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WORLD ENVIRONMENT CENTER

FINAL REPORT

INDUSTRIAL WASTE MINIMIZATION PROGRAM

IN

CENTRAL & EASTERN EUROPE

&

CENTRAL ASIAN REPUBLICS

Submitted to

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Glossary

CEE	Central and Eastern Europe
CAR	Central Asian Republics
CP	Cleaner Production
EAP	Environmental Action Plan
EC	Energy Conservation
ELI	Environmental Law Institute
EMS	Environmental Management System
EPA	United States Environmental Protection Agency
EU	European Union
GIS	Geographic Information System
HIID	Harvard Institute for International Development
IEDS	International Environment Development Service
IEF	International Environment Forum
INEM	International Network for Environmental Management
ISO	International Organization for Standardization
IWMP	Industrial Waste Minimization Program
LAEM	Latvian Association for Environmental Management
NCPC	National Cleaner Production Center
NEFCO	Nordic Environmental Finance Corporation
OECD	Organization for Economic Development and Cooperation
PPC	Pollution Prevention Center
RTI	Research Triangle Institute
SEPA	Senior Environmental Policy Advisor
UNEP	United Nations Environment Program
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WASH	Water and Sanitation for Health
WBCSD	World Business Council for Sustainable Development
WEC	World Environment Center
WM	Waste Minimization

Acknowledgements

The past ten years have been both challenging and rewarding. The World Environment Center (WEC) worked with many industrial and governmental representatives in the emerging democracies in Central and Eastern Europe and the Central Asian Republics. Working with United States Agency for International Development (USAID) support WEC identified and implemented hundreds of projects that generated both environmental and economic benefits. With our partner organizations, the Harvard Institute for International Development (HIID) and the Environmental Law Institute (ELI), and other donor organizations, important policy reforms were developed and implemented through the adoption of laws and regulations. All this would not have been possible without the good will, expertise and dedication of many individuals.

WEC expresses its deep appreciation for the support and direction it received from USAID and from the governments, ministries and agencies in the US and in all the countries in which it worked.

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Finally, the success of our work is directly attributable to the managers and staff at the World Environment Center and the volunteers from the participating companies to whom we express our appreciation.

Executive Summary

United States Agency for International Development program support during the nine years of the WEC cooperative agreement has been instrumental in assisting industries and governmental organizations recognize the importance of linking good industrial and good environmental practices to bring about economic and environmental benefits.

The USAID sponsored environmental programs conducted by the World Environment Center's Industrial Waste Minimization Program saved the 144 participating companies U.S. $ 27.1 million per year. The savings were realized from a cumulative investment of $6.3 million, of which the plants contributed $5.0 million or 78.4 per cent. Since savings of a similar magnitude are expected to continue in future years, the economic benefits gained by the companies are more appropriately expressed as Net Present Value (NPV). The NPV of the economic benefit for the 308 Waste Minimization projects at the 144 companies was calculated at $110.6 million using an average project life of eight years, a dollar annual discount rate of five percent, and corporate tax rate of 35 percent.

The companies improved productivity by decreasing the use of resources such as water, energy and raw materials. Environmental discharges were reduced enhancing worker health and safety by decreasing the generation of waste materials. Based on data provided by the companies, the program prevented 126,000 tons of hazardous pollutants and over 3.8 million cubic meters of contaminated wastewater from being discharged to the environment each year. Decreased energy use significantly contributed to the reduction of carbon dioxide emissions. Examples of pollutant reduction from waste minimization activities are shown in Table 2.2.2.

These environmental improvements and economic benefits were accomplished by three key activities:

- **Outreach & training** to raise the awareness of industries and regulators about the importance of good environmental practices and resultant benefits

- **Technical assistance** to equip managers, engineers, financial and administrative support personnel with the skills to develop, implement and evaluate waste minimization projects

- **Policy reforms** to foster the advancement of environmentally sound manufacturing practices by providing economic incentives for needed investments

The lessons learned provide a practical guide that can be used to build on the experiences described in this report. These lessons can be divided into two general areas: lessons that are related to broader program goals or context issues and those that are technical and program implementation specific.

Critical overarching lessons learned include the importance of: (1) an understanding of the inter-relationships between and among the USAID program goals; (2) the need for specific coordinating mechanisms and communication between and among USAID contractors and other donor programs; (3) a recognition of the need for sufficient time and flexibility to adapt to different cultural, social and political norms.

More specific program implementation related lessons learned include: (1) the need for early involvement and motivation of key decision makers and implementers at all levels; (2) the need to link economic development with good environmental practices; (3) an understanding of the barriers to program implementation, especially that it is a continuing process that moves at its own pace.

An important measure of institutional capacity building is the sustainability of the Pollution Prevention Centers (PPCs). Post project inquiries to all PPCs indicated that ten of eleven are still in operation since they were first established in 1994-5. They have expanded the nature and scope of their activities beyond waste minimization and continue to attract an expanding client base. One merger has occurred between the WEC and UNEP centers in Slovakia.

The PPCs represent an opportunity to capitalize on the USAID investment in human resources trained and equipped to provide cost-effective environmental consulting services to industry and governments yielding economic and environmental benefits.

I. Introduction

The World Environment Center conducted a broad range of environmental technical assistance and policy development activities in support of the United States Agency for International Development Private Sector Environmental Initiative in Central and Eastern Europe. Working under a nine-year cooperative agreement (1990-1999), WEC organized and implemented a two-part program – an initial assessment of environmental needs and development of a strategic plan for a regional environmental management and control program. The project was conducted under Cooperative Agreement ANE-0004-A-00-0048-00, as amended. It consisted of activities conducted in twelve countries in cooperation with USAID missions. This chapter focuses on the background and scope of the project.

The *strategic planning and assessment aspect* focused on assisting CEE governments to formulate environmental strategies; to identify priority policy, legal and regulatory constraints; and to develop action plans for environmental assistance. This was accomplished through a combination of both short-term and long-term advisory services. Technical experts recruited from US industries and regulatory agencies gathered and analyzed information to identify major pollution sources to assess health, environmental and economic impacts. Legal and regulatory constraints and economic policies were reviewed to jointly develop priorities working with ministry counterparts. WEC, in cooperation with the Harvard Institute for International Development (HIID) and the Environmental Law Institute (ELI), prepared recommendations outlining strategic approaches to address the most critical health, environmental and economic issues. Senior level environmental economists worked at the ministry level, analyzing issues and training ministry personnel in drafting policies, regulations and statutes. HIID and ELI completed this work under separate agreements with USAID. The detailed results were reported separately by both organizations.

The *regional environmental management and control program* conducted by the WEC International Environment Development Service (IEDS), provided technical assistance and training to industry technical and managerial representatives, environmental ministry officials, business industry association members and academia. The objectives were to identify least cost ways to reduce pollution and to enable industries to improve industrial efficiency, thus becoming profitable and more competitive. This was accomplished using US experts with broad industrial experience including waste minimization, industrial health and safety, process control and efficiency, energy conservation, community relations and ISO 14001. WEC's International Environment Forum (IEF), a group of more than 60 multinational companies, provided many of these experts from a cadre of both active and retired professionals.

There were three aspects to the work performed – general environmental and fact finding missions; waste minimization programs and environmental management activities; and development of institutional capacity by establishing Pollution Prevention Centers (PPC).

The initial fact-finding oriented missions laid the foundation for general environmental assessment programs and workshops during the first three years of the cooperative agreement. Recognizing the need for building institutional capacity over the long term, USAID asked WEC to design a program to address urban and industrial pollution and environmental quality in developing countries leading to sustainable programs. WEC organized and implemented a waste minimization program conducted over a six-year period from 1993-1999.

The three-part program involved (1) **demonstration** of the economic and environmental benefits of waste minimization; (2) broad dissemination of the **impacts** to additional companies in several industrial sectors; and (3) institutional **capacity building** by establishing Pollution Prevention Centers.

This final report summarizes the program approaches used; describes individual country programs and key activities; and presents representative achievements and lessons learned. While the overall program was presented in both Central & Eastern Europe (CEE) and the Central Asian Republics (CAR), the level of effort varied depending on specific mission objectives and resource allocations as well as the commitment of participating companies. Detailed information was submitted in the regular progress reports and trip reports submitted to USAID during the term of the cooperative agreement.

The practical results of WEC's industrial waste minimization program in support of USAID's economic restructuring and environmental improvement goals can be summarized as follows:

- Management "buy in" that improved production efficiency is good business
- Worker participation using "floor" level leaders and teams is critical in generating and implementing suggestions for waste generation and energy reduction
- An organized system of regular environmental management reviews of all company operations is needed to meet future competitive challenges
- Recognition that minimizing wastes has both economic and environmental "bottom line" benefits by lowering costs and increasing productivity
- Activity based cost accounting identifies the real costs of manufacturing including costs for energy, water, raw materials and labor
- Greater understanding of the value of short-term, low cost/no cost projects in faster pay-backs and management motivation to encourage waste minimization/ energy conservation/programs
- Increased awareness of cost savings through basic process instrumentation and preventive maintenance procedures

The appendices contain supplemental descriptive information related to these activities.

1.1 Background

The monumental environmental task facing the newly independent republics in Central and Eastern Europe and the Central Asian Republics after the break up of the Soviet Union were succinctly summarized in The Joint Environmental Mission report prepared by Dr. Robert Kapner. He said, "... it is important to understand that there are national and institutional problems that mitigate against a concerted effort to solve even the most obvious problems. The critical issues include privatization, raw material supply, pollution charges and fees and manufacturing quality." These factors had a direct bearing on the scope and timing of WEC program development, priority setting and program implementation schedules.

Consistent with the broad scope of the USAID objectives, WEC used a phased strategy quickly establishing momentum and gaining credibility by providing immediate, practical and locally oriented results. This was achieved through a series of short course training workshops and technical assistance activities building good working relationships with local industrial enterprises and organizations. A guiding principle for the work done in CEE and CAR stressed that participants had the primary responsibility for solving environmental problems.

It was in this broad context that WEC designed and carried out programs to actively engage industries, governments and universities in restoring the environment in Eastern Europe while supporting and advancing economic and social reforms. This initiative fully supported the USAID goals of democracy building, economic restructuring and environmental improvements. These broad goals were initially addressed by partnering with the Harvard Institute for International Development and the Environmental Law Institute by:

- Identifying economically viable industries and candidate firms for privatization
- Developing market oriented mechanisms for environmental management
- Raising awareness about economic and environmental benefits
- Developing economic, business, and environmental management skills
- Reducing the risk to human health from past industrial pollution
- Avoiding future environmental problems through waste minimization and economic restructuring

1.2 Scope of the Project

The broad technical assistance, training and policy reforms completed by WEC supported the following USAID goals:

- Institution strengthening in environmental policy and management
- Environmental economics and policy analysis and reforms
- Industrial pollution prevention and reduction efforts

The objectives of the WEC programs and activities in CEE and CAR countries were:

- Transfer industrial pollution prevention and environmental management expertise
- Establish sustainable pollution prevention programs
- Improve environmental quality

Over the course of the project, WEC established multi-year technical assistance and training programs in Bulgaria, Czech Republic, Estonia, Hungary, Kazakstan, Latvia, Lithuania, Poland, Romania, Slovakia, Ukraine and Uzbekistan. WEC also established 11 Pollution Prevention Centers in nine CEE countries.

To achieve its objectives, WEC implemented programs in three principal areas:

> ***Outreach and training*** - providing training, organizing and conducting study tours and disseminating information on environmental management and pollution prevention to industry, governments, consultants and academia.
>
> ***Technical assistance to industry*** - influencing industry behavior through plant-level assessments of industrial facilities and promotion of technology development and transfer using demonstration projects and fostering access to investment capital.
>
> ***Policy development*** - helping design, establish and support pollution prevention programs, environmental economic policies, national environmental management policies and environmental law policies.

1.2.1. Outreach and Training

Outreach and training were effective tools in raising awareness about pollution prevention and energy conservation opportunities among industrial managers and technical staff and government and environmental protection representatives. Training and sharing US industry expertise and practices was the most important element in generating interest at the plant level. WEC training enabled industries to draw links between inefficiencies in production and lost revenues, environmental impacts, and worker health and safety hazards.

Raising awareness across a broad sector of industries, industry organizations, national and regional environmental agencies and academia was a crucial first step. A three pronged approach was taken – environmental **assessments** at key industries identified by environmental authorities; environmental training **workshops** for a broad range of technically oriented personnel; and **study tours** to establish links with US technical, policy and regulatory experts and environmental services and technology providers. These activities provided valuable first hand knowledge of the circumstances faced by CEE and CAR industries and regulators. Participant feedback was instrumental in

developing a more focused strategy that coincided with USAID's institutional capacity building goal.

Initial problems to be overcome included the lack of familiarity with US experts and practices, language and cultural barriers and an inherent suspicion of westerners. The work environment was complicated because industries and government ministries did not have any significant experience or traditions of working with external donor organizations. This required a significant investment in time to identify key stakeholders and to establish and build good working relationships. Industry and/or trade groups either did not exist or had very limited knowledge and awareness of western environmental policies, procedures and practices. Industries were state owned and highly regulated by ministries. Environmental regulations and enforcement activities, while strict, were not actively enforced.

The objective of WEC training activities was to first educate key senior and mid-level management and technical professionals. They in turn were expected to promote pollution prevention and energy conservation practices after USAID programs were completed, thus contributing to USAID's sustainability goal.

WEC training programs were based on workshops with defined and customized curricula to meet the needs of the recipients of the training. The training activities targeted:

- Plant level managerial, technical and financial staff
- Business and industry trade groups and private consultants
- Environmental, trade and business oriented ministry representatives

Training manuals were translated into the local language and provided to all workshop participants. Additional copies were made available for distribution through other professional organization and governmental agency distribution channels.

Study tours provided valuable exchange opportunities for CEE personnel to meet their professional peers and become acquainted with US industrial and regulatory practices and policies. The types of tours are listed under each country program.

Information dissemination was a key program element. Much of the experience gained from the more than 300 projects was published in various formats. These included technical manuals, waste minimization case studies, project results in both written and video formats and PPC marketing and capability brochures. Shorter videos were also completed for several projects and published on CD-ROM.

Written and video materials were prepared in local languages including Bulgarian, Czech, Estonian, Hungarian, Latvian, Lithuanian, Polish, Romanian, Russian, Slovakian and Ukrainian in addition to English. A list of publications and videos is in Appendix B.

1.2.2 Technical Assistance to Industry

WEC worked with industries to introduce industrial pollution prevention concepts and to apply them as a matter of regular business practice. WEC provided technical assistance, training and equipment to industries to assess environmental problems; to motivate and encourage management in pollution prevention efforts; to demonstrate private sector approaches to industrial environmental management; and to address hazardous waste management issues.

The term "waste minimization" is used in this report not in the formal US regulatory definition. It is generally considered by WEC to be descriptive of broad efforts to reduce or eliminate the generation of wastes and is consistent with the spirit of other pollution prevention and cleaner production program activities.

The Industrial Waste Minimization Program (IWMP) was developed in response to USAID's increased emphasis on long term capacity building. The IWMP also supported USAID economic restructuring goals through its focus on the economic benefits of environmental improvement projects. Demonstrating the benefits of waste minimization by local participants was an effective peer communication technique laying the foundation for wider dissemination of successful projects to a broader audience. Linking economic benefits with profits gained the attention of upper management and garnered support for continuation and expansion of waste minimization programs.

The IWMP demonstrated waste minimization in companies through a series of regional workshops to introduce waste minimization policies and methods using case studies that added a practical dimension to the training. This training was followed by in-depth, technical assistance in individual plants emphasizing no-cost/ low-cost waste minimization projects. After waste minimization projects were identified, US monitoring and/or process equipment were selected and installed. The results were measured and reported to other companies in the industrial sector at a results seminar. A more detailed description of the IWMP is in Appendix A.

The final step in institutional capacity building was the establishment of Pollution Prevention Centers. The purpose of organizing PPCs was to provide a focal point for technical assistance to industries through on-site assistance, workshops and training seminars and information dissemination via library and PPC web-sites. The PPCs adopted mission statements focusing on long-term goals to support sustainable development, reduce environmental impacts and increase production efficiency. They worked toward restructuring of industry via quality and environmental management systems and low-cost waste minimization alternatives to traditional "end-of-the-pipe" pollution controls and technologies.

The 11 centers in all nine CEE countries (three in Poland) were established to develop a technical expert consulting capability providing practical pollution prevention information. Although the WEC cooperative agreement was expanded in 1995 to include the CAR and Ukraine, mission resource constraints precluded the establishment of PPCs in these countries. WEC did provide training for an independent NGO representative in Kazakstan who established a PPC with other donor support.

The PPC organizational and management structure varied by country and local conditions. Five PPCs were established at universities, three at business assistance organizations, and one each at a government management institute, an NGO and a private consulting firm. While most did not have advisory boards, they all had good connections and working relationships with industry and professional engineering groups or industries from past work experience.

PPCs provide a wide range of services depending on local circumstances and capabilities. ***Technical assistance and training*** activities are common to all PPCs. Several provide varying levels of ***monitoring and laboratory services*** using USAID provided equipment. A few offer ***policy development services*** to ministries, but most provide input on an informal basis through affiliations with professional associations and personal contacts with ministry personnel. Several PPC directors serve as appointees to ministry level environmental advisory bodies. In the final two years of the cooperative agreement, five PPCs were trained in ISO 14001 by WEC. Others obtained ISO certifications on their own and are providing ***environmental management systems*** consulting services. The Lithuanian PPC, building on the training and support provided by WEC, is now providing ***project financing assistance*** through another donor organization. ***Information dissemination***, a function performed by all PPCs, is accomplished in several ways. These include seminars and workshops, home pages on the Internet, computer databases, books, pamphlets and brochures describing PPC activities, case studies, newsletters and journals, and technical libraries.

An Internet server was installed at the PPC in Opole, Poland to link all PPCs. The web-site enables them to establish their own home pages or established links to the PPC server. While Internet access for many industries is still limited, the server enhances the PPCs' ability to market their services and respond to inquiries over the Internet. This capability will become increasingly important in the future as Internet access increases.

1.2.3 Policy Development

WEC initially managed subcontracts with the Harvard Institute for International Development (HIID) and the Environmental Law Institute (ELI) on the analysis, development and implementation of environmental and economic policies and programs. These policy reform initiatives were aimed at supporting the emerging democracies of Central and Eastern Europe. Short and long term country advisors worked directly with ministers and high-level ministerial staff to review environmental, economic, taxation, privatization and other related policies, regulations and statutes. Revisions or new

regulations and legislation were drafted. Study tours were organized to introduce CEE policy and decision-makers to their US peers to better understand how US experiences could be transferred to CEE.

The HIID provided technical assistance to support price reforms, self-sustaining environmental investments, private sector and market driven environmental investments and financing mechanisms. HIID worked closely with various ministries including the Ministries of Environment, Industry and Energy, Economy, Finance and Privatization to gather information, develop case studies, and draft policies and regulations.

ELI worked on the development of public right to know policies and legislation to provide for more transparent procedures and public access to environmental information.

Individual in-country environmental policy advisors worked in Czechoslovakia and Hungary on the first environmental liability policies, a crucial element in the valuation of industries being privatized. A resident liaison person was assigned to the World Bank to participate in bank project reviews. This involvement helped USAID, its contractors and grantees identify bank projects that could advance USAID objectives through better coordination and leveraging of USAID and other donor funds.

Study tours dealing with solid waste management linked solid waste professionals in the New York City Department of Sanitation with major CEE city representatives from Poland, Hungary and the Czech Republic. They exchanged information, experience and experts in organizing solid waste collection and disposal strategies. Another study tour for private sector Hungarian hazardous waste managers dealt with US hazardous waste management practices and regulatory issues.

1.3 Project Organization and Management

1.3.1 Overview

The International Environment Development Services (IEDS) staff in New York had the overall responsibility for managing the projects under the cooperative agreement with administrative and financial support from WEC program staff. Project manager responsibilities included: reconnaissance trips to meet with ministry and regional environmental authorities to identify participating companies; recruit participating companies; recruit local in-country coordinators to manage local activities; identify and recruit US volunteer and paid technical experts; organize and conduct study tours, training workshops and waste minimization projects; provide management support to Pollution Prevention Centers with business plans, budgets and marketing materials. Project managers were organized into two regional areas: Region I – Poland, Estonia, Latvia, Lithuania, Kazakstan and Uzbekistan; Region II – Bulgaria, Czech Republic, Hungary, Romania, Slovakia and the Ukraine. Project managers were assigned project management responsibilities by country.

A key element in the success of the IWMP was the use of US consultants with direct industry experience. All experts, whether pro bono or paid, had extensive technical knowledge and experience. IEF member companies were the source of many experts. Their assistance and support in group training and technical site visits was critical in establishing WEC credibility.

1.3.2 Local Organization and Coordination Activities

The success of WEC programs was strongly related to establishing good in-country contacts and personnel to assist in the organization, development and monitoring of program activities in each country. In the start-up phase of the programs, this was accomplished by engaging country coordinators. The criteria for these positions included a good technical background, familiarity with environmental laws and current issues, and good networking contacts at the national and local level and in the government and industry sectors.

Institutional arrangements varied by country, with coordinators coming from either industry or ministerial backgrounds and experience. Given that the primary clients were from industry, affiliations with industry related organizations were preferable. In CEE and CAR, coordinators spanned the range of industry, government and academic and research institute sectors. In several cases the coordinators ultimately became affiliated with the Pollution Prevention Centers (PPC) that were established at business industry associations (Bulgaria, Czech Republic, Latvia); at government sponsored institutes (Estonia); at universities (Hungary, Lithuania, Poland, Slovakia); at an NGO (Romania); and at a private consulting firm (Poland).

The nature of the organization where PPCs were established presented distinct advantages and disadvantages regarding their ability to relate to industrial clients, to develop good business plans and to deliver services. Critical factors included the reputation of the organization, technical credibility, knowledge and familiarity with industry perspectives and needs; well-established ties to industry and key government institutions and key managers; and compatibility of missions with partner organization.

The degree to which these factors were present and the leadership skills and personality of the PPC directors were key factors in the effectiveness of the PPC in creating a favorable environment for promoting sound environmental management practices.

In the early phases of the program environmental and industry ministries were key contacts to identify possible industry participants. Some companies were suspicious of this connection due to the regulatory responsibilities of the ministries. WEC's independent status as a non-advocacy organization and its large multinational company support was an important element in gaining the confidence of the industries. Two developments worked to reduce or eliminate this concern – dissemination of successful project results by peer companies and increased levels of privatization leading to more independence from government management of companies.

1.3.2 Relationships with USAID and Other Donor Organizations

In addition to the formal program manager liaisons, WEC had senior policy advisors in residence at both USAID and World Bank offices in Washington, DC. These staff assignments provided for the exchange of information and "cross-fertilization" of perspectives. The Senior Environmental Policy Advisor (SEPA) at USAID was responsible for evaluation of the fundamental economic relationships between economic development and environmental degradation and their relationship to WEC program activities. The World Bank advisor worked with relevant sector operating divisions responsible for environmental project financing. This work was in support of the Environmental Action Plan (EAP) adopted at the Lucerne Conference to better coordinate donor support. These activities included development of alternative investment concepts for environmental projects and matching projects identified through the IWMP with potential national and international funding sources.

WEC representatives also responded to numerous speaker invitations from international organizations including the World Bank, the European Bank for Reconstruction and Development, the Inter-American Development Bank, the United Nations Environment Program, the Organization for Economic Cooperation and Development, the United Nations Industrial Development Organization and Scandinavian donor organizations. On the national level there were both formal and informal contacts with various governmental ministries from other donor countries with environmental assistance programs. At the EAP meeting of environmental ministers in Sofia in October 1994, WEC participated in the industrial and environmental plenary session and provided 200 sets of reports summarizing WEC's USAID supported activities in CEE.

WEC informally coordinated its activities at the program manager level through contacts with other donor organizations in some countries, e.g. the Norwegian Cleaner Production Program in Lithuania, Estonia and Latvia. In some cases this was facilitated by formal other donor program support for PPCs (Lithuania, Estonia). At the close of the term of the cooperative agreement, these informal contacts led to the merger of the UNIDO National Cleaner Production Center and the PPC in Slovakia.

II. Major Accomplishments and Lessons Learned

This chapter summarizes the major accomplishments and lessons learned in outreach and training, technical assistance and policy development areas.

2.1 Outreach and Training

2.1.1. Representative Accomplishments

WEC developed, organized and conducted training in environmental assessments, waste minimization, environmental management systems, business plan development, marketing and public relations for more than 2000 representatives of industry, private sector consultants, academic institutions and government ministries. WEC delivered training in all CEE countries and the Central Asian Republics of Kazakstan and Uzbekistan. The high level of acceptance and subsequent application in plants is attributed to several factors including:

- Use of experienced industrial sector experts
- Emphasis on practice over theory using case studies
- Emphasis on the economic benefits and enterprise profitability
- Use of customized technical manuals and reference materials in the local language
- Publication of results through seminars, videos and CD-ROMs

WEC's initial training activities were broadly based and conducted in three phases – general environmental awareness and outreach for industry, government and academic representatives; specific waste minimization methods and practices for industries; and business development and environmental management skills for Pollution Prevention Centers.

The transition from awareness to specific skill sets development was based on USAID's changing priorities that emphasized institutional capacity building. WEC then developed waste minimization specific course materials. Coupled with on-site technical assistance, the courses were designed to promote opportunities for identifying and implementing waste minimization projects in industries. This effort was eventually expanded to cover 28 industrial sectors in 11 countries as detailed in Table 2.1.1. Industry managers and technical staff increasingly began to understand and apply the relationships between and among business profitability, environmental and regulatory issues, employee health and safety, and community relations.

The development and implementation of company-wide waste minimization programs was an important indicator of training effectiveness. Anecdotal and post training workshop site visits confirmed that many industries initially adopted programs. The degree to which these programs were continued over the long term was difficult to assess since technical skill is only one factor affecting long-term behavioral changes. In general, economic conditions appeared to be the most significant factor affecting systemic changes.

Finally, consistent with the USAID capacity building goal, PPCs were established, trained and equipped to provide technical assistance and support to interested companies.

The break up of the Soviet Union disrupted and eliminated many contacts and relationships with technical institutes that provided timely and regular access to experts as well as technical and research information. The Pollution Prevention Centers played an increasingly important role in filling this void by developing reference libraries on pollution prevention and environmental management systems.

WEC also kept pace with the emerging use of current information technology advances including electronic document formats established by USAID and the Internet. A web-site was established at the PPC in Opole, Poland to provide individual country programs with one easily centrally accessible source of information on pollution prevention. The home page and server contains links to WEC, USAID and reports on industry-specific applications of pollution prevention techniques, training materials and WEC reports, case studies, videos and CD ROMS.

Monthly activity reports were prepared and widely distributed to USAID offices in Washington DC and in each mission. Other USAID contractors, other cooperating donor organizations and interested parties also were kept up to date of WEC activities. A distribution list is included in Appendix D.

Table 2.1.1
Key Industry Sectors Assisted by WEC Country Programs

Sector	Bulgaria	Czech	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Kazakstan	Ukraine	Uzbekistan
Battery				X			X	X				
Cement						X				X		X
Chemicals	X	X		X		X	X	X	X		X	X
Dairy			X		X		X					
Dyes							X					
Electroplating			X	X	X	X	X					
Fertilizer			X			X	X					
Non-Ferrous							X				X	
Food	X		X		X							
Furniture			X	X		X						
Glass	X	X										
Heating								X				
Lithography			X									
Machinery	X											
Meat Processing			X				X					
Metallurgy				X			X		X		X	
Metal Finishing			X		X							
Mining	X											
Oil Shale Refinery			X									
Paint Spray												
Petrochemical	X	X					X	X	X		X	
Pharmaceutical	X				X							
Plastics						X						
Refinery	X	X								X		
Rubber					X	X	X				X	
Tannery			X	X	X			X				
Textiles					X							
Wood Processing			X									

2.1.2 Lessons Learned

Develop a Better Understanding of USAID Environmental and Economic Restructuring Objectives - A better understanding of long term strategic goals and contractor relationships would have resulted in more effective delivery of training to related client groups, e.g. regulators, industries, consultants and academia. Joint contractor development of environmental and business training programs would have mutually advanced USAID's environmental and economic restructuring objectives. Early training activities addressed environmental and business as separate topics. Discussions with providers in both areas led to better integration of business and environmental topics and fostered networking between and among industries, regulators, consultants and academia. This approach helped industries and governments understand the larger issues such as European Union (EU) membership, western investment expectations related to environmental management systems and other market driven demands. For example, the interest in ISO 14000 standards due to EU accession negotiations showed the strong links between environmental management systems (EMS), waste minimization and company profitability and competitiveness. This increased awareness would better support USAID technology transfer and trade development efforts.

Develop a More Formal Coordination Mechanism With Other Donors – A two level process is needed to make the best use of resources committed to PPC development – a more meaningful dialogue at the multinational level among major waste minimization providers; and better planning at the national level through international donor coordinators. There are essentially three international donor organizations involved in waste minimization/cleaner production activities – USAID through the WEC, the Norwegian Cleaner Production Program and UNIDO National Cleaner Production Centers. While the Environmental Action Plan Support (EAPS) was established to better coordinate donor support and more efficiently use resources, the linkages between and among these three donors in this area never effectively materialized. The OECD EAP Task Force Secretariat report, *Cleaner Production Centres in Central and Eastern Europe and the New Independent States*, provides an excellent summary of CP activities worldwide. While the report identifies the key factors which foster or inhibit the development of CP centers, there appears to be no effective multilateral mechanism to effect meaningful changes at the program level. An OECD sponsored meeting of CP providers and international donor coordinators to address these recommendations would be valuable.

Develop a Waste Minimization Development Strategy Linked to Environmental Management Systems (EMS) – Where multilateral donor opportunities and interests coincide, national waste minimization strategies should integrate the strengths of the various donor organizations. The WEC experienced based approach would be best used in early awareness phases to introduce waste minimization concepts. These quick result demonstrations should be highly publicized and used to recruit additional companies. Companies demonstrating managerial commitments to develop more comprehensive systems could enroll in a longer term Norwegian CP type program providing more in depth training aimed at systemic changes. National environmental policies must be developed to foster waste minimization and EMS programs.

Case Study based, Highly Interactive Training is Most Successful – Participants rated case study based, highly interactive training workshops as the most effective approach to introducing waste minimization concepts into industry. Two factors appeared to be most influential. First, participants responded very favorably to "real world" practical examples based on western industrial experience and the presence of US industry experts. Second, interactive group problem solving and brainstorming sessions fully engaged the participants. Setting an experience base first and then integrating waste minimization theory and principles was found to be more effective than the traditional lecture approach.

Direct More Attention to Training for Small and Medium Sized Enterprises (SME) – Initial recruitment activities were directed at large companies since the SME sector was not well developed. Environmental ministries preferred large companies since they were also major pollution sources. At the later stages of the program, the emerging interest in ISO 14001 focused much attention on SMEs, which have significant roles as suppliers. Anecdotal field information indicated that SME demand for training was increasing due to EU environmental harmonization and increasing pressure by western investors for ISO 14001 certified suppliers.

A Viable Environmental Consulting Sector Is Critical to Adoption of Waste Minimization Practices – Wide scale and effective dissemination of waste minimization practices and methods is strongly linked to the presence of a viable environmental consulting sector. Since most participants came from industries and returned to companies, the "train the trainer" benefits in spreading the skills learned in workshops were generally limited to the companies from which the participants came. In the early program delivery stages, economic conditions did not foster private consultant activities. These conditions still exist in CEE, especially in the southern tier countries. Overall, training contributed to the development of a local cadre of technical experts with skills to become professional environmental consultants as the market for these service increases.

Information Dissemination Methods Need to Keep Pace with Technology – Access to timely technical information through the reference libraries and Internet access available to PPCs made an important contribution to the sustainability of the PPCs. The investment in computers and a computer server at PPC/Opole will continue the ability of linked PPCs to meet the demands of industries for timely and relevant information.

2.2. Technical Assistance to Industry

The initial short term event activities, e.g. environmental assessments, workshops and study tours eventually evolved to meet changing USAID program development goals to build institutional capacity. This was achieved by the development of the three phase IWMP described in Appendix A. The 11 Pollution Prevention Centers (PPC) should have been established sooner as the focal point for institutional capacity building in each country. Despite their late start, however, the PPCs now provide one or more of the following: technical consulting services in waste minimization and environmental management systems (EMS), training, environmental measurements and analyses, and technical information services. The long term success of the PPCs will be determined by several key factors including: the continued revision and implementation of business plans; PPC responsiveness to economic conditions and government policy decisions supportive of waste minimization and EMS; and EU accession and regulatory harmonization forces.

2.2.1 Representative Accomplishments

WEC programs achieved significant economic and environmental benefits leading to improved industrial efficiency and reductions in the use of raw materials, water and energy. Initial awareness of waste minimization policies, procedures and benefits was minimal. WEC helped industries understand both the economic and environmental benefits to improving enterprise competitiveness.

More than 140 companies in 28 sectors identified and implemented more than 300 waste minimization projects. Table 2.2.1 summarizes the investments made and the economic benefits derived. WEC publicized numerous case studies of successful implementation of waste minimization projects. Some underreporting is probable for several reasons. First, company accounting procedures were generally not consistent with US practices and were not able to quantify cost elements and savings. Second, sharing of cost information was not an accepted practice within different operating departments within many of the companies. Third, some companies still harbored suspicions regarding the intended use of information gathered in conjunction with projects, especially the possibility that the information would be used by regulatory authorities or would be shared with competitors.

Table 2.2.1

Summary of Investments and Economic Benefits of 308 Waste Minimization and Energy Conservation Projects at 144 Plants in 12 Countries

Country	No. of Plants	No. of Projects	Investment in U.S. $ (000)			Savings
			USAID	Plants	Total	U.S.$ /year (000)
Bulgaria	14	28	44.5	19.5	95	637
Czech Republic	9	29	45.6	1,139.4	1,180	2,490
Estonia	7	20	57.3	40.7	98	553
Hungary	10	23	59.9	420.4	480.3	747
Kazakstan	2	6	52	42.5	94.5	1,322
Latvia	11	18	108.6	97.8	206.4	1,021
Lithuania	8	13	92.5	75	167.5	473.2
Poland	37	82	463.68	2,538.65	2,992.33	12,043.11
Romania	19	42	110	300	410	3,350
Slovakia	13	23	46.9	194	240	1,290
Ukraine	12	21	210	94.5	304.5	2,125
Uzbekistan	2	3	44	0	44	1053
TOTAL	144	308	1,334.98	4,962.45	6,312.53	27,104.31

Table 2.2.2
Estimates of Environmental Benefits for 115 Waste Minimization Projects In Central and Eastern Europe[1]

Selected Air Pollutants	Emission Reduction (tons/year)
Ammonia	1,010
Benzene	1,068
Hydrogen Sulfide	40
Lead Oxide	132
Particulates	1,108
Particulates (containing heavy metals)	390
Sulfur Dioxide (SO_2), Nitrogen Oxides (No_x) and Carbon Monoxide (CO)	Significant [2]
Vinyl Chloride	300
Volatile Organic Compounds	2,230
Selected Water Pollutants	**Discharge Reduction (Tons/Year)**
Acetone	170
Ammonia	270
Sodium Hydroxide	5,400
Sulfuric Acid	3,800
Wastewater (containing metals and other contaminants)	1,530,890
Selected Hazardous Waste Materials	**Disposal Reduction (Tons/Year)**
Electrolytes	9,000
Hazardous Wastes (miscellaneous)	7,130
Sludges (containing metals)	1,350
Sulfuric Acid (contaminated)	45,000

[1] From the total waste minimization projects implemented, data for environmental benefits was only available for 115 projects. Additional environmental benefits associated with decreased water, energy and raw material usage were also realized.

[2] Energy conservation activities associated with many of the waste minimization projects are projected to result in significant reduction in SO_2, SOx and CO emissions from reduced fuel combustion.

2.2.2 Lessons Learned

Management Commitment is Essential to Program Success – Management commitment was the most significant factor for successful program implementation. WEC required management participation in all phases of the program from selection to implementation to reporting the results. This was formalized in a brief Memorandum of Understanding (MOU) outlining the responsibilities of the company and WEC. The most successful programs were those where management remained involved, encouraged and rewarded worker involvement and established formal management systems to continue the program after WEC involvement was completed. When one or more of the three elements - management commitment, worker participation and a systematic approach - were neglected the programs suffered or failed. Successful programs require a two tier motivational approach - stressing profitability to management and responsibility and rewards to workers.

Profitability Was the Bottom Line Motivator – Participants were not primarily motivated by altruistic appeals to environmental improvements. Forward thinking management recognized that economic and environmental improvements were closely linked, especially in those countries in line for EU accession. This became more apparent as companies were privatized and profitability was in the hands of management. This perspective worked to the advantage of later course presentations that emphasized the economic benefits. Managers from successful companies were strong advocates in publicizing the benefits of waste minimization to their peers.

US Industry Experts and Technology Are Well Respected – Experts with practical multinational industrial experience were able to quickly establish credibility and trust, leading to good working relationships. Early program implementation was frequently met with suspicion. Experts who engaged workers on the basis of shared experience put them at ease by "speaking their language" in the technical sense. The high level of interest in US technology and methods formed the basis for working cooperatively.

Broad Based Technical and Business Management Programs Are More Effective When Linked - By design, WEC focused primarily on no-cost/low-cost process efficiency improvements that produced immediate, substantial and visible benefits, thereby promoting higher levels of adoption of waste minimization techniques. This approach worked well for the initial stages since it was focused and project oriented. However, industrial plants often wanted more comprehensive solutions that could address both environment and business related needs. This presented opportunities to introduce the importance of having business strategies that integrated technology, environment and good business management practices. Better links with other USAID sponsored programs in business development, financial management practices, e.g. activity based cost accounting, energy conservation, and environmental management systems, are needed to develop sustainable programs.

PPCs Should Be Established Concurrently with Industry Technical Assistance Programs – PPCs were established after the demonstration and impact phases of the IWMP were completed or almost completed. This development sequence resulted in lost time from an organizational and staff development standpoint. Developing the technical skills of personnel was a fairly easy problem to address. Organizational development, however, is much more complex, requiring the integration of staff skills, team building, acquisition of equipment and staff training.

Gaining and establishing organizational credibility and reputation can only be achieved by successful performance over time. In addition, the fast paced changes in CEE required a constant reassessment of how to keep current from a business development perspective. Three items would have fostered more timely PPC development: (1) immediate development of business plans with regular updates; (2) better integration of USAID and other donor environmental and business development programs for PPCs; and (3) more emphasis on PPC networking between and among USAID, UNIDO and the Norwegian CP program.

Earlier development of PPCs may have avoided the duplication of such centers under different donor organizations, or at least enhanced the possibility of cooperation and ultimately mergers, such as occurred in Slovakia.

Integrate Pollution Prevention and Environmental Management Systems – Market driven forces, especially EU accession, generated significant interest among companies to understand the business implications of certification to ISO 14001, environmental management systems (EMS). Several major automotive and electronic sector companies (Ford, Volvo, IBM) notified their suppliers that voluntary certification to ISO 14001 was expected. This level of interest only developed in the last two years when the demonstration and impacts phases of the IWMP were largely completed. Recognizing the trend, WEC initiated ISO 14001 training for several of the PPCs to position them to meet the expected demand for ISO certification. This investment in training reaped rewards since several PPCs are now providing EMS services to private industries. Since waste minimization has the basic elements of ISO 14001, the prior experience is now being directly transferred to new clients to increase production efficiency, enhance corporate image and effect continual improvement.

PPCs Should Take a More Active Role in Promoting Governmental and Other Institutional Pollution Prevention Policies – PPC sustainability is highly dependent on several factors such as: the condition of the economy; the level of regulatory enforcement; supportive waste minimization policies; industry perceptions that environmental improvements "cost" money and do not "save" money; and traditional reliance on "end of pipe" solutions. A concerted, broad-based approach engaging other stakeholders is needed. Emerging international and regional markets and EU accession are key driving forces.

Project Identification and Financing Source Links Are Needed – Rampant inflation, lack of a well developed banking system and the legacy of a centrally controlled economy added to the difficulty of matching project financing with the sources of capital. Helping companies to identify and develop technically and financially feasible projects would meet an increasing demand among industries unfamiliar with project financing. This expansion of PPCs services into the financial sector to provide services such as due diligence evaluations, technical project feasibility evaluations and training of loan officers would be beneficial. The Lithuania PPC is the best example through its project identification and financing work with Norwegian financing sources.

2.3 Policy Analysis and Development

2.3.1. Representative Accomplishments

WEC's industrial sector experience, coupled with HIID's economic and environmental capabilities and ELI's regulatory and legal expertise, worked together to develop a multi-faceted policy framework to encourage industries to adopt practices leading to greater efficiency and thus become more competitive. As PPCs gained experience and credibility, they became increasingly involved in providing valuable input on waste minimization and its importance as an integral element of national environmental action plans (NEAPS) and other statutory and regulatory initiatives. Demonstration projects and publication of results were important factors leading to the inclusion of waste minimization as an important environmental priority in the Estonia, Lithuania and Kazakstan NEAPS.

WEC's policy development initiatives were closely linked to its technical assistance activities providing a foundation for both long-term institutional capacity and program sustainability. Economic and environmental policy reforms were critical to USAID's economic restructuring goals. A "top down, bottom up" approach fostered the concurrent development and growth of technical assistance programs and policies. The exchange of information between the two program activities at the working level provided timely information to ensure that policies enhanced the possibility of industries becoming more competitive.

In-country advisors Jim Scherer and Sandy Hale had extensive policy development experience. In Czechoslovakia, Jim Scherer worked directly at the ministerial level on policy reforms. Working with the Office of the Prime Minister and the Ministries of Finance, Privatization and Environment, he was instrumental in developing and codifying environmental liability provisions into the quickly developing privatization statutes. These provisions were critical to maximizing the economic evaluation of state owned enterprises. There was a delicate balance to be established and maintained in negotiating the clean-up responsibilities of purchasers without jeopardizing the sale of the assets. Advisors contributed to an improved understanding of the economic risks from improper environmental liability assignments, insecure property rights and cumbersome regulations. They were instrumental in preventing intrusive and restrictive environmental policies by introducing more consistent and predictable rules.

Sandy Hale was part of the USAID, WEC and World Bank team that developed the first Environmental Action Plan (EAP) for Czechoslovakia. In Hungary, Mr. Hale concentrated on economic analysis and strategic planning issues, resulting in reports and policies related to the economic cost implications of poor air quality; the development of economic instruments such as the auto fuel charges and financing for the Water Fund. In cooperation with the Ministry of Finance and Budapest University of Economics, he analyzed restructuring and privatization issues leading to reforms in these areas. Coordination with other USAID contractors and donor organizations was a critical part of his work, especially in the initial phases of the technical assistance and advisory activities. These counterpart organizations included the World Bank, PHARE, WASH and RTI. This work was an integral part of the follow up activity that occurred after the establishment of the separate Czech and Slovak Republics.

The HIID policy reform initiatives involved the assignment of an in-country advisor over a multi-year timeframe. The initial efforts were aimed at raising the understanding of policy and decision-makers in applying environmental economics to environmental problems

through a series of seminars including multilateral seminars. Ministry officials teamed with HIID representatives to analyze and draft policies on such topics as user fees and charges, integration of economic policies and permitting systems, economic analysis of funding options for national environmental protection funds and emission trading. Case studies were prepared to demonstrate the use of innovative, cost effective economic approaches in environmental control. The case studies were useful tools to examine the prospects for revamping and improving regulatory systems and natural resource pricing mechanisms. This assistance led to improved strategic planning, priority setting and environmental policy formulation and implementation and improved coordination with other donors e.g., EC-PHARE, the World Bank, the European Development Bank, the Nordic Investment Bank and other bilateral donors.

Specific activities included multilateral seminars in which HIID specialists explained user fees and pollution charges. The Ministry of Environment usually hosted the seminars with invitees from other donor countries. Policy seminars were held by HIID and other environmental economists to show how environmental economics could be applied to address environmental problems. The environmental ministries coordinated and identified priority topics for the policy seminars. Regional policy case studies were typically used to present the findings from the policy analyses in order to present practical solutions grounded in the CEE context. Topics included an analysis of the design and implementation of a system of pollution permits for industry and a case study on royalties for natural resources extraction, e.g., forest resources.

The case study on industrial pollution permits involved developing a system of industrial emission permits for water pollution, air pollution and hazardous waste. Specific procedures were developed establishing allowable emission levels and compliance schedules and development of tradable pollution rights/permits to ensure effective pollution control at lowest cost.

The case study on natural resource extraction and use considered investments in previously mentioned activities, establishment of long-term concessions for the timber industry, economic aspects of forest management and forest legislation and the development of a value-added forestry industry.

HIID provided information and relevant literature on selected environmental economic analyses conducted in other CEE countries in which it worked.

ELI was instrumental in developing institutional analytical capacity in ministries through specialized training programs and workshops on environmental law, regulatory standards and redrafting of environmental laws. ELI began its work in 1991-92 in Poland, Hungary and the Czech and Slovak Republics, later extending its activities into Romania and Bulgaria. It hosted an international roundtable on practical approaches to implementing environmental laws. ELI activities also resulted in introducing more transparent decision-making processes by providing public access to information through public participation reforms. These early efforts led to more decentralized decision-making and increased local participation and democratization.

2.3.2. Lessons Learned

Long-term, Multi-level Ministry Relationships are Critical to Policy Development – Adequate time (2-4 years) is needed to develop good working relationships at the decision making and program implementation levels in all related ministries. Bureaucratic hierarchies from the past were highly segmented with little or no experience of joint planning or program development. Environmental ministries generally had little or no influence compared with economic and trade ministries. Long-term in-country advisors provided the best opportunity to develop good working relationships. They were thus able to identify and cultivate key ministry staff in affected ministries to facilitate policy development. Frequent personnel changes due to government reorganizations hampered the development and implementation due to lack of continuity.

Contractor and Other Donor Collaboration is Vital - The interaction of economic, environmental and regulatory policies warrant more formal coordination mechanisms between and among USAID contractors and other donors. This should include the distribution of contractor contact lists to all providers, periodic coordination meetings with appropriate mission program managers, better notification of contractor travel schedules and distribution of brief progress reports. Collaboration on the development of strategic objectives and measures of performance could also be improved to complement other donor programs. Some measure of success was achieved at the national level through the EAP process.

COUNTRY PROGRAM SUMMARIES

BULGARIA

CENTRAL ASIAN REPUBLICS
KAZAKSTAN
UZBEKISTAN

CZECH REPUBLIC

ESTONIA

HUNGARY

LATVIA

LITHUANIA

POLAND

ROMANIA

SLOVAKIA

UKRAINE

The summaries of the activities in each of the CEE and CAR countries include a background description and information about the main types of activities conducted (environmental assessments, waste minimization/energy conservation and study tours). Beginning with environmental assessment workshops and plant assessments, a traveling team of US experts with industrial, business development and regulatory experience, targeted technical and economic managerial staff at the plant level with workshop attendees from local industry, government and environmental protection authorities and consultants. Training activities included plant specific training, topical training for enterprises in the region and study tours in the US.

Training and outreach efforts proved to be an effective tool in raising the awareness of environmental assessments, waste minimization and energy conservation opportunities among industrial managers, technical staff and government and environmental protection representatives. Training and sharing US experience was a vital element in generating interest and technical initiatives at the plant level. WEC training resulted in an increased ability of enterprises to draw links between inefficiencies in production and lost revenues, environmental impacts and workers' health and safety hazards.

With an average of 25 participants per workshop it is estimated that between 800 to 1000 persons were trained in environmental assessment, waste minimization and energy conservation. Typically, WEC worked with 10-15 member teams in plants resulting in between 2000-3000 persons applying theory to practice in their companies.

Working with environmental and trade ministries, WEC recruited companies that were leaders in their field to develop a cadre of managers who could identify and recruit their peers in other companies to participate in future programs. Companies were generally eager to meet with US experts to get information on current technologies and practices and to be identified as having contacts with westerners. This approach enabled WEC to get early "grassroots" feedback on issues of importance to companies and thus shape future program development.

The success of this outreach is evident from the list of more than 200 participating companies in Appendix B, which does not include firms that were contacted but could not participate.

Environmental assessments usually involved a "walk through" of a plant to identify production efficiency and energy conservation opportunities. WEC experts briefed key plant personnel on their findings and followed up with a written report to the company. The report findings presented practical recommendations on improvements that could be quickly implemented at little or no cost to reduce environmental emissions, use less raw material and energy and increase product yields.

Workshops generated awareness and interest in taking the next steps to develop a systematic approach to identify additional cost saving opportunities. Participants received a workshop manual customized to meet the business, technical and cultural perspectives of the participants. The first manuals developed were patterned on the USEPA " Waste Minimization Opportunity Assessment Manual" and the USEPA "Facility Pollution Prevention Guide". WEC then developed two customized manuals that were printed and distributed extensively (WEC "Waste Minimization Manual, 10 Steps for Success" and WEC "Energy Conservation Manual"). This early field experience was critical in developing the Industrial Waste Minimization Program (IWMP), responding to USAID's institutional

capacity building goal. The IWMP is described in Appendix A. The results of these activities were summarized in the accomplishments section of the report.

Study tours brought representatives from various industry and government sectors to the U.S. to gain first hand experience about current technology and work practices and how U.S. companies, regulatory agencies and trade and business associations work together on environmental issues.

The country program summaries are described in the context of the Pollution Prevention Centers that gradually took on the coordinating, training and consulting roles. PPC development was fostered by extensive training and consultation in three critical areas - business planning and development, marketing, and consulting. Jay Gronlund of the Pathfinder Group, a New York based consulting firm, worked with the PPCs on the first two areas. James Stouch, P.E. from Malcolm Pirnie, Inc., worked on consulting skills.

The success of the WEC program can be attributed to several factors. First, its broad base of technical expertise with international experience accessed through its member partners in the IEF. Second, its ability to organize a broad spectrum of experts with practical, "real world" experience and the skills to share and apply that expertise at the plant level. Third, its perspective and experience of how good industrial practices can yield both environmental and economic benefits when applied in a regular and consistent manner.

Industries, ministries and business and trade groups in CEE, CAR and the Ukraine were successful in understanding and applying these ideas and practices and continue to be so.

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Background

The Bulgaria program started in 1992. In coordination with USAID Sofia, WEC established initial contacts with the Ministry of Industry and Ministry of Environment. Early program activities were aimed at raising awareness through environmental assessment workshops and the conduct of environmental assessments in a broad range of industry and government sectors. In 1993 WEC hired an In Country Coordinator who assisted WEC in laying the foundation for waste minimization activities. The Clean Industry Center (CIC) was established as a separate operation unit of the Bulgarian Industrial Association (BIA) in September 1995. The BIA is the major business association, which represents companies, entrepreneurs and employers of the state, private, cooperative and municipal sectors. The BIA and Center long-term sustainability goal was the introduction of environmental management systems and low-cost waste minimization solutions in industries. Both organizations shared a common goal to work with small and medium sized businesses (SMEs). An earlier attempt to establish a PPC at a research organization was not compatible with the industrial focus of the WEC programs.

USAID supported training laid the foundation for the development of a staff with expertise as certified third party auditors of environmental management systems, corporate finances, project management, waste minimization methods and environmental legislation and waste management. Environmental monitoring equipment purchased with USAID funds provided high-tech equipment for precise gas-emission measurements providing a competitive edge.

The CIC was a leader is several other areas including the operation of a "Waste Exchange Program" and maintenance of databases on air emissions, water discharges, solid waste and polluted soils of large industrial polluters. They supported the establishment of the National Pollutants Release and Transfer Register, an inventory of toxic releases.

Representative activities conducted by the CIC are listed below.

1. Environmental Assessments

- Environmental Assessments for Agriculture and Natural Resources
- Environmental Assessments for Parks and Protected Areas
- Environmental Assessments for Coastal Zone
- Environmental Assessments of Stomana Steel Works in Pernik
- Environmental Assessments of Komet Steel Works in Pernik
- Environmental Assessments of Municipal Sanitation Operations and Municipal Public Service Department in Sofia
- Environmental Assessments of LUV Tannery in Gobrovo
- Environmental Assessments of Eintex/Rune Textile Plant in Gobrove

- Environmental Assessments of Sugar Plant
- Assessment of Environmental NGOs
- Environmental and Energy Assessments for enterprises participating in the Waste Minimization and Energy Conservation Demonstration Program

2. **Waste Minimization Program (WMDP &WMIP)**
   The Waste Minimization Program was implemented in 14 industrial enterprises with 28 projects resulting in savings of US$637,000.

3. **Study Tours**
   Study tours were organized to various organizations including industries, trade and professional associations, environmental regulatory agencies, local government agencies and technical assistance programs in the US.
   - Sofia Sanitation Department to the New York City Department of Sanitation
   - Ministry of Environment officials to US regulatory agencies
   - WMIP participants to similar sector plants and US technical assistance centers

Central Asian Republics

Kazakstan

Uzbekistan

Background

The Central Asian Republics (CAR) program, begun in October 1995, was completed in September 1997. It was modeled on the successful Waste Minimization Program conducted in other CEE countries with the exception that it did not establish a Pollution Prevention Center due to resource constraints. Other USAID contractors were completing projects focused on water conservation and pollution control measures, a high USAID priority. The water projects did not have extensive direct industry participation. The waste minimization program provided an opportunity to introduce new environmentally beneficial practices to several industry sectors. The CAR projects represented one of the best examples of how USAID contractors worked together to take advantage of their mutual skills and expertise. The HIID was already working in CAR and had established good working relationships with national and local authorities. CH_2MHill water projects offered a good foundation upon which to introduce waste minimization programs.

This cooperation resulted in nine projects completed at the participating companies listed in Appendix B. In Kazakstan, a unique water conservation project was developed involving the Ministry of Environment, the regional Environmental Inspectorate, the Pavlodar Regional Water Authority, a local industry and the city of Pavlodar officials. The high degree of cooperation was fostered by the role played by USAID Almaty and the HIID Office in Kazakstan. They assisted WEC in establishing initial contacts with local environmental authorities. This was extremely valuable since the regulatory authorities still had significant control over industries compared to other CEE environmental authorities. The private sector provided equipment, which was shared with the regional water authority.

WEC worked extensively with national and local officials. In Kazakstan this included the Ministry of Natural Resources and Environment, Ministry of Economy, the National Environmental Action Plan Office, the Pavlodar Regional Department of Ecology and Bioresources, Pavlodar Oblast Governor's Office, and the Ust'Kamenogorsk Regional Department of Ecology and Bioresources.

In Uzbekistan, WEC worked closely with the State Committee for Nature Protection, Fergana Region Environmental Protection Department, State Construction Materials Corporation, State Oil and Gas Corporation, and the "Atmosphere" Scientific and Research Institute in Tashkent. This last organization served as a local coordinator for the duration of the projects. The late Dr. Irina Darkenbaeva later assumed this role for CAR.

WEC supplemented the USAID funding through a joint funding initiative with another USAID contractor, CH_2MHill, applying for and receiving training funds from the Academy

for Educational Development. This was a good example of USAID contractor cooperation begun informally by the WEC and CH_2MHill project managers.

While there were no funds for establishing a PPC, WEC did provide training and technical assistance to an NGO in Pavlodar supported by EC-PHARE and TACIS. The director participated in the waste minimization training conducted for the companies in Kazakstan and received all the technical manuals and reference materials in Russian.

HIID long-term advisor Michael Boyd was an excellent resource regarding local issues and information about key personnel working in the ministries. His perspective was very helpful in avoiding or overcoming several organizational barriers in the ministries leading to faster program implementation.

Waste Minimization Program (WMDP and WMIP)

The Waste Minimization Program was implemented in four industrial enterprises with nine projects resulting in savings of US$2,375,000.

Pollution Prevention Center in the Czech Republic

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Background

The Czech Pollution Prevention Center (PPC) was established in 1995 with support from USAID. The Center is an independent unit within the Czech Environmental Management Center (CEMC). The PPC, staffed by one part-time and two full-time experts, is a specialized consulting and training center with the mission of removing barriers between industry, government and the public in the field of environmental protection and reducing the negative impact of industrial activities. Over the course of its operation it has expanded the network of cooperating partners to include both national and international industry and governmental organizations such as the Confederation of Industry of the Czech Republic; Ministries of Environment and Industry and Trade; the Czech Cleaner Production Center (CCPC); University of Technology Brno (VUT Brno); United Nations Industrial Development Organisation (UNIDO) & United Nations Environmental Programme (UNEP); Technical University Ostrava; World Business Council for Sustainable Development (WBCSD); and International Network for Environmental Management (INEM).

Building on its WEC cooperation in developing technical assistance, training and information libraries in waste minimization, it expanded its consulting services to include environmental management systems under ISO 14000. Recognizing that capital is often needed to implement larger projects, it also assists companies financing projects through domestic and foreign subsidies and banks. The advent of membership in the EU has expanded consulting dealing with such regulatory affair as harmonization of Czech and EU legislation and new environmental legislation.

From August 1998 to June 2000, the PPC and INEM cooperated on a pilot project, "Pollution Prevention and Environmental Management Systems Consultation in Small and Medium Sized Enterprises" (POEMS). During this period twelve Czech companies implemented an ISO 14001 system together, integrating waste minimization activities. This led to the certification of 21 company personnel as internal EMS auditors. Twenty-five projects were implemented, demonstrating reduced pollution and economic savings. Five of the 12 companies ultimately received an ISO 14001 certification.

1. **Environmental Assessments**
   - Petrochemical industry
   - Energy sector
   - Natural resources management
   - Metallurgy industry
   - Slovinske Lucalne Zavody plant
   - Poldi Steel Works
   - VCHZ Synthesia Chemical Works Pardubice
   - Chemopetrol Fertilizer Plant

2. **Waste Minimization Program (WMDP and WMIP)**

The Waste Minimization Program was implemented in nine industrial enterprises with 29 projects resulting in savings of US$2, 490,000.

3. **Study Tours**

Study tours were organized to various organizations including industries, trade and professional associations, environmental regulatory agencies, local government agencies and technical assistance programs in the US.

- Participation in the International Environmental Accord Conference on Solid and Hazardous Waste Management
- Deputy Minister of Environment to USEPA
- Representatives from Ministries of Industry and Environment to Wayne State University
- Prague Sanitation Department to New York City Sanitation Department
- Representatives from enterprises participating in the WMIP
- Representatives from Ministry of Industry, Vitkovise Steel Plant and chemical plants

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Background

WEC began its activities in the Baltic Republics in January 1992 with the Baltic Republics Joint Environment Mission. These USAID supported studies were conducted as part of a broad examination of critical sectors including environment, energy, housing, transportation and telecommunications. In addition to WEC, the other cooperating organizations were the World Bank and the USEPA. The mission was charged with evaluating the overall health, environment conditions and environmental organizational and policy structures in Estonia, Latvia and Lithuania. The missions included industrial and ministry site visits and the study and evaluation of available environmental and health statistical data and reports. These assessments were used to identify key pollution issues and major sources in order to establish the initial program priorities for USAID sponsored programs.

There were historical environmental program links between the Baltic Republics and the Nordic and other donor countries, e.g. Denmark, Finland, Sweden and Germany. However, these tended to be directed at long term, high capital investment projects compared to the WEC short term, low cost projects.

The PPC was opened in 1994 at the Estonian Management Institute at the Centre for Sustainable Development under the direction of Dr. Anne Randmer, an economist with an extensive environmental background. The PPC became the focal point for coordination of technical assistance to industries by organizing "train the trainer" waste minimization workshops for both industry and ministry personnel. The USAID supported waste minimization work at the RAS Kiviter oil shale processing plant provided the foundation for one of the first major investment projects under the follow on USAID Environmental Action Program.

After USAID program support concluded in September 1996, EMI was privatized and the PPC became EMI-ECO, a private consulting company. EMI-ECO continues as a self-sustaining consulting company through consulting fees and other donor cooperation including PHARE, EBRD, the Nordic Environmental Finance Corporation (NEFCO), World Bank, The Environmental Fund of Estonia, UNDP, UNEP and UNIDO.

1. Environmental Assessments

- The Baltic Republics Joint Environment Mission
- Tallinn Plywood and Furniture Works

2. **Waste Minimization Program (WMDP and WMIP)**
   The Waste Minimization program was implemented at seven industrial enterprises with 20 projects resulting in savings of US$553,000.

3. **Study Tours**
   Study tours to US industrial enterprises, USEPA regional offices and US Pollution Prevention Centers and financial institutions were conducted for the meat processing and dairy sectors.

Hungary	**PPC at the University of Veszprem** **H-8201 Veszprem** **P.O. Box 158, Egyetem u.10** **Hungary** **Tel: 36-88-422-022 exts, 4404, 4405, 4208** **Tel/Fax 36-88-425 049** **e-mail: redeya@almos.vein.hu** **Internet: http://www.vein.hu/~szmik**

Background

The PPC, initially established at the Hungarian Engineering Society, was moved in 1995 to provide more administrative support as a separate unit within the University of Veszprem in the Department of Environmental Engineering and Chemical Technology. With close links to other departments at the university and research institutes, it was well positioned to conduct research oriented projects for industries on both technical and environment management problems. The graduate and post-graduate programs also provided access to a pool of personnel with good technical expertise. It also cooperated with the National Cleaner Production Center established by UNIDO at the Budapest University of Economic Sciences.

The current emphasis is focused on gaining accreditation for both ISO 9000 and ISO 14001 and upgrading the PPCs information management systems to meet expected demand for services in Geographic Information Systems (GIS) and specialty software.

1. **Environmental Assessments;**
   - Used Lead Battery Management
   - Metallchemia Plant Cleanup
   - Hazardous Waste Management
   - Agricultural and Natural Resources
   - Management of Municipal Sanitation in Budapest
   - Viscose Plant
   - Tannery in Debrecen
   - Tannery in Budapest
   - Tannery in Simontirnyr
   - Akkumulator Battery Plant
   - Dunapack Paper Mill in Dunayvaros
   - Chemical and Plastic Plant in Tiszayvaros
   - Assessment of Environmental Expenditures
   - Assessment of country environmental and economic issues

2. **Waste Minimization Program (WMDP and WMIP)**
   The Waste Minimization program was implemented in ten industrial enterprises with 23 projects resulting in savings of US$747,000.

3. Study Tours

Study tours were organized to various organizations including industries, trade and professional associations, environmental regulatory agencies, local government agencies and technical assistance programs in the US.

- Ministry of Environment for US environmental policy assessment
- Budapest Hazardous and Toxic Waste Disposal staff to US hazardous waste disposal facilities
- Budapest Sanitation Department to the New York City Department of Sanitation
- Participation in the International Conference on Reporting of Toxic Chemicals in Vienna.

Latvia	PPC Latvia Not Currently in Operation

Background

WEC began its activities in the Baltic Republics in January 1992 with the Baltic Republics Joint Environment Mission. These USAID supported studies were conducted as part of a broad examination of critical sectors including environment, energy, housing, transportation and telecommunications. In addition to WEC, the other cooperating organizations were the World Bank and the USEPA. The mission was charged with evaluating the overall health, environment conditions and environmental, organizational and policy structures in Estonia, Latvia and Lithuania. The missions included industrial and ministry site visits and the study and evaluation of available environmental and health statistical data and reports. These assessments were used to identify key pollution issues and major sources in order to establish the initial program priorities for USAID sponsored programs.

There were historical environmental program links between the Baltic Republics and the Nordic and other donor countries, e.g. Denmark, Finland, Sweden and Germany. However, these tended to be directed at long term, high capital investment projects compared to the WEC short term, low cost projects.

WEC introduced the IWMP and established a PPC in December 1994. The center was initially established at the Business Advisory Center since the two organizations shared similar missions to support industry through technical assistance. The Latvian Pollution Prevention Center (LPPC), as an independent, non-profit organization, educates, promotes and introduces advanced waste minimization programs and environmental management systems in manufacturing plants, designed to generate measurable environmental and economic benefits, hence sustaining the overall development of Latvian industry.

LPPC services helped Latvian enterprises to enter a growing market of environmental friendly goods; to work toward compliance of EU environmental standards in anticipation of joining the EU; to become more competitive by adopting environmental management and ISO 14000 standards; and to improve health and safety conditions for employees.

Space limitations required the relocation of the LPPC to Latvian Technical University, but the lack of independence within the university structure made the PPC program and budget management unwieldy, resulting in the establishment of a separate office.

Support from the Ministries of Environment and Industry was inconsistent since there was no clear national waste minimization policy. Further, industries had no advocates or champions due to frequent changes in management within the ministries. This institutional barrier affected both eligibility for and access to other donor support critical to sustainability. Some

typical consulting services involved "Capacity Building for Cleaner Technology in Latvia", conducted by Carl Bro, Denmark; the Daugavpils Regional Environment Project in cooperation with Vesihydro and an investment project for Ligatne Paper Mill, both funded by the Finnish Ministry of the Environment.

The PPC established the Latvian Association for Environmental Management (LAEM) in response to the lack of ministerial advocates for waste minimization and environmental management systems. Its goals were to foster support for the development of policies advancing the cause of waste minimization. LPPC worked with a number of Latvian organizations including the Latvian Association of Mechanical Engineering and Metalworking Industries, UAC- Enterprise Support Centre, Latvian Chamber of Commerce and Industry, Latvian Technical University, BIK- Bureau of Information and Consulting, Latvian Waste Management Association, and private consulting companies.

At the conclusion of USAID support in September 1997, the PPC was registered as a non-profit limited liability company. It developed ties with many national and international organizations, receiving funding mostly on a project basis. It received funding or earned fees through contracts from Danish, British and Finnish consultants, the International Network for Environmental Management (INEM) and bi-lateral donors including Denmark, Finland and the United Kingdom.

1. **Environmental Assessments**
   - Baltic Republics Joint Environment Mission
   - Grindex State Pharmaceutical Company
   - Olaine Cemico Pharmaceutical Plant

2. **Waste Minimization Program (WMDP and WMIP)**
   The Waste Minimization Program was implemented in 11 industrial enterprises with 18 projects resulting in savings of US$1,021,000.

3. **Study Tours**
   Study Tours in the US to US industrial enterprises, USEPA regional offices and US Pollution Prevention Centers and financial institutions were conducted for the electroplating, cement and dairy sectors.

4. **Workshops and training**
   Sixteen local experts were trained in four-day waste minimization workshops. U.S. experts during the demonstration and impact projects trained more than 100 company technical personnel. Additional workshops also included:
   - Waste minimization and medical waste practices for hospitals
   - Latvian regulatory updates on new hazardous/chemical waste regulations

Lithuania	**PPC at Kaunas University of Technology** **Institute of Environmental Engineering** **K. Donelaicio st. 20** **LT- 3000 Kaunas** **Lithuania** **Tel: 370-7-22-4655 Fax: 370-7- 209372** **e-mail: jurgis.staniskis@apini.ktu.lt**

Background

WEC began its activities in the Baltic Republics in January 1992 with the Baltic Republics Joint Environment Mission. These USAID supported studies were conducted as part of a broad examination of critical sectors including environment, energy, housing, transportation and telecommunications. In addition to WEC, the other cooperating organizations were the World Bank and the US Environmental Protection Agency. The mission was charged with evaluating the overall health, environmental conditions and environmental organizational and policy structures in Estonia, Latvia and Lithuania. The missions included industrial and ministry site visits and the study and evaluation of available environmental and health statistical data and reports. These assessments were used to identify key pollution issues and major sources in order to establish the initial program priorities for USAID sponsored programs.

There were historical environmental program links between the Baltic Republics and the Nordic and other donor countries, e.g. Denmark, Finland, Sweden, and Germany. However, these tended to be directed at long term, high capital investment projects compared to the WEC short term, low cost projects. Building on an existing organization WEC established the PPC at Kaunas Technical University within the Institute of Environmental Engineering. The Institute was an existing independent entity within the university with its own program development and budget authority. This Institute was well established, with substantial industry consulting experience and a staff that had already received training under both a UNEP sponsored cleaner production program and the Norwegian Cleaner Production Program. The Institute director, Dr. Jurgis Staniskis, had extensive international contacts in the governmental and academic sectors with organizations working on waste minimization.

The PPC developed expertise and experience with USAID support in sampling and analysis in water and air. Environmental regulations required emission information that few companies were in a position to provide. Industry confidence in the university as an independent laboratory able to provide accurate and confidential results enabled the PPC to market both its analytical and consulting capabilities.

Of particular note is the PPC's development of its role as a financial intermediary by linking its ability to match bankable projects with funding sources in cooperation with NEFCO. The PPC plays a crucial role in this program by preparing the loan application on behalf of the applicant, according to NEFCO's format. The application includes the estimated project savings and payback to determine the loan terms; monitoring the progress compared to

budget and implementation schedules. The PPC was involved in more than ten approved NEFCO projects during the duration of the WEC program.

1. **Environmental Assessments**
   - The Baltic Republics Joint Environmental Mission
   - Kaunas Fiber Plant
   - Akmenes Cementas cement plant

2. **Waste Minimization Program (WMDP and WMIP)**
   The Waste Minimization Program was implemented in eight industrial enterprises with 13 projects resulting in savings of US$473,200.

3. **Study Tours**
   A study tour was conducted for general and technical directors from the cement and fertilizer sectors to US industrial enterprises, USEPA regional offices and US Pollution Prevention Centers and financial institutions.

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Background

In coordination with USAID Warsaw, WEC established initial contacts with various ministries and local environmental authorities that organized visits of WEC representatives to Poland in 1990. These included the Ministry of Environmental Protection, Natural Resources and Forestry; the Ministry of Industry and Trade; Ministry of Economy; Opole Voivodship; local Environmental Protection Administrations in the Katowice, Opole, Gdansk and Szczecin Voivodships. In 1992 WEC established an In-Country Coordinator in Katowice in the Upper Silesia region, and hired Henryk Sojka as In-Country Coordinator. He assisted WEC in contacts with industrial enterprises and local authorities, in organizing workshops and served as liaison with the USAID Office in Warsaw. Close collaboration between WEC and the above mentioned organizations was invaluable for the success of the USAID Waste Minimization Program in Poland.

In order to institutionalize waste minimization and pollution prevention activities throughout industry sectors, three Pollution Prevention Centers were established. The first PPC was established in 1996 at Lodz Technical University. Persons with waste minimization skills were hard to find in CEE, and the director selected to head the PPC had successfully completed a UNEP sponsored training program in cleaner production. The second PPC was established in 1997 at ATMOTERM, a private environmental consulting company based in Opole. Five consulting and R & D organizations were evaluated and screened as host companies for the PPC. ATMOTERM, one of the largest private environmental companies in Poland, was selected due to the broad range of environmental services offered, including

pollution monitoring and measurements and environmental software and a well-established client base.

The third PPC was established in 1997 at the Silesian Technical University (STU) in Katowice. Location of the PPC at STU was suggested by USAID due to the presence of the USAID Environmental Training Program, a post diploma study program for industry and governmental personnel.

PPC at ATMOTERM became a self-sustaining PPC in late 1998 with a portfolio of contracts for training, measurement services, environmental assessments and ISO 14000 implementation. The remaining two university affiliated PPCs had more limited environmental consulting success, probably attributed to less practical industry project experience and a perception of technical expertise with an academic or theoretical perspective.

1. Environmental Assessments

Environmental assessments were completed at 18 companies in the coal, pharmaceutical, coke, chemical, power and battery sectors:

- Polfa Pharmaceutical Plants in Krakow
- Polfa Pharmaceutical Plant Grodzisk Mazowiecki
- Blachownia Chemical Plant in Kedzierzyn
- Organika-Azot Chemical Plant in Jaworzno
- Azoty Nitrogen Plant in Tarnow
- Coal Mine Halemba
- Coal Mine Knurow
- Coal Mine Krupinski
- Coal Mine Pionek
- Coal Mine Jankowice
- Coal Mine Wujek
- Coal Mine Jan Kanty
- Nitrogen Works Kedzierzyn
- Coke Plant in Zdzieszowice
- Battery Plant in Bielsko-Biala
- Battery Plant in Poznan
- Boruta Chemical Plant in Zgierz
- Organika-Zachem Chemical Plant in Bydgoszcz

2. Waste Minimization Program (WMDP and WMIP)

The Waste Minimization Program was implemented in 37 industrial enterprises with 82 projects resulting in savings of US$12,043,110.

3. Study Tours

Study tours were organized to various organizations including industries, trade and professional associations, environmental regulatory agencies, local government agencies and technical assistance programs in the US.

- Senior staff from Krakow Sanitation Department to New York City Sanitation Department

- Senior staff from National Center for Health System Management to Robert Wood Johnson Medical School, Environmental & Occupational Health Institute
- Senior staff from Warsaw Voivodship Sanitation Department to New York City Department of Sanitation
- Symposium on Environment and Industry in Alexandria, VA
- Participation in the International Environmental Accord Conference
- WMIP participants from the chemical industry
- WMIP participants from the dairy industry
- WMIP participants from the electroplating industry
- WMIP participants from the meat industry
- Senior staff from phosphate fertilizer sector, Ministry of Environment, environmental authorities from three voivodships and municipalities

Romania	**Vladimir Gheorghievici, Executive Director** **Foundation Pollution Prevention Center** **Str.Theodor Sperantia 98** **Bl. S 28, Sc. 1, Et.3, Ap. 10** **74317 Bucharest, S3** **Tel: 40-1-327-47-95 Fax: 40-1-327-47-96** **Cell (director) 40-93-33-58-28** **e-mail:** cpp@pcnet.ro **Website: http://users.pcnet.ro/pcnet**

Background

The Romania program started in 1992. In coordination with USAID Bucharest WEC established initial contacts with Ministries and local environmental authorities. These included the Ministry of Industry, Ministry of Environment, Ministry of Social Affairs, Chamber of Commerce and Industry and the Agency for Restructuring. In 1993, WEC hired an In Country Coordinator to assist WEC in contacting industries and local authorities to organize workshops and served as liaison with the Romania USAID Office. The WMP was expanded to specifically address energy audits and conservation measures based on expressions of interest from a broad range of high energy use sectors including municipal heating plants, chemicals, glass, and non-ferrous metals. A separate energy conservation workshop manual was prepared in addition to those on waste minimization.

Environmental consultants in Romania must be certified by the Ministry of Wastes, Forests and Environmental Protection and demonstrate both expertise and equipment to provide services. USAID support helped the PPC to develop ambient and source monitoring and analytical laboratory capabilities for air, water, particulates, soil and combustion efficiency. State of the art environmental instrumentation gave the PPC a competitive edge, fostering USAID's goal to assist in the development of an environmental consulting service sector. Sophisticated environmental instrumentation, air pollutant dispersion modeling software and technical expertise enabled the PPC to provide "added value" to its clients by offering one stop service to meet regulatory requirements in a timely and cost efficient manner.

PPC staff also participated in ISO 14001 training to broaden the services offered to include environmental management systems analysis and training. ISO 14001 standards are becoming a de facto requirement for service and material suppliers to major international corporations. The PPC client base numbers more than 60 companies attributable in large part to the support, training and equipment provided by USAID.

1. Environmental Assessments

- Environmental Assessments for Coastal Zone
- Petrochemia Petrochemical Plant in Constanca
- Bucharest Municipal Sanitation
- System and Municipal Public Service Department
- ARO Car Plant in Cimpulung-Muscel
- Hot Spot Impact Assessment at AMPELUM Copper Mines and Smelter

2. **Waste Minimization/Energy Conservation Program (WMDP and WMIP)**
   The Waste Minimization program was implemented in 19 industrial enterprises with 42 projects resulting in savings of US$3,350,000.

3. **Study Tours**
   Study tours were organized to various US organizations including industries, trade and professional associations, environmental regulatory agencies, local government agencies and technical assistance programs.

   - Senior staff from Bucharest Sanitation Department to New York Sanitation Department
   - Technical staff from enterprises participating in the WMIP
   - Management from Comceh SAPulp and Paper Plant
   - Siderca SA enterprise

Slovakia	**Slovak Environment Center** **Slovak Technical University** **Pionierska 15** **831 02 Bratislava** **Tel: 421-7-444 54328 Fax: 421-7-442 590 15** **e-mail: sccp@cpz.sk**

Background

In coordination with USAID Bratislava, WEC started its program in Slovakia in 1990. WEC established initial contacts with the Ministry of Economy and the Ministry of Environment and local environmental authorities. In 1992 WEC hired an In Country Coordinator in Slovakia who organized workshops and served as liaison with the USAID Office. In order to institutionalize waste minimization and pollution prevention activities through the industry a Pollution Prevention Center was established in Bratislava. The purpose of organizing the PPC was to provide a focal point for technical assistance to industries through on-site assistance, workshops and training seminars and information dissemination via library and CD-ROM.

1. **Environmental Assessments**
   Environmental assessments were combined with the WMP.

2. **Waste Minimization Program (WMDP and WMIP)**
   The Waste Minimization program was implemented in 13 industrial enterprises with 23 projects resulting in savings of US$1,290,000.

3. **Study Tours**
   Study Tours to US industrial enterprises, EPA regional offices and Pollution Prevention Centers, municipal services and financial institutions
   - Participation in the International Environmental Accord Conference for The Slovak Commission of Environment
   - Companies participating in the WMIP

UKRAINE
No PPC

Background
Work on the program started with an October 1995 reconnaissance trip by WEC staff to Ukraine. Consistent with USAID's goal of developing institutional capacity, WEC quickly established contacts and good working relationship with key environmental officials. In Donetsk, as a first step, Gennady Merkhelevitch was hired to serve as an in-country coordinator as well as interpreter. Subsequently, the WEC team established contacts with Dr. Sujatoslav Kurukenko, Head of Department, State Agency of Ecological Safety for the Donetsk Region, Ministry for Environmental Protection and Nuclear Safety. Consultations were made regarding mutual cooperation and an initial list of enterprises to be considered was developed.

In developing an appropriate assistance program consideration was given to the fact that since Ukraine was going through a very difficult economic transition any major investment in the modernization of pollution control equipment is practically unaffordable right now. WEC's Waste Minimization program, implemented earlier in nine other CEE countries with very positive results, offered attractive environmental and economic benefits. Unlike the other CEE programs, PPCs were not included in the institutional capacity building strategy due to funding limitations.

A different capacity building model was developed with a workshop training curriculum aimed at providing small and medium sized enterprises with both technical and business development training to establish local private consulting firms. Longer-term workforce development strategies involved the introduction of an Energy Conservation/Waste Minimization curriculum for universities. US study tours were organized as in other CEE programs.

Special emphasis was directed to the metallurgical and chemical sectors since they are major energy consumers and pollution emitters.

1. **Environmental Assessments**

   - Petrovsky plant in Dnipropetrovsk
   - Krivoshstal plant Krivyrih

2. **Waste Minimization Program (WMDP and WMIP)**
   The Waste Minimization program was implemented in 12 industrial enterprises with 21 projects resulting in savings of US$2,125,000.

   NOTE: At the request of USAID the Waste Minimization Program focused on energy conservation because of the high energy requirements, especially natural gas, in the steel and metallurgical sectors. Therefore 20 of the 21 projects implemented were identified as "Energy Conservation" Projects.

3. Study Tours

WEC, in cooperation with USAID, sponsored two study tours to the U.S. The chemical industry study tour visited three U.S. chemical corporations, Allied Signal, 3M and E.I. Du Pont. In addition they visited the Chemical Manufacturers Association, USEPA, Region II; and USAID in Washington, D.C.

The second study tour for metallurgical plants visited two U.S. corporations, Timken Steel and Bethlehem Steel; the Steel Manufacturers Association; the Specialty Steel Industry of North America Association; USEPA, Region II; and USAID, Washington.

4. Specialty Seminars

Waste minimization and energy conservation workshops were organized in Donetsk and Dnepropetrovsk in December 1996, October 1997 and January 1999. The workshop were presented by WEC's consultants: William Beck, Mr. Rowan Perkins and Dr. Paul Wilkinson, former employees of E.I. DuPont Corporation, who developed both programs based on U.S. industry's experience. WEC's manuals translated into Ukrainian and Russian were used during those workshops. Over 200 participants representing major industrial plants and governmental agencies were trained.

As indicated previously, special attention was given to the most important industrial sector in Ukraine, i.e., metallurgical. Therefore, besides the demonstration projects established at five metallurgical enterprises, WEC specialists performed assessments at two additional integrated iron and steel works.

Steel Industry Seminars

In November 1997 two seminars were held, specifically designed for the metallurgical sector. The first seminar was arranged in Donetsk and the second in Dnepropetrovsk and included a historical review of the U.S. steel industry from 1960 to the present given the similar condition of the Ukrainian steel sector. The seminars highlighted U.S. steelmaker decisions to close inefficient mills and facilities based on the cost of environmental problems. The progress made by the U.S. steel sector through changes in production practices, energy conservation, pollution prevention and preventive maintenance techniques were presented to the participants of the seminars. In addition, WEC's findings and recommendations from Demonstration Projects and production efficiency assessments performed at the Ukrainian steel plants by U.S. specialists were presented and analyzed. Over 80 persons representing leading steel enterprises and related institutions attended the seminars.

Waste Minimization/Energy Conservation Seminars

To further disseminate and publicize the concept of waste minimization and energy conservation in the academic sector that is the source of future industry leaders, WEC organized a series of seminars at the Pridniprovky University in Dnepropetrovsk in October 1998, by Professor Marvin Fleischmann, a recognized leader in pollution prevention, waste minimization and energy conservation programs from the University of Louisville. The goal of the seminar was to assist universities with possible modifications of their environmental training curriculum by adapting ideas from U.S. experience and fitted to conditions in Ukraine. About 30 faculty members and about 180 students attended the seminars.

IV. APPENDICES

A. INDUSTRIAL WASTE MINIMIZATION PROGRAM DESCRIPTION

B. PARTICIPATING COMPANIES LIST

C. PUBLICATIONS AND VIDEO LIST

D. ACTIVITY REPORT DISTRIBUTION LIST

APPENDIX A

INDUSTRIAL WASTE MINIMIZATION PROGRAM DESCRIPTION

WASTE MINIMIZATION PROGRAM (WMP)

Background

The WEC industrial waste minimization program consists of three phases:

1. Waste Minimization Demonstration Project (WMDP)
2. Waste Minimization Impact Project (WMIP)
3. Formation of Pollution Prevention Centers

From our past experience in CEE, it became clear that many industrial managers associated environmental and economic improvements with high cost capital investments. They argued that successes in waste minimization achieved in Western European and United States industries were possible because enterprises in the West had the necessary capital to do it. In designing the industrial waste minimization program for CEE, WEC took into account the existing constraints and included the WMDP in the first phase of the program.

Objective

The objective of the WMDP was to demonstrate in each CEE country measurable environmental and economic benefits from no-cost/low-cost waste minimization activities.

Description

The criteria for the selection of the enterprise participating in the WMDP include: management support; must sign agreement of cooperation; must be economically viable; has serious environmental problems and agrees to share waste minimization results with other enterprises within the industrial sector.

The one-year WMDP was a joint effort between WEC and the enterprise. At the start of the project, one to three processes in each enterprise were selected for a detailed waste minimization investigation. Within each process, a working team was established to work closely with a WEC team in the implementation of waste minimization projects. The working team members usually were engineers from production, process, environmental, maintenance and instrumentation departments. In order to introduce waste minimization practices throughout the enterprise, a Waste Minimization Committee was organized. The Committee was preferably chaired by the technical director and included management representatives from production, environmental, engineering, maintenance, energy, research, procurement and financial departments. The responsibilities of the Committee included: prepare and distribute a corporate environmental and waste minimization policy signed by the general director; provide guidance to the working teams; organize and implement waste minimization projects within all production processes of the enterprise; coordinate work with WEC; and monitor waste minimization progress.

The WEC team could include a consultant, several industrial experts and a WEC project manager. The team visited the enterprise several times during the one-year cooperative program. Each visit was of one to two weeks' duration. The WEC team provided training in waste minimization to working process teams, members of the Waste Minimization Committee and local consultants who participated in the WMDP. The WEC team worked closely with the plant teams in waste minimization project assessment and implementation.

To help institutionalize the WMDP, other facilities located where the project was performed were invited to briefing meetings where project progress was discussed.

WEC also provided technology and know-how transfer. For each WMDP, WEC had modest funds available to purchase process or monitoring equipment to demonstrate to the enterprise the environmental and economic benefits that could result from low-cost investment.

While the WMDP showed how waste minimization could bring economic and health benefits to a company and the community in which the company is located, it offered more extensive impact. It taught company personnel that waste minimization is a philosophy of doing business that will permeate throughout the company leading to increased emphasis on worker health and safety. WMDPs also form the foundation for establishing an environmental management system throughout the company that will place environmental concerns at a high level in all company decisions and programs. These steps should result in a significant reduction in industrial pollution.

WASTE MINIMIZATION IMPACT PROJECT (WMIP)

Background

Utilizing the information developed during the Waste Minimization Demonstration Project, WEC implemented the second phase of the program, namely, the Waste Minimization Impact Project. Ten enterprises from the same industrial sector were selected to participate in the WMIP. The enterprises were required to sign an agreement of cooperation with WEC specifying the responsibilities of both parties during the project. The WMIP was primarily an effort by the enterprise.

Objective

The objective of the WMIP was to transfer the experience and know-how gained at one or two plants during the Waste Minimization Demonstration Project (WMDP) to a larger number of companies within an industrial sector.

Description

In-plant and local consulting engineers participated in a workshop organized by WEC to train them in waste minimization assessments and procedures. The trained in-plant engineers and local consultants conducted one or two waste minimization project(s) at the ten selected enterprises. The projects(s) were to be completed approximately within a six month period and the results presented at a seminar. During the project, WEC experts provided short-term technical assistance. These experts assisted the enterprise in waste minimization opportunity assessments and in the organization of a plant-wide Waste Minimization Committee.

Since most of the companies participating in the WMIP were not directly exposed to the WMDP, WEC organized a study tour to the United States. Ten senior industrial managers spent a minimum of one week at major U.S. companies, learning first-hand how their companies operate their Environmental Management Systems (EMS). This experience further motivated the managers to practice waste minimization and incorporate EMS within their companies.

Successful waste minimization projects completed during the WMDP and WMIP were broadly publicized. It was expected that a demand for waste minimization services and know-how would develop within a broad spectrum of industries in CEE countries. WEC organized "train-the-trainer" workshops in waste minimization to meet this demand. The goal of this training program, which was initiated during the WMDP and WMIP, is to provide in-country capability in waste minimization services by developing a first class group of authorized instructors.

POLLUTION PREVENTION CENTER (PPC)

The purpose of organizing PPCs was to provide a focal point for technical assistance in waste minimization and other environmental management programs to industries in CEE countries via library materials (hard copy and electronic), workshops and seminars, on-site technical assistance and direct mailings of published waste minimization materials.

The PPCs were officially designated by WEC in cooperative efforts with existing organizations. The PPCs were supported, trained and assisted by WEC and become financially independent of WEC within an approximate period of three years. The technical assistance provided by the PPCs varied from country to country with the scope of services dependent on future funding availability.

During the first six months of operation, a preliminary activity plan was being developed with work plans for succeeding years. An activity plan for long term independent sustainability of PPCs was developed. Possible funding options may include national ministries, industry fees for PPC's technical assistance and other international donor support.

The PPCs initial activities could:

- Specify computer needs (e.g., hardware, software, database accessibility)
- Identify other donor involvement in industrial waste minimization
- Build PPC library in cooperation with WEC staff
- Establish Advisory Steering Committee of industry leaders to determine focus of PPC and identify industry technical assistance needs
- Train PPC personnel, in-country experts, in-plant engineers, consultants and student interns in waste minimization concepts and techniques
- Conduct waste minimization workshops for selected industrial sectors
- Conduct waste minimization assessments for industries requesting assistance
- Publish case studies of WEC waste minimization projects and industry specific fact sheets
- Publicize PPC services and successful projects

APPENDIX B

PARTICIPATING COMPANIES LIST

Partial List of Companies Participating in WEC Programs

Company	Sector
BULGARIA	
Agrobiochim	Chemical
Chimco	
Lead and Zinc Complex	
Neftochim	
Neochim	
Orgachim	
Petar Karaminchev	
Phannacia	Pharmaceutical
Plarna Pleven Oils	
Sopharma	
Svilosa	Chemical
Verila Jsc	
Vidachim	
CZECH REPUBLIC	
Chemopetrol	Oil Refinery & Petrochemical
Farmakon	
Lachema	
Moravske Chemicke Zavody (MCHZ)	
Ostramo	
Sindat	
Spolana	Chemical
Spolchemie	
Viadrus	
ESTONIA	
Kehra	Pulp and Paper
Kiviter	Oil Shale Refinery
Kunda	Cement
Nakro	Leather Tannery
Nitrofert	Fertilizer
Norma	Metal Finishing
Parnu	Meat
Rakvere	Meat
Tarbeklass	Glass
Tallinn Paper, Ltd.	Pulp & Paper
Tallinn Plywood & Furniture	Wood Products
Tartu	Dairy

Company	Sector
HUNGARY	
Alkaloida	
Borsodchem	Chemical
Budapest Chemical Works	
Magyar Viscosagyar	Synthetic Fibers
Medikernia	
Nitrokernia	
Perion	Battery
Tiszai Vegyi Kombinat	
United Chemical Works	
LATVIA	
Arta-F	Metal Finishing
Riga	Metal Finishing
Autoelektroapparatus	
Biolar	Pharmaceuticals
Broceni	Cement
Riga Carriage Building Works	Metal Finishing
Dauer	Metal Finishing
Dauteks	Chemical Fibers
Electra	Leather Tannery
Riga Electric Motor Building Works	Metal Finishing
Grindex	Pharmaceutical
Interprom	Metal finishing
Jaunciems	Paper
Jelgava	Leather Tannery
Kossmos	Leather Tannery
Kurzemes Piens	Dairy
Kvadrots	Rubber
Laima	Chocolate
Lauma	Textile
Latblofarni	Pharmaceuticals
Lokomotiv	Metal Finishing
Nakotnes	Leather Tannery
Olaine	Pharmaceutical
Plena Kombinats	Dairy
Riga Paint & Varnish	Industrial Coatings
Rital	Leather Tannery
Sloka Pulp & Paper	Pulp and Paper
Vahulera Glass	Fiberglass

Company	Sector
LITHUANIA	
Achema	Fertilizer
Akmenes	Cement
Alytaus Chemija	Chemical
Astra	Metal appliances
Buitine Chemija	Chemical
Egle	Wood Furniture
Elnias	Leather Tannery
Freda	Wood Furniture
Grigishkes	Wood Products
Guotas	Leather Tannery
Inkaras	Synthetic Rubber
Kaunas Fiber	Synthetic Fibers
Kedainiai	Fertilizer
Kuro Aparatura	Metal Parts
Litoda	Plastics
Mazheikiai Refinery	Oil Refinery
Medienos Plausa	Wood Products
MEP	Leather Tannery
Miskas	Wood Furniture
Panavezys	Sugar
Plasta	Plastics
Skalteks	Metal Parts
Skraja	Wood Furniture
Stumbras	Leather Tannery
Toksika	Leather Tannery
Vilkas	Leather Tannery
Vilnius Furniture	Wood Furniture
Vilinius Kailiai	Leather Tannery
POLAND	
Agryf	Meat
Blachownia	Chemical
Boleslaw	Non-ferrous Metals
Bonarka	Chemical
Boruta	Chemical
Boryszew	Chemical
Centra	Battery
Chate	Metal Finishing
EMA-FAK	Battey
Elblag	Meat
Elk	Meat
Fosfory	Fertilizer
Galwall	Metal Finishing
Garwolin	Dairy
Huta Buczek	
Huta Czestochowa	

Company	Sector
POLAND (cont'd)	
Huta Szopienice	Non-ferrous Metals
Huta Zabrze	Non-ferrous Metals
Hutmen	Non-ferrous Metals
Jan Kanty	Mining
Krupinski	Mining
Lubon	Fertilizer
Lukow	Meat
Metallurgical Works Silesia	Non-ferrous Metals
Metalodlew	Non-ferrous Metals
Metalplast	Metal Finishing
Milko	Dairy
Nitrogen Works	Fertilizer
Nowa Huta Dairy	Dairy
Nowa Targ	Dairy
Organika Azot	Chemical
Organika Rokita	Chemical
Organika Zachem	Chemical
Ostroleka	Meat
Oswiecim	Chemical
Podryn	Chemical
Polchem	Chemical
Polfa	Pharmaceutical
Police	Fertilizer
Polmot	Metal Finishing
Prodryn	Chemical
Romet	Metal Finishing
Siarkopol	Fertilizer
Tarnow Nitrogen Works	Chemical
Ubocz	Fertilizer
Viscoplast	Chemical
Wegierska Gorka	Non-ferrous Metals
ZAP	Battery
Zakopane	Dairy
Zdzieszowice Coke	Coke
ZGH Orzel-Bialy	Non-ferrous Metals
ZM Trzebinia	Non-ferrous Metals
ZML Kety	Non-ferrous Metals
SLOVAKIA	
Chemes	
Chemko	Chemical
Chemolak	Chemical
Chemosvit	
Steel	Duslo

Company	Sector
SLOVAKIA (cont'd)	
Istrochem	
Novacke Chemicke Zavody (NCHZ)	
Petrochema	Petrochemical
Povazske Chemicke Zavody (PCHZ)	
Slovnaft	
Pohronske Strojarne	
Slovenske Lodenice	
ZTS Tees	
ROMANIA	
Acumulatorul	Battery
Aerostar	
Arpechim	Oil Refinery & Petrochemical
Astra Romana	
Biofarm	Pharmaceutical
Chimcomplex	
Chimopar	Chemical
Clujana	Leather Tannery
Dacia	Automotive
Fepa	
Gumoflex	
Oltchim	
Petrobrazi	
Petrotel	
Petrotub	
Policolor	
Rafinaria Darmanesti	
Rombox	Leather Tannery
Romvag	
SC Cord	Metal treatment
SC Goscom	
Sidermet	
Sidex	Steel
Sigmob	
Tamiv	Leather Tannery

Company	Sector
UKRAINE	
Alfa Fuel	Storage/transfer
Azovstal	Steel
Chemical Reagents	Chemical
Donestsk Metallurgical	Metal Works
DniproAzot	Chemical
Dniproshina	Tire mfg.
Donetsk Metallurgy	Metal Works
Markochim	Coke & Chemical
Nizhnedniprovsk	Pipe mfg.
Pavlograd Chemical	Chemical
Silur	Steel Wire & Cable
Stirol	Chemical
Yenakievo Steel Works	Iron and Steel
KAZAKSTAN	
Chimprom	Chemical
Pavlodar Refinery	Oil Refinery
UZBEKISTAN	
Kuvasai Cement	Cement
Fergana Refinery	Oil Refinery

APPENDIX C

PUBLICATIONS AND VIDEO LIST

PUBLICATIONS AND VIDEO LIST

- *Economic and Environmental Benefits of Industrial Waste Minimization Program in Bulgaria, Czech Republic, Hungary, Romania, Slovakia, Progress Report # 1,* 1995 (local languages and English)
- *Economic and Environmental Benefits of Industrial Waste Minimization Program in Estonia, Latvia and Lithuania,* 1995 (local languages and English)
- *Economic and Environmental Benefits of Industrial Waste Minimization Program in Poland,* 1995 (Polish and English)
- *Economic and Environmental Benefits of Industrial Waste Minimization Program in Poland,* 1999 (Polish)
- *Economic and Environmental Benefits of Industrial Waste Minimization Program in Kazakstan & Uzbekistan,* 1997 (Russian and English)
- *Facility Pollution Prevention Guide, EPA/600/R-92/088,* translated into Estonian, Latvian, Polish, Russian
- *How To Overcome Barriers to Environmental Investments in Bulgaria, First Assessment,* 1997 (Bulgarian and German)
- *Industrial Restructuring, Environmental Performance and Environmental Investment in Bulgaria, The Second Assessment.* 1998
- *Implementation of Cleaner Production Projects in Lithuanian Textile Industry,* 1997 (Lithuanian)
- *Implementation of Cleaner Production Projects in Lithuanian Food Industry,* 1997 (Lithuania)
- *Manual for Waste Minimization and Environmental Management,* 1995 (Lithuanian)
- *Modern Environment Management Systems - Guide for Implementation,* 1997 (Bulgarian)
- *Pollution Prevention Opportunities,* 1993 (Latvian)
- *Practical Approach for EMS implementation,* 1997 (Bulgarian)
- *Status Report - 1996 Waste Minimization Program - Monetary & Environmental Benefits - Bulgaria, Czech Republic, Hungary, Romania, Slovakia, Ukraine,* 1996 (local languages and English)
- *USAID Replicable Waste Minimization Program for the Central Asian Republics* (Russian and English)
- *WEC Energy Conservation Manual,* 1998 (Bulgarian, Czech, English, Hungarian, Romanian, Russian, and Slovak)

- *WEC Waste Minimization Manual: A 10-Step Program for Success, 1996* (Bulgarian, Czech, English, Hungarian, Polish/1998, Romanian, Russian, and Slovak)

- *Waste Minimization Opportunity Assessment Guide, EPA/625/7-88/003,* 1988 (translated into Polish, Russian)

VIDEOS

- *WEC's Industrial Waste Minimization Program in Central Asian Republics* (Russian and English) - 5 minutes

- *WEC's Industrial Waste Minimization Program in Czech Republic* (Czech and English) - 6 minutes

- *WEC's Industrial Waste Minimization Program in Estonia* (Estonian and English) - 5 minutes

- *WEC's Industrial Waste Minimization Program in Latvia* (Latvian and English) - 5 minute and 17 minutes (English, Latvian, Russian)

- *WEC's Industrial Waste Minimization Program in Lithuania* (Lithuanian and English) - 5 minutes

- *WEC's Industrial Waste Minimization Program in Poland* (Polish, English, and French) - 5-minute and 15-minute versions

APPENDIX D

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