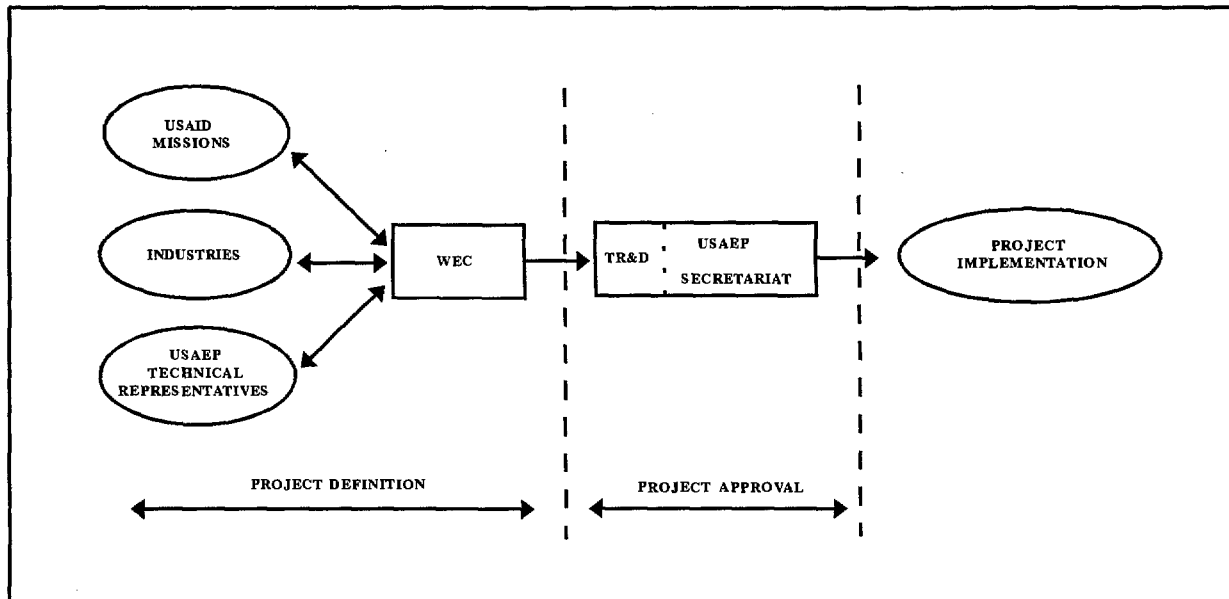


EXHIBIT 1. ENVIRONMENTAL BUSINESS EXCHANGE DEVELOPMENT AND APPROVAL PROCESS

Ideas for projects typically come from USAID missions, US-AEP technical representatives, individual industries, and associations. Through discussions with WEC, the project scopes are developed and refined, and USAID mission endorsement sought (in countries where missions exist). Once mission concurrence is received, the project scope (including names of participants, and proposed dates) are passed to Tropical Research & Development, the technical support contractor to the US-AEP Secretariat. Upon approval by the Secretariat, the project can commence.

With a potentially huge demand on the exchange program, US-AEP established certain priorities for approving projects, with the first tier being those supported by USAID missions. In fact, many missions have been allocated a number of exchanges to program according to mission priorities. Proposals for Exchanges from other US-AEP eligible countries were sought, based on three broadly defined WEC exchange programs: the Technology Assessment Programs; Factory Assessment Programs; and Corporate Environmental Programs. A summary of the selected activities completed under each of these programs in 1993 is provided below.

ENVIRONMENTAL BUSINESS EXCHANGE PROGRAMS

WEC's Environmental Business Exchange Programs under the US-AEP were designed to take advantage of WEC strengths in drawing on private sector technical expertise, and also provide a degree of structure for those seeking to participate in the programs. At the same time the programs were designed to be flexible, placing emphasis on projects and ideas that were consistent with the intent of the programs, as described below.

The purpose of the Technology Assessment Program was to raise Asian industry and government awareness of the potential environmental solutions represented by the U.S. experience and technology. Thus, the program brought together Asian's with specific environmental problems or needs, and U.S. experts capable of meeting those needs. The venue for these programs was both in the U.S. and in Asian nations.

WEC's Factory Assessment Program, which demonstrates (and transfers) techniques and procedures used in U.S. industry, has been successful in Asia, Eastern Europe, and the Near East. Continuing this Program under the auspices of the US-AEP, experts from U.S. industry perform assessments of industrial facilities in Asia, identifying process and operational changes, with a goal of reducing operating costs, minimizing waste generation, and providing more effective treatment of the wastes that are generated.

Finally, through WEC's Corporate Environmental Program, WEC sought to introduce, or reinforce an environmental mindset on the part of corporate officers and decision makers in Asia seeking to make environmental considerations a part of normal business practice rather than a reaction to a regulatory mandate.

The following are brief descriptions of 1993 exchanges carried out under the three programs.

TECHNOLOGY ASSESSMENT PROGRAM

The Technology Assessment Program provides a mechanism for Asia's industry officials to meet with their U.S. counterparts and evaluate new or alternative technologies for environmentally-safe production and pollution mitigation, working towards more sustainable industrial development. Each program is tailored to the needs of its participants. An exchange may focus on addressing a specific environmental problem within an industry's production process, or seek to improve the facility's overall environmental performance.

Programs have been designed to include: tours of U.S. environ-

mental technology and manufacturing companies; visits to facilities employing the target technologies to evaluate the reliability and appropriateness of the equipment; and, discussions with U.S. industry officials regarding cost savings and other benefits that result from installing the given technology.

Fourteen projects involving 35 exchanges (see Exhibit 2.) were undertaken under the Technology Assessment Program. Five of these projects were selected to represent the range of activities encompassed by this program, and are discussed below.

Evaluating Bangkok's Need for a Hazardous Chemical Accident Response System

The Exchange: At the present time, Thailand does not have a nation-wide indexing system for hazardous chemicals produced or imported into the country. It also lacks a source from which persons responding to emergencies involving hazardous chemicals may obtain information on their safe handling and disposal. One step to make the transport of hazardous chemicals safer, and to help preserve the lives and property of the people and industries, is the development of an emergency response center.

WEC worked with the Chemical Manufacturers Association (CMA) to provide an expert to describe and explain the CMA chemical data base and emergency hotline, the Chemical Transportation Emergency Center

PROJECT TITLE	PARTNERING ORGANIZATIONS	
	ASIAN	UNITED STATES
TRANSFERRING TECHNOLOGY FOR DEMAND-SIDE MANAGEMENT TO THAILAND	TEAM CONSULTING	RCG/HAGLER - BAILLY
EVALUATING BANGKOK'S NEEDS FOR A HAZARDOUS CHEMICAL ACCIDENT RESPONSE SYSTEM	THAI MINISTRY OF SCIENCE TECHNOLOGY AND THE ENVIRONMENT	CHEMICAL MANUFACTURER'S ASSOCIATION
EVALUATING THAILAND'S AIR MONITORING NEEDS	MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT (MOSTE), DEPARTMENT OF POLLUTION CONTROL (PCD); ELECTRICITY GENERATING AUTHORITY OF THAILAND (EGAT)	RADIAN CORPORATION
INTRODUCING ELECTRIC VEHICLES TO THAILAND	PHOLASITH TUK-TUK COMPANY LTD. OF BANGKOK	ADVANCED ELECTRIC CAR TECHNOLOGY; ELECTRIC POWER RESEARCH INSTITUTE
REFORESTING THAILAND	ROYAL THAI FORESTRY DEPARTMENT	OREGON FOREST RESOURCES COALITION; OREGON WOODS, INC.; OREGON STATE UNIVERSITY, DEPARTMENTS OF FORESTRY AND INTERNATIONAL RESEARCH AND DEVELOPMENT
ASSESSING U.S. ENVIRONMENTAL TECHNOLOGY FOR PHILIPPINE CEMENT AND PULP AND PAPER INDUSTRY	PHILIPPINE INVESTMENT MANAGEMENT CO. (PHINMA)	STONE CONTAINER; WEYERHAUSER; SCOTT PAPER; SIMPSON TACOMA KRAFT; MEDUSA CEMENT; HOLNAM CEMENT; 3M
EVALUATING THE FEASIBILITY OF INTEGRATED WASTE HANDLING AND DISPOSAL FACILITIES IN THE PHILIPPINES	PHILIPPINE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES	ENERGY ANSWERS CORP./POLYDYNE, INC.
SHARING U.S. EXPERIENCES IN THE MANAGEMENT OF ELECTRIC ARC FURNACES	SOUTH EAST ASIAN IRON AND STEEL INSTITUTE (SEASI)	INORGANIC RECYCLING CORP.
EVALUATING U.S. TECHNOLOGY FOR FLUE GAS CONDITIONING, MUNICIPAL SOLID WASTE LANDFILL DESIGN AND INCINERATION FOR USE IN THE SMOKEY MOUNTAIN RECLAMATION PROJECT	R-II BUILDERS, INC.	OGDEN MARTIN MUNICIPAL WASTE INCINERATOR; POST, BUCKLEY, SCHUH AND JERNIGAN, INC.; PORT WASHINGTON MUNICIPAL WASTE INCINERATOR; NATEC RESOURCES
INTRODUCING ELECTRIC VEHICLES TO NEPAL	CONSOLIDATED ENGINEERS; MERCANTILE COMPUTER CORPORATION; SOCIETY OF MECHANICAL ENGINEERS; SOUTH ASIAN TRADING CO. LTD.	ADVANCED ELECTRIC CAR TECHNOLOGY; ELECTRIC POWER RESEARCH INSTITUTE
ASSESSING U.S. TECHNOLOGIES AND TECHNIQUES IN THE PULP AND PAPER INDUSTRY FOR USE IN INDONESIA	PAKERIN; KERTAS LECES; SURABAYA AGUNG INDUSTRI PULP & KERTAS; INDAH KIAT PULP & PAPER CORP.	NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC.; WILLAMETTE INDUSTRIES, INC.; UNION CAMP CORP.; SONOCO PAPER PRODUCTS; WEYERHAUSER
ASSESSING U.S. TECHNOLOGIES AND TECHNIQUES IN THE METAL FINISHING INDUSTRY FOR USE IN INDONESIA	SUPRAREX RAYS; INDONESIA ZIPPER CO. LTD.; PADL KOMPONEN CORP.; PROBENGKEI	METAL SURFACES, INC.; ELECTROLIZING, INC.; METAL FINISHING ASSOCIATION OF CALIFORNIA; LAWRENCE LIVERMORE LABS; WASTE WATER TREATMENT SYSTEMS, INC.; READ RITE, INC.; ACTERON CORP.; SANTA CLARA PLATING COMPANY; UNITED AIRLINES; SAN FRANCISCO AIRPORT; NEW UNITED MOTORS; SAN JOSE WATER POLLUTION CONTROL DEPARTMENT
ASSESSING U.S. FLUE GAS DESULFURIZATION TECHNOLOGY FOR USE IN SOUTH KOREA	KOREA ELECTRIC POWER CO.	ELECTRIC POWER RESEARCH INSTITUTE, HYDROGEN SULPHUR TEST CENTER; GENERAL ELECTRIC, ENVIRONMENTAL SERVICES DIVISION; BABCOCK AND WILCOX; COMBUSTION ENGINEERS
ASSESSING U.S. TECHNOLOGY FOR MERCURY RECOVERY AND HAZARDOUS WASTE TREATMENT	ENVIRONMENT MANAGEMENT COMPANY (EMC)	INTERNATIONAL TECHNOLOGY CORPORATION (IT CORP); WMX TECHNOLOGIES

EXHIBIT 2. TECHNOLOGY ASSESSMENT ENVIRONMENTAL BUSINESS EXCHANGES

(CHEMTREC®).

The CMA developed CHEMTREC® to provide hazard information warnings and guidance based on the name of the product and the nature of the problem. When the product can not be identified, CHEMTREC® makes every attempt to obtain information from the manufacturer, shipper, or consignee.

Alma Howard, Staff Executive (retired), of the CHEMTREC® Task Group, met with representatives of various Thai government agencies and chemical associations to demonstrate how CHEMTREC® functions and to determine the feasibility of establishing a similar system in Thailand, and, more broadly, the necessary steps for establishing an emergency response center.

The Result: The recommendations and conclusions from this exchange have identified the steps necessary to establishing an emergency response center: the development of a comprehensive indexing system, adoption of labeling regulations, and training for response center personnel, emergency site responders, and medical staffs. The Ministry of Industry's Head of Hazardous Substances Division has committed to pursue a standardized labeling system. In addition, various organizations, including the Pollution Control Department, the Industrial Works Department, the Center for Urban Development, the Fire Department, the National committee on Disaster Prevention, and the Federation of Thai Industries, have formed a working group to visit the U.S. for further

study of the CHEMTREC® system.

Introducing Electric Vehicles to Thailand and Nepal

The Exchange: Mobile sources are major contributors to the air pollution problems experienced in the rapidly expanding urban centers of Asia. High profile contributors to the mobile source problem in Bangkok and Kathmandu are the ubiquitous three-wheeled work-horses known locally as tuk-tuks, and tempus, respectively.

This project sought to capitalize on advances in U.S. technology to introduce zero-emission electric vehicle technology to the Thai and Nepal private sector.

Initial discussions between R.J. Gurley, Business Advisor to the USAID mission in Bangkok, and Dr. Supat of the Emissions and Noise Control Division of the Department of Pollution Control in Thailand, led them to Anan Supataravanich, the President and Managing Director of Pholasith Tuk-Tuk Industry Co., Ltd. Pholasith has a near monopoly on the tuk-tuk industry in Thailand and exports to India and Australia. Dr. Supat and Mr. Gurley found Mr. Anan to be very interested in the possibility of manufacturing electric vehicles.

Through the US-AEP/WEC exchange program, Pholasith Tuk-Tuk Company was brought together with the forefront of U.S. research and development and the private sector, as represented by David Porter, and Ed Riddell from the Electric Power Research Institute (EPRI), and Chaz Haba, President and CEO of Advanced Electric Car Tech-

nology, Inc. (AECT).

In a separate exchange, the delegates from Nepal were hosted in the U.S. by AECT and EPRI. While at AECT, they saw firsthand the cutting edge technology that seems perfectly applicable for electric vehicles in their local situation. The Nepalese businessmen also had the opportunity to meet with members of the Transportation Department at EPRI to explore the efficient transfer of U.S. electric vehicle technology to the streets of Kathmandu.

The Result: With Pholasith providing a tuk-tuk and an extra transmission, and AECT providing the re-engineering, the new electric vehicle was unveiled to Thai government, industry and the press with much fanfare. With continued support from USAID/Thailand, AECT and Pholasith Tuk-Tuk have signed a Letter of Intent and are expected to begin joint production of electric tuk-tuks in Thailand during 1994.

As a direct result of the Nepal - U.S. exchange, the Nepalese coalition placed a order for several electric vehicle conversion kits with the Thai - U.S. venture partners. If these initial shipments are, as expected, acceptable and effective, the Nepali coalition would like to have a fleet of electric tempus numbering in the hundreds serving as taxis in Kathmandu by the end of 1995.

Evaluating Thailand's National Air Monitoring Needs

The Exchange: Radian Corporation was invited by the Thai Government to assist the Pollution Control Department

(PCD) in planning an air quality monitoring network for Thailand. The US-AEP/WEC exchange program allowed Scott Jenkins, an air quality monitoring expert from Radian, to provide technical assistance and practical recommendations to the PCD.

Wanida Srichai, an Environmental Engineer with WEC/Thailand, accompanied Jenkins and Thai government officials to Taipei to familiarize them with the Taiwan Air Quality Monitoring Network. Designed by Radian, it is the largest air quality monitoring network installation in Asia.

After observing the demonstration in Taiwan the group proceeded to Bangkok. Jenkins reviewed the PCD's conceptual plan for the nationwide network. The commitment to develop air quality management programs to address the deteriorating air quality in Bangkok became apparent during discussions with PCD and the Ministry of Science, Technology, and the Environment. The officials expressed great interest in expanding these programs to include other urban areas beyond Bangkok.

The Result: Mr. Jenkins found that most of the equipment currently used for air quality monitoring was outdated and would not be easily integrated into a new network. Jenkins concluded that the PCD should consider implementing specific action plans in each of the four pollution control zones that they have established. These action plans should provide for the quantification of emissions and determine the need for and design of air quality measurement systems in each zone. He also recommended the establishment

of minimum acceptable criteria for data collection and management of the programs, as well as guidelines for implementing private air quality monitoring programs for individual facilities and/or industrial estates to determine the impacts on the surrounding population.

The Thai government recently awarded Radian a half-million dollar contract to develop an "Action Plan to Reduce Vehicle Emissions and Noise Pollution" in Bangkok. This multifaceted project is being funded by the World Bank.

Assessing U.S. Technology for Philippine Cement and Paper Industries

The Exchange: The Philippines Investment-Management Company. (PHINMA) approached USAID/Philippines with a request to provide their Vice President for Environment, Lauro D. Guevara, exposure to the latest in U.S. pollution control technologies and training in pollution prevention management techniques. PHINMA's main areas of business are cement production and the manufacture of sack kraft paper. The total output from PHINMA's six cement plants currently supplies approximately 40 percent of the entire Philippine market.

Currently in the Philippines, companies producing cement are required to obtain a permit certifying that their plants built before 1978 emit less than 500 mg/m³ of particulate, and newer plants emit less than 300 mg/m³. PHINMA's Board of Directors has made a commitment to have all of their plants emitting less than 100 mg/m³. The companies

operated by PHINMA will spend US\$200 million on pollution control technologies to achieve this goal.

PHINMA is also interested in building a facility to recycle paper. Currently, their paper operations mainly produce sack kraft for bags to support their cement operations. After seeing the operations of several U.S. producers, PHINMA has determined that most of the material used in the sack kraft, as well as other packaging stock, could be more economically and ecologically produced from recycled fibers.

WEC arranged plant site visits demonstrating environmental technology, including: 3M, Holnam Cement, Medusa Cement, Scott Paper, Stone Container, and Weyerhaeuser.

During this US-AEP/exchange, Guevara reviewed a range of U.S. environmental technologies in action. Guevara also spoke with equipment manufacturers and operators. He was particularly impressed with the developments in U.S. baghouse technology. PHINMA cement plants currently use electrostatic precipitators which, due to the erratic electricity supply and temperature extremes in the Philippines, have not been fully effective.

Also during this exchange, Mr. Guevara was able to meet with management from U.S. companies that have similar operations to PHINMA's. At Stone Container Company, he was hosted by Allen Koleff, Vice President for Environment and Health & Safety. Mr. Koleff and Mr. Guevara spoke at length about "getting commitment from the top" for true environmental

stewardship, and motivating the plant floor employee on how to minimize waste and recycle the waste that is produced.

The Result: The exchange provided Mr. Guevara with a good sense of the capabilities of U.S. pollution control technologies. Equally important, friendships were initiated between the Philippines and the U.S. that will allow for continued dialogue for sharing experiences and ideas.

Since returning to the Philippines, Mr. Guevara has been in great demand as a speaker, discussing his tour in the U.S. with others in the Manila industrial community, and at USAID/Philippines functions.

Reforestation Thailand

The Exchange: The Royal Thai Government has announced plans to plant 500,000,000 trees by 1996 in a massive reforestation effort to commemorate the 50th birthday of his Majesty, the King. In attempting to implement this very

ambitious agenda, the Royal Thai Forestry Department approached USAID for technical assistance. Using existing planting methods, the Royal Thai Forestry Department has only a 20 percent sapling survival rate; far less than experienced in the U.S.

WEC, working with USAID/Thailand, assembled a program to allow three forestry experts from the U.S. to travel to Thailand: Rick Herson, President of Oregon Woods, Inc; experienced in forestry operation and management, including reforestation and land stewardship; Dr. Robin Rose, Associate Professor of nursery technology and reforestation, Department of Forest Science, College of Forestry,

Oregon State University; and Jim Peters, International Training Coordinator, Office of International Research and Development, Oregon State University, a community forestry specialist, currently studying on a comparative analysis of Oregon and Thailand resource dependent communities.

These experts evaluated Thai conditions and practices, and provided technical recommendations on nursery modernization, seedling quality criteria and seedling production, site preparation, and planting media to the Thai Forestry Department. They also identified opportunities for U.S. reforestation companies to participate in this enormous reforestation effort.

The Result: The team found that the nurseries and tree planting operations are well run; however, the Oregon experts predict that seedling production efficiency could be increased by up to 1,000 percent by using U.S. techniques. For improvement in the seedling

production, a containerized-styroblock-system be considered.

The delegation found that the nursery systems for 48 native species of trees should be upgraded to the current advanced level of teak development. The group also found that the Thai black plastic poly-bag system was limiting the survival rate of saplings.

Since this exchange took place, a delegation of Thai businessman and government officials travelled to Oregon and several other western states to see the best in U.S. reforestation technologies. This follow-on trip was an excellent indication that the

exchange was effective and will have mutually beneficial and lasting results.

FACTORY ASSESSMENT PROGRAM

The Factory Assessment Program allows Asian industry officials to draw on the expertise of their U.S. counterparts and explore alternatives to achieve more environmentally sound and profitable operations. Through this program, the participants exchange ideas on the performance of environmental audits, the effectiveness of wastestream treatment systems, and best management practices to minimize or eliminate waste generation.

Throughout its history, WEC has successfully conducted more than 120 factory assessments in 20 countries, including Thailand, Indonesia, and the Philippines. Our expert volunteers have conducted environmental assessments of industries as varied as food processing, metal finishing and related operations, water

chemicals, organic chemicals, pulp and paper, leather tanning, and textiles.

In 1993, WEC's Factory Assessment Program continued work in Indonesia, and was introduced to Sri Lanka for the first time.

Indonesian Pulp & Paper Industry Factory Assessment

The Exchange: The pulp and paper industry in Indonesia is a major source of water and air pollution. The use of appropriate environmental technology and management techniques are critical issues facing the industry. Under this US-AEP/WEC ex-

change, four representatives from Indonesian pulp and paper companies had the opportunity to review U.S. environmental technology in use at American pulp and paper plants. The delegates: Darono Wikanaji, Chemical Engineer, PT. Kertas Leces; Widya Tjahyana Lauwangsa, Senior Engineer, P.T. Pakerin; Warih Superiadi, Quality Control Department Engineer, Environmental Protection, P.T. Indah Kiat Pulp and Paper Corp., had the opportunity to observe technologies relating to water reduction and recycling, wastewater treatment, air pollution control, black liquor oxidation systems, and chemical recovery systems. Facilities visited included: Sonoco Paper Products, Willamet Industries, Inc., Union Camp, Weyerhaeuser, and the National Council of the Paper Industry for Air Stream Improvement, Inc. (NCASI).

The Result: Follow-up contacts have occurred between an Indonesian firm and Sonoco Paper to discuss transfer of a Sonoco chemical recovery system. Also, NCASI officials have provided the Indonesians with technical bulletins and reports relating to NCASI member companies.

Expanding Factory Assessment Programs in Sri Lanka

The Exchange: Much of industry in Sri Lanka is using technologies from the 1960s, consuming and tremendous amounts of energy resources, and polluting the local environment. USAID/Sri Lanka requested US-AEP/WEC assistance in performing factory assessments with the goal of introducing pollution prevention

measures by optimizing production, operations, and raw materials use; employing good housekeeping practices; and recommending waste treatment, as appropriate.

Factory assessments were conducted at metal finishing, canning, paint, and leather tanning facilities. The assessments broke new ground in introducing an analytical approach for conducting environmental audits. The concept was introduced in all four industries and consisted of: 1) developing a mission statement; 2) defining goals (e.g., eliminate waste, minimize waste, monitor waste); 3) identifying specific problem to be addressed to achieve the goals; 4) formulating and implementing solutions, and; 5) establishing a monitoring system to determine effectiveness.

Industry officials observed the analytical process carefully, often making process changes on the spot, while carefully considering other more complex suggestions. Sri Lankan consultants were also trained in audit procedures as part of this exchange, providing the potential for more widespread transfer of this knowledge.

The Result: The assessments had a strong impact. At seminars concluding each mission, representatives of the industries undergoing the assessments spoke enthusiastically to a wider industry audience. They reported details of new concepts and process changes that had already been implemented and the savings that had resulted in more efficient raw material usage (as well as reduced pollution).

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C O R P O R A T E E N V I R O N M E N T A L P R O G R A M

The Corporate Environmental Program brings industry leaders from the U.S. and Asian countries together for practical discussions of the challenges associated with environmental regulations. Topics of discussion for this program might include trends in environmental regulations, the greening of corporate philosophy in the U.S., the economics of environmental stewardship, and the environmental challenges faced by specific types of industries.

During 1993, projects undertaken as part of WEC's Corporate Environmental Program included: The Philippine Business for the Environment Conferences held in Manila and Cebu, Philippines, and the Sri Lanka Institution Building Exchange.

Conferences on Corporate Policies and Programs

The Exchange: The Conferences on Corporate Environmental Policies and Programs were organized by the Philippine Business for the Environment (PBE), a non-profit, industry-based Filipino NGO. In response to a request from PBE, US-AEP/WEC supported two U.S. experts who spoke to over 120 Filipino business executives and government leaders present at the conferences.

David Chittick, the Environmental and Safety Engineering Vice President of AT&T provided the keynote address: "The Greening of the Corporation" and Burton Hamner, Environmental Plan-

ning, Washington Department of Ecology, spoke on "Elements of a Corporate Environmental Policy" at the conference held in Manila. At the conference in Cebu, Burton Hamner presented his paper on corporate environmental policy.

The goal of the conferences was to assist Filipino corporations in integrating both their concern for sustainable development and their response to environmental pollution reduction initiatives and regulations, into corporate policies and programs.

Specifically, the conferences provided participants with: insights from local and international corporations that have adopted environmentally responsible corporate policies and programs; future trends in environmental policies and regulations affecting business and industry; and options and resources available to Philippine industry for environmental policies and programs.

The Result: The conference was successful in supplying participating executives with an understanding of corporate environmental policies as practiced in the U.S., enabling them to credibly introduce corporate environmentalism in their respective companies.

Conference presentations demonstrated the cost saving benefits of pollution reduction/prevention, and provided a general plan of action for formulating a company-specific corporate environmental policy. They also gave the participants specific examples of how U.S. companies have addressed pollution prevention and waste minimization concerns.

Conference participants made a formal commitment to pursue the development of corporate environmental policies in their respective companies.

Environmental Institution Building in Sri Lanka

The Exchange: In response to Sri Lanka's request for assistance in developing an effective program for industrial pollution control. WEC, through the US-AEP, and in coordination with the World Bank's Metropolitan Environmental Improvement Project (MEIP) and USAID/Sri Lanka, identified individuals responsible for the State of Minnesota's leading-edge institutions that disseminate and encourage industry's consideration and implementation of environmental protection measures. U.S. volunteer experts were: Kevin McDonald, a Senior Planner at the policy-making institution called the Minnesota Office of Waste Management; Terry Foecke, Director of WRITAR, an industry association/affiliation NGO; and Karin Nelson, Environmental Technology and Services Representative at the "linking" institution, the Minnesota Trade Office.

The goals of this exchange were to 1) gain first hand knowledge of the Sri Lankan industrial, economic, and environmental situation, 2) share Minnesota's experience in institution building and in linking the institution to the pollution prevention needs of industry, and 3) develop, with Sri Lankans, alternative approaches to building a waste minimization institution.

The Result: As a result of this exchange, the U.S. experts gained an understanding of the level of

technology, management practices, and views on waste minimization in Sri Lankan industry. This enabled the experts to begin discussions with the Sri Lankan representatives and develop models for a waste minimization institution tailored to fit Sri Lanka's needs. In addition, the exchange provided industry and government leaders with additional information on waste minimization and encouraged them to commit to the same in their policies and programs.

L LEVERAGED PROJECTS

One of the goals of the US-AEP/WEC program has been to offer support to environmental programs offered by other institutions, where shared goals exist. Such programs have included USAID mission initiatives, and regional and national programs being undertaken by donors such as the World Bank, and the United Nations Development Program (UNDP). Leveraged projects are attractive where they serve to advance US-AEP and WEC missions. They also minimize duplication of resources and efforts being directed at the same issue, and bring complementary capabilities to address problems more effectively.

Activities that US-AEP/WEC chose to leverage during 1993 were USAID/India's Trade in Environmental Services and Technologies (TEST) program, the World Bank's URBAIR initiative under the Metropolitan Environmental Improvement Program (MEIP), and the Megacities on the Pacific Rim and the Burden of Air Pollution Conference, in Jakarta Indonesia.

URBAIR activities were supported in Indonesia, the Philippines, Nepal and Bombay. The URBAIR/Manila project, the Megacities conference, and an example TEST exchange are highlighted below.

Developing an Urban Air Quality Management Strategy for Manila

The Exchange: The URBAIR project in Manila is driven by the need to address Manila's critical air pollution problems. Respirable Particulates (PM-10) in Manila range from 36 to 459 $\mu\text{g}/\text{m}^3$, more than three times the U.S. ambient air quality standards. The effect of this is clear in the Metro Manila area where visibility is limited to a few kilometers. From the outskirts of the urban area, it is possible to see a dark, heavy pall that hangs over the city. Resuspension of road dust, refuse disposal by open burning, diesel buses and cars, and emissions from industrial complexes in the Metro area all contribute to the high particulate matter concentration.

US-AEP/WEC sent Dr. Michael Ruby, President and Director of Engineering, Envirometrics, an air quality management expert to participate in the URBAIR workshop in Manila. Dr. Ruby assessed the nature and sources of air pollution in Manila, identified the legal and regulatory measures necessary to mitigate air pollution problems; and finally, recommended possible solutions, including technological options, to alleviate these problems.

Dr. Ruby spoke on the U.S. air quality management experience. His presentation focused on air pollution control issues in the United States with an emphasis

on the history of regulations, the role of NGOs, and the current state of research on air quality management. He also met with local government officials regarding the current institutional framework needed to support air quality management in the Philippines

The Result: Dr. Ruby determined that the legal and institutional framework was in place to address air pollution issues, and that the time was ripe for taking significant steps to controlling air pollution in the Metro Manila area.

In addition to making recommendations to the government for the development of an industrial emissions inventory, Dr. Ruby identified markets for U.S. technology. Specifically demand exists for: air pollution control equipment, motor vehicle emissions testing equipment, and particulate control equipment.

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IMPACT/EVALUATION OF ENVIRONMENTAL BUSINESS EXCHANGES

The goal of WEC's Environmental Business Exchange Programs has been to help address Asia's environmental problems by drawing on the environmental expertise and experiences of U.S. industry. This "people to people" program brought together the individuals (in Asia) with environmental problems or needs with those (from the U.S.) having potential solutions.

During 1993, WEC completed a total of 82 exchanges, as part of 34 projects, in 8 countries. Donations *in-kind* associated with these exchanges totalled \$1,084,303. WEC estimates that the EBE program was successful in bringing together more than 500 industry professionals from the U.S. and Asia.

The success of WEC's Environmental Business Exchange programs is predicated on the enthusiastic involvement of expert volunteers under WEC's International Environmental Development Service (IEDS), and the participation of U.S. industries that host visitors from Asia. Necessary WEC support for the volunteers includes: appropriate preparation for the exchange, developing travel itineraries, and ensuring that fruitful meetings and tours are conducted in the host Asian country.

To measure our success in each of these vital areas, WEC surveyed the volunteers and engaged in numerous telephone calls to get their perspective on what we were doing right, and what needed improvement. Rated on a scale of 1 to 5, with **1 being poor**, and **5 being excellent**; on average, IEDS participants rated WEC programs as follows:

- Quality of information provided as preparation for the project 4.15
- Quality of travel arrangements 4.58
- Appropriateness of meetings scheduled 4.16
- Appropriateness of tours/site visits conducted 4.23
- Value of project 4.45

Perhaps the most important of these indicators is the "Value of project." The high rating received is further amplified by comments provided by the U.S. partners.

"... opened up a number of future opportunities to work with various Thai government agencies ..." Scott Jenkins, Radian Corporation

"Extremely valuable experience. Essential on-site information and understanding of needs in business community ... as well as future projects were brought into context." Karin Nelson, Minnesota Trade Office

"Self-fulfillment from helping a third-world country." Larry Ring, Pillsbury Food, Green Giant Division

"This could be a long and fruitful relationship with Thailand in the area of reforestation." Dr. Robin Rose, Oregon State University

"Meetings with potential clients in India have resulted in excellent interest in our chemical recovery system for pulp and paper mills. In fact, Shreyans Pulp and Paper has sent us a letter of intent for a complete plant ..." Joseph Enders, Enders Process Equipment Corporation

"We believe that the support of this project by US-AEP's Environmental Business Exchange Program has made discussions smoother, more effective, and increased the probability of joint success." Prakash Acharya, IT Corporation

This people-to-people program has been successful in moving U.S. environmental expertise and practices to Asia. For ease of discussion, exchanges may be grouped into four categories based on the outcome of the exchange.

1. Where environmental benefits have been a direct result
2. Where increased understanding of available U.S. resources and expertise to the Asian market has resulted
3. Where Asian partners have adopted U.S. practices that will reduce pollution of the environment
4. Where Asian partners have committed their own resources to conduct exchange follow-up activities

Exhibit 3. provides a summary of the successes of WEC's Environmental Business Exchange Program. Each of the projects undertaken during 1993 was successful in at least one of the four categories for evaluation.

All of the exchanges achieved the goal of increasing Asian awareness (A) of U.S. expertise, equipment, and experience for addressing environmental problems. In assessing an exchange's environmental impact (E), a conservative approach was taken, highlighting only those exchanges which had an immediate impact. While more long range perspectives of environmental impact might be highly desirable, these would be speculative in nature. The promise of longer range environmental improvement is perhaps represented by the projects which resulted in the use of U.S. environmental practices (P).

Finally, the strong commitment of Asian partners to the U.S. environmental methods, expertise, and capabilities is best illustrated by those instances where actual resources (R) were expended by the Asians to conduct follow-up activities. These follow-up activities have included visits to the U.S., and the signing of letters of intent, or contracts.

PROJECTS SUMMARY	E	A	P	R
TEST Program Cooperation (multiple projects) - India		*		*
MEIP Support - India/Indonesia/Nepal/Philippines		*		
Megacities Conference - Indonesia		*		*
Pulp & Paper Industry Technology Assessment - Indonesia		*		*
Metal Finishing Industry Technology Assessment - Indonesia		*		
Waste Minimization Technology Transfer - Indonesia	*	*	*	
Flue Gas Desulfurization Technology Assessment - Korea		*		*
Mercury Recovery/Hazardous Waste Treatment Technology Assessment - Korea		*		*
SEAISI Conference Support - Malaysia		*		
Electric Vehicle Technology Assessment - Nepal		*		*
PBE Conference Support (Manila/Cebu) - Philippines		*	*	*
Cement and Paper Industry Technology Assessment - Philippines		*		*
Integrated Waste Handling/Disposal Technology Assessment - Philippines		*		
Smokey Mountain Project Technology Assessment - Philippines		*	*	*
Technical Information Center - Sri Lanka	*	*	*	
Demand Side Management Technology Transfer - Thailand		*	*	
CHEMTREC® Training - Thailand		*	*	
Air Monitoring Needs Assessment - Thailand		*		*
Electric Tuk-Tuk Technology Assessment - Thailand		*		*
Reforestation Project - Thailand	*	*	*	*
Carbon Offset Project Development - Thailand		*		
Environment and Safety Certification Program - Thailand		*	*	
Key:				
E = Environmental benefit was immediate result of exchange				
A = Asian partners gained increased Awareness of U.S. capabilities and experience				
P = Asian partners adopted U.S. Practices as a result of the exchange				
R = Asian partners committed their own Resources to conduct exchange follow-up				

EXHIBIT 3. SUMMARY OF ENVIRONMENTAL BUSINESS EXCHANGE PROGRAM SUCCESSES

1993 PARTICIPANTS IN WEC's EBE PROGRAM

- * Sushil Amatya, Executive Director, Consolidated Engineers, Nepal
- * Raul A. Arellano, Jr., Vice President, R-II Builders, Inc., Philippines
- * Dr. Larry Berg, Director, Jessie M. Uruh Institute of Politics
- * Dr. Stephen Bryen, President, Lean Power Corporation
- * Ir. Bayu Cahyono, PT Padl Komponen Corporation, Indonesia
- * T. Chandran, Ion Exchange, India
- * Jan Chatten-Brown, Esq.
- * D. Chatterjee, Manager, INALSA, India
- * Dr. Satish Chilekar, Ion Exchange, India
- * David Chittick, Vice President for Engineering, AT&T, WEC Board Member
- * Dr. Chulapongs, Governor, Provincial Electric Authority, Thailand
- * Catherine Clerf, President CAC International
- * Jean Clinton, RCG/Hagler, Bailly
- * David Coel, Program Supervisor, South Coast Air Quality Management District
- * Jo Young Dae, Assistant Manager, Environmental Technology Section, Korea Electric Power Corporation (KEPCO), Korea
- * James Dewey, P.E., Vice President, HSB Professional Loss Control
- * Glenn Dunmire, Director, International Development, FPI
- * Joseph Enders, President, Enders Process Equipment
- * Joel Epstein, Vice President, RCG/Hagler, Bailly
- * Terry Foecke, Director, Waste Reduction Institute (WRITAR)
- * Dr. Stanley Greenfield, Senior Vice President, Systems Applications International
- * Lauro Guevara, Vice President for Environment, Philippine Investment Management Co. (PHINMA), Philippines
- * Chaz Haba, Chairman and CEO, Advanced Electric Car Technology Inc. (AECT)
- * Charles Hamilton, Vice President, Lean Power Corporation
- * Burt Hamner, Environmental Planner, Washington State Department of Ecology
- * Louis Harms, Vice President Engineering, FPI
- * Mary Harris, Vice President, RCG/Hagler, Bailly
- * Calvin Henning, President, Frost Paint Co.
- * Rick Herson, President, Oregon Woods, Inc.
- * Alma Howard, Chemical Manufacturer's Association
- * Scott Jenkins, Senior Program Manager, Radian Corporation
- * A. Goldwin Joseph, Pure Tech Engineering, India
- * G. Kharel, Consultant, Nepal
- * Kris Kudrnac, K3 Corporation
- * Widya Tjahyana Lauwangsa, PT Pakerin, Indonesia
- * Lee Shin-Bom, Executive Director, EMC, Korea
- * Christian Lint, President and Chairman, Yankee Engineering Services
- * Kernan Lipper, Esq., Staff Director, California State Assembly
- * Zulkifli Lubis, PT Indah Kiat Pulp & Paper Corporation, Indonesia
- * Harold Martinez, President and CEO, ABLE Industrial Products
- * Richard Mayer, Vice President of Operations and Director of Engineering, Advanced Electric Car Technology, Inc. (AECT)
- * Kevin McDonald, Senior Planner, Minnesota Office of Waste Management
- * Fiona Mikkelson, RCG/Hagler, Bailly
- * Kenneth L. Minnick, Environmental Compliance and Planning Manager (Rtrd.), Lukens Steel
- * Marilyn Morton, Government Relations, Parsons Corporation
- * Mr. Narashimhan, Pure Tech Engineering, India
- * Karin Nelson, Environmental Technology and Services Representative, Minnesota Trade Office
- * Park Hun Kyung, Environmental Section, Korea Electric Power Corporation Technology (KEPCO), Korea.

- * Dr. Pansak, Deputy Governor, National Electronics and Computer Technology Center, Thailand
- * Janice Perlman, Executive Director, Megacities Project
- * Jim Peters, International Training Coordinator, Office of International Research and Development, Oregon State University
- * David Porter, Manager, International Technology Transfer, Electric Power Research Institute (EPRI)
- * Ir. Jaya Agung Prastowo, PT Y.K.K. Indonesian Zipper Co. Ltd., Indonesia
- * S. Raj Bhandari, CEO of Mercantile Computers, Nepal
- * Ram Rathi, Executive Vice President, FPI
- * B. Ravi, Managing Director, Pure Tech Engineering, India
- * Ed Riddell, Program Manager, Electric Power Research Institute (EPRI)
- * Reghis Romero, Chairman, R-II Builders, Inc., Philippines
- * Dr. Robin Rose, Associate Professor, Department of Forestry, Oregon State University
- * James Rochow, Esq.
- * Michael Ruby, Director of Engineering, Envirometrics Inc.
- * Alan Sarko, Inorganic Recycling Corp.
- * Edmond Q. Sese, President, RII Builders, Inc., Philippines
- * K.B. Shrestha, Owner, South Asia Trading Co., Nepal
- * Jim Silvers, President/CEO FPI
- * John Smith, Vice President for Environment, S.B. Foot Tanning Company
- * Frank Stern, RCG/Hagler, Bailly
- * Marc Stuart, Senior Analyst, COPEC
- * John Studer, Automotive Engineer, Lean Power Corporation
- * Ir. Dadang Sudrajat, PT Suprarex Rays, Indonesia
- * Dr. Warih Supriadi, PT Surabaya Agung Industri Pulp & Kertas, Indonesia
- * Gordon Sutin, Executive Vice President, Energy Answers Corporation/Polydyne, Inc.
- * Tig Tuntivate, RCG/Hagler, Bailly
- * Ravi Vaidya, Ion Exchange, India
- * Atanasio Vercide, Vice President, Fabrication, R-II Builders, Inc., Philippines
- * Michael Walsh, Consultant
- * Jack Wallace, President and CEO, Ab-Sorb
- * Ir. Widya Wicaksana, PT Probengkei, Indonesia
- * Ir. Darono Wikanaji, PT Kertas Leces, Indonesia

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The World Environment Center (WEC), a not-for-profit, nonadvocacy, independent organization, contributes to sustainable development worldwide by strengthening industrial and urban environmental, health, and safety policy and practices. WEC, founded in 1974 with seed funding from the United Nations Environment Programme, today receives funding and support from industry, government, and international organizations, corporate and private foundations, and the public.

The Center, serving as a bridge for the exchange of information and expertise among industry, government, and non-governmental organizations, has established three programs to achieve its mission.

**International Environment and
Development Service (IEDS)**

Using volunteer and other experts, IEDS makes environmental management expertise available directly to industries and governments in 32 countries at little or no cost. Since it was launched in 1982, IEDS has completed over 250 activities and worked with over 900 host-country professionals.

International Environment Forum (IEF)

The IEF, established in 1977, promotes ongoing and off-the-record dialogue between government and industry on environmental and resource management issues. Today, 60 multinational corporations, based in eight countries, and engaged in nine industrial sectors, participate in the IEF.

**WEC Gold Medal of International
Corporate Environmental Achievement**

The WEC Gold Medal honors multinational corporations which have outstanding, sustained, and well-implemented worldwide environmental programs. Every year since 1985, an independent international jury has selected the recipient of the WEC Gold Medal to provide international public recognition of industry's environmental accomplishments.