PD-ABW-625

EcoLinks Partnership Grants
Quarterly Progress Report
January 1, 2001 – March 31, 2001

Part I. Narrative Discussion

1. Brief overview of activity status and major accomplishments this quarter.

Status:

Challenge Grants: The fifth cycle of Challenge Grants was launched on March 12. Thirty-one Challenge Grants for $1,506,900 were awarded for the fourth cycle. Over 100 active projects funded by Challenge Grants are being monitored. To date 36 grants have been closed.
Twinning Grants: The pilot cycle of Twinning Grants is in progress. Five concept papers were received in January, and three of them were approved. Full applications are due on April 23.
Quick Response Awards: QRAs continue to be offered on a rolling basis. During the quarter, eleven Quick Response Awards were awarded for $54,183.

Total program expenses at the end of the quarter are $11,095,734.

Major Achievements:

Grants Administration:

- On January 16 five concept papers were received for the pilot cycle of Twinning Grants and screened against the screening criteria. Three concept papers were approved to proceed to the full application stage. Full applications are due on April 23.

- The selection panel for the Twinning Grants pilot cycle was organized. The three panelists are Barbara Felitti from Institute of Sustainable Communities, Robert Cronin from IREX, and Aleg Cherp from Central European University.

- On January 22 the Challenge Grants selection panel met in Szentendre and awarded 31 grants for the fourth cycle (out of 65 applications). Project summaries are provided in Annex A. The breakdown of grants by country is as follows:

Bulgaria	6	Romania	7
Croatia	3	Russia Far East	3
Kazakhstan	3	Ukraine	7
Macedonia	2		

- By grant topic, 48% of the grants were awarded in Cleaner Production, 29% in Global Climate Change and 23% in Water Quality Management.

- By type of organization, 55% of the project leaders were businesses, 29% local governments and 16% utilities.

- During the quarter, eleven Quick Response Awards were awarded for $54,183. A listing is provided in Annex B. Of this total, three facilitated Twinning Grant applications and eight pursued environmental trade and investment relationships. The country breakdown is as follows:

Georgia	1
Poland	4
Romania	5
Slovakia	1

- Of the above QRAs, two were initiated by Northern Tech Reps. This brings their total to 14 QRAs for $57,647 under the $150,000 allocation for July 1, 2000 to June 30, 2001.

- To date 206 QRAs have been awarded, amounting to $882,674.

- Twenty grants were closed during the quarter. All grants from the first cycle and nineteen grants from the second cycle have now been closed.

- A survey was conducted among past awardees of Quick Response Awards to determine the success of the program in initiating on-going partnerships and to evaluate the service of the staff. 164 organizations that were awarded QRAs from December 1999 to October 2000 were sent surveys, and 60% of them responded. Of these respondents, 80% had applied for a QRA to prepare a challenge grant application and 20% to facilitate an investment/trade relationship. Of all the respondents, 78% reported that their partnership was still continuing and some of them described completed trade agreements. 75% rated staff support as excellent and 23% as good.

- During the quarter, five Best Practices were prepared from closed grants. They include a solid waste management project with municipalities along the Danube; an environmental management system for dredging on the Bulgarian Black Sea Coast; remediation of underground pollution by petroleum in a Romanian refinery; treatment of wastewater from an abandoned pyrite mine in Slovakia; and an energy audit at a Romanian petrochemical plant. These Best Practices are attached as Appendix C. They will be posted to the website.

- During the quarter, the CPOs organized 19 information workshops, attended by 571 people.

- Total program expenditures to date are $11,095,734. A financial report is attached as Appendix D.

Program Outreach and Coordination:

- A 16-page marketing brochure was produced, listing all the grants awarded in 2000, presenting program developments during the year and describing four best practices from Challenge Grants and one success story resulting from a Quick Response Award.

- During the quarter the Chief of Party traveled to Croatia, Macedonia and Bulgaria to visit the EcoLinks offices and the USAID Missions. He also participated in various events, such as a press conference in Croatia and a start-up meeting in Bulgaria, and met with various donor organizations to discuss possible collaboration.

- The NIS Regional Program Manager met with USAID Missions in Moscow and Almaty.

- In January the Program Officer in Ukraine arranged for two grantees to present their projects on EMS to an EMS/Cleaner Production seminar sponsored by USAID.

- In February the Program Officer in Croatia presented the EcoLinks program to the American Chamber of Business in Croatia.

- In March the Program Officer in Croatia introduced the Challenge Grants program to two municipalities in Bosnia, Mostar and Konjic, with assistance from the USAID Mission in Sarajevo.

Staffing Office and Network:

- Due to the heavy workload in monitoring grants, particularly in Bulgaria and Romania, it was decided to streamline procedures and to make some organizational changes within the existing budget. The major organizational changes are the following:
  - Olga Schetinina will be promoted to Grants Manager and transferred to the NIS Regional Office in Kiev.
  - Marina Petrova will replace Olga as RFE Program Officer.
  - Two local hires will be added in Bulgaria and Romania to monitor grants in those countries. These new positions are funded by the elimination of positions in Northern Tier.

2. Implementation issues identified last period and status of resolution.

- The $ 3448 budget to expand the Challenge Grants program to two municipalities in Bosnia was approved by the Mission in Sarajevo. USAID/Sarajevo informed EcoLinks on February 26 that USAID/Washington would make the payment. The funds have not yet been received.

- The current Challenge Grants cycle is the last one, unless the program is extended. A plan how to proceed needs to be discussed with USAID/Washington.

3. Implementation issues and/or procurement issues anticipated in the next reporting period.

- USAID decision regarding possible program extension and strategy for USAID Mission support.

IIE's Eleventh Quarterly Report

For the Period: January 1, 2001 – March 31, 2001

Prepared by: Winston Bowman, IIE
Date Prepared: April 25, 2001

Part II. Basic Activity Information

Activity Name: Eurasian-American Partnerships for Environmentally Sustainable Economies – EcoLinks	Life of Activity Value:	$23,297,897
Purpose of Activity: Promote market-based solutions to Environmental problems in CEE/NIS, with emphasis on the urban and industrial sectors.	Amount to be obligated:	$10,480,946
Implementing Partner: Institute of International Education (IIE)	Amount obligated:	$12,816,951
Award/Amendment No., Type (CA): EE-A-00-98-00020	IPSES Funds 180-0039 (CEE)	$ 7,436,775
	EPT Funds 110-0003 (NIS)	$ 3,658,959
Period of Award: 07/01/98 to 06/30/03	Funds Expended to Date (Total):	$ 11,095,734
CO/CTO/COP: Cherrill Fachet (AO), Carl F. Maxwell (CTO), /Winston Bowman (COP).	Obligated Funds Remaining:	$ 1,721,217
Linked to S.O. No.: 1.6 Increased Environmental Management Capacity to Promote Sustainable Economic Growth	Next Obligation Due By:	
Intermediate Results Nos.: IR 1.6.2 (Trade), IR 1.6.3a (Best Practices), and IR 1.6.4 (Inst.)		

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Part III. Results Performance

Result Description	Result Indicator Performance
Result No. 1.6.3a: "Best Practices" Adopted by Industrial and Public Sectors.	
Results: Successfully operating environmental partnerships will be established to promote solutions to environmental problems appropriate to market-oriented economies and democratic societies.	
Indicators: (1) Number of projects that result in a best practice to solve an environmental problem; (2) Number of projects that result in a market-based solution to an environmental problem ; (3) Number of Quick Response Awards (QRAs) that result in a collaborative Challenge Grant Proposals.	
Result Indicator (1): Number of projects that result in a best practice to solve an environmental problem Unit of Measurement: same	**Life of Strategy Target:** 70 **Cumulative Achievement to Date:** 19 **Current Year Target (6/01):** 20 **Current Quarter Achievement:** 12
Result Indicator (2): Number of projects that result in a market-based solution to an environmental problem Unit of Measurement: same	**Life of Strategy Target:.** 225 **Cumulative Achievement to Date:** 26 **Current Year Target (6/01):** 50 **Current Quarter Achievement:** 14
Result No. 1.6.4: Increased Institutional Ability to Identify and Remedy Environmental Problems.	
Results: Successfully operating environmental partnerships will be established to promote solutions to environmental problems appropriate to market-oriented economies and democratic societies.	
Indicators: (1) Number of Challenge Grant proposals that met prescreening criteria. (2) Number of partner searches that result in an on-going relationship (e.g. challenge grant proposal); (3) Number of projects that result in institutional changes that enhance the project participant's ability to identify and remedy environmental problems.	
Result Indicator (1): Number of Challenge Grant proposals that met prescreening criteria. Unit of Measurement: same	**Life of Strategy Target:** 525 **Cumulative Achievement to Date:** 227 **Current Year Target (6/01):** 60 **Current Quarter Achievement:**

Result Indicator (2): Number of partner searches that result in an on-going relationship (e.g. challenge grant proposal) Unit of Measurement: same	**Life of Strategy Target:** 150 **Cumulative Achievement to Date:** 50 **Current Program Year (6/01) Target:** 20 **Current Quarter Achievement:** 0
Result Indicator (3): Number of projects that result in institutional changes that enhance the project participant's ability to identify and remedy environmental problems Unit of Measurement: same	**Life of Strategy Target:** 150 **Cumulative Achievement to Date:** 23 **Current Program Year (6/01) Target:** 30 **Current Quarter Achievement:** 12

Result No. 1.6.2: Increased environmental trade, finance, and investment

Results: Successfully operating environmental partnerships will be established to promote solutions to environmental problems appropriate to market-oriented economies and democratic societies.

Indicators: (1)Number of QRAs that result in an agreement to pursue environmental trade, finance, or investment; will also track the number of QRAs that result in a Challenge Grant Proposal (2) Number of projects that result in an agreement to further pursue environmental trade, finance, or investment.

Result Indicator (1): Number of QRAs that result in an agreement to pursue environmental trade, finance, or investment; also track the number that result in a Challenge Grant Proposal Unit of Measurement: same	**Life of Strategy Target:** 350 **Cumulative Achievement to Date:** Total QRAs = 208, Trade – 76, Grants – 119 **Current Year Target (6/01):** Total QRAs = 120, Trade – 40, Grants – 80 **Current Quarter Achievement:** Total QRAs = 11 • Support Investment & Trade 8 • Result in Challenge Grants Proposal 3
Result Indicator (2): Number of Challenge Grant projects that result in an agreement to further pursue environmental trade, finance, or investment. Unit of Measurement: same	**Life of Strategy Target:**. 70 **Cumulative Achievement to Date:** 9 **Current Year Target (6/01):** 15 **Current Quarter Achievement:** 7

Annex A
EcoLinks Partnership Grants Program
Awarded Challenge Grants
Fourth cycle – 2000-2001

In January, 2001 the EcoLinks Grants Selection Panel met in Budapest, Hungary and awarded 31 Challenge Grants in cycle 4 for a total of about $1,500,000. The grant topics were Cleaner Production, Water Quality Management and Global Climate Change. By country breakdown, 6 grants were awarded in Bulgaria, 3 in Croatia, 3 in Kazakhstan, 2 in FYR Macedonia, 7 in Romania, 3 in Russia, 7 in Ukraine. Brief descriptions of the awarded grants are provided below. These awards are not considered final until the agreements are signed by all parties involved.

BULGARIA

1) Title: A Techno-Economic Model for a Geothermal Plant in Sapareva Banja
Leader: Municipality of Sapareva Banja, Bulgaria
Partner: Princeton Energy Resources International, LLC, MD,USA
Partner: Elisa Consult, Sofia, Bulgaria
Grant Total: $48,000
Summary: The team will assess the potential of extending the geothermal energy use for all district heating needs of the Sapareva Banja community. Currently, the municipality is using geothermal on a small scale as an alternative to the use of fossil fuel. First, the US partner will analyze the current system and identify opportunities to improve it. Then they will estimate the geothermal potential of the local field as well as determine the heat and energy consumption in the city. Based on the findings, a technical and economic study will be prepared to evaluate developing a district-heating scheme, including a general system configuration, environmental impact, and cost estimates. The study will be the basis for obtaining future funding for project. The partnership was facilitated by an EcoLinks QRA awarded to the municipality.
Results: A description of the existing geothermal system and a report on the geothermal resource potential, including estimated costs to increase the fluid production. Also a district heating model including an assessment of economic and environmental impacts of the proposed system.

2) Title: Cleaner Shoe Production: Environmental Friendly Products
Leader: Valeo Company, Plovdiv, Bulgaria
Partner: BEM Systems, Inc., NJ,USA
Associates: CSM Worldwide, Inc., NJ,USA
Grant Total: $50,000
Summary: The goal of the project is to significantly reduce the VOC emissions through several cleaner production methods, including raw material substitution, and waste minimization practices at the plant. The following tasks are planned: a preliminary assessment, including a process flow diagram that identifies each manufacturing step, raw materials, packaging methods, intermediate and end products, and waste stream. Based on the initial data, the team will develop a waste and emissions inventory and evaluate the substitution of currently used hazardous materials with less polluting materials, including low VOC content or water-based adhesives. The US Partner will develop a cost-benefit analysis of these options, including environmental benefits and a set of recommendations. Guidelines for Cleaner Shoe Production will be developed and distributed during a final workshop to disseminate project results.

Results: A preliminary assessment of shoe manufacturing and waste handling practices at the plant, an environmental inventory, and a cost-benefit analysis of identified options. The main result is a final report including recommending the best, feasible options as well as a brochure entitled "Guidelines for Cleaner Shoe Production" to be distributed to similar facilities.

3) Title: Action Plan for Integrated Water Quality Management
Leader: Municipality of Kavarna, Bulgaria
Partner: Pennsylvania-American Water Company, McMurray, PA, USA
Partner: Stoarch, Sofia, Bulgaria
Associates: Center for Environmental Research and Education, Duquesne University, Pittsburgh, PA, USA; Allegheny County Sanitary Authority, Pittsburgh, PA, USA
Grant Total: $50,000
Summary: The goal of this project is to develop a long-term action plan for developing an integrated water quality management system for the Kavarna region. The partners will identify and rank the causes of water quality problems and the potential for water conservation. Based on this information, the partners will identify the best ways to improve water quality and reduce water consumption.
Results: The partners will produce an analytical study of the state of water quality management in the Municipality, a draft action plan for integrated water quality management, and an investment promotion brochure for priority projects.

4) Title: Energy Audit
Leader: Kitka 1 Joint Stock Company, Novi Pazar, Bulgaria
Partner: EETEK Kft, Budapest, Hungary
Associate: Tetiva Ltd., Sofia, Bulgaria
Grant Total: $50,000
Summary: The goal of this project is to develop, design and implement a comprehensive energy efficiency strategy for Kitka 1. The partners will conduct an energy audit of the plant, including a financial analysis of potential energy efficiency investments. As part of the audit, the partners will analyze current energy consumption, calculate the amount of energy required for operation, estimate potential energy and cost savings from efficiency improvements, and make a cost/benefit analysis of the proposed efficiency measures.
Results: The partners will produce an energy audit report.

5) Title: Treatment System for Recyclable Waste at a Landfill
Leader: Chistota Iskar Ltd., Sofia, Bulgaria
Partner: EBA Wastechnologies, Santa Rosa, California, USA
Grant Total: $38,800
Summary: The primary goal of the project is to minimize the amount of residential waste deposited in the Sofia municipal landfill. In order to accomplish this goal, the partners will examine methods of waste separation that allow recyclable materials to be treated separately from non-recyclable waste. The partners will examine two possible strategies: separate collection of recyclable and non-recyclable wastes and separation of wastes at a central location. The partnership is a result of a partner match conducted by EcoLinks.
Results: The partners will produce an analysis of the composition and quantities of recyclable waste at the landfill, a proposal for waste separation, and a report that details strategies for modern landfill management and the recovery of recyclable waste.

6) Title: Recycling Fluorescent and High Intensive Discharge Lamps
Leader: Svetlina, Sofia, Bulgaria
Partner: Lamp Recyclers of Louisiana, Inc., Hammond, Louisiana, USA
Grant Total: $49,980
Summary: The goal of the project is to develop a plan for tracking, collecting, storing and transporting fluorescent lamps containing mercury. In addition, the partners will work towards identifying technologies for recycling lamps that can be integrated with the leader's current manufacturing technology. The partnership was facilitated by a QRA awarded to the leader.
Results: The partners will develop models for the effective management of a recycling facility for mercury-bearing lamps, the collection, storage and transportation activities associates with such a facility, and the effective reutilization of all by-products of the recycling process.

CROATIA

7) Title: Cogeneration Plant in Clinical Hospital Osijek
Leader: Klinicka Bolnica Osijek (KBO), Croatia
Partner: Parsons Energy & Chemicals Group, Reading, PA, USA
Grant Total: $49,500
Summary: This project will set up the preconditions for considerable reduction in Osijek Clinical Hospital energy supply expenses and consequently in the costs of medical treatment. The project leader and partner will develop an Energy Management Plan. The Plan will include data on total heat and power consumption during a calendar year, analysis of results and possible internal savings. Also, the selection of the most favorable technical and process options for combined heat and power supply of the hospital will be provided. Finally, they will determine parameters for the cogeneration plant and prepare documentation for the future plant. The partnership was facilitated by a QRA awarded to the leader.
Results: The final results of this project are process and tender documents for selecting the most favorable bidder for contract award.

8) Title: Waste Management Planning
Leader: Municipality of Biskupija, Croatia
Partner: Environmental Technology Group, Inc., Centerport, NY, USA
Partner: Urbing, Zagreb, Croatia
Grant Total: $50,000
Summary: The goal of the project is to completely reorganize and reform the leader's solid waste management system. Solid waste management in the municipality will be improved through waste reduction, reuse, separation, and the composting of organic materials. The partnership was facilitated by a QRA awarded to the American partner.
Results: The partners will produce an inventory of the waste disposed of at the municipal landfill, a model for a solid waste disposal facility, a marketing plan for recovered waste material, and a report that analyzes the information gathered during the project and details the plan for reorganizing the solid waste management system.

9) Title: Improvement of Water Quality and Reduction of Leaks
Leader: Darkom Ltd. Public Utility Company, Daruvar, Croatia
Partner: DHI HydroInform, Prague, Czech Republic
Partner: IMGD Ltd., Zagreb, Croatia
Grant Total: $49,939
Summary: The purpose of the project is to improve water quality and reduce the loss of water due to leaks in the system. The partners will develop a model to identify areas of severe leakage. Using that information, they will test and monitor the leak detection equipment on a pilot basis. The partnership was facilitated by a QRA awarded to the leader.
Results: The partners will prepare a leak detection study to be used for implementing the plan throughout the system.

KAZAKHSTAN

10) Title: Reduction of Ammonia Emissions at Atyrau Dairy Refrigeration Facility
Leader: Atyrau Sutcombinat Open Joint-Stock Company, Atyrau, Kazakhstan
Partner: PSRG Consultants, TX, USA
Grant Total: $49,929
Summary: The purpose of the project is to develop economically-viable options to reduce ammonia emissions by implementing cleaner production and energy efficiency measures at the diary plant. The US partner will assist the leader in assessing the conditions at the plant and develop a maintenance plan, including leak detection and abatement. Activities include: an energy audit to determine opportunities for energy conservation and the development of a plan to identify options for new refrigeration equipment. The partnership is a result of partner search conducted by EcoLinks and was facilitated by a QRA awarded to the Kazak organization.
Results: An energy audit report, ammonia emissions testing report as well as a feasibility study that includes a project assessment, financing, and implementation cost estimates.

11) Title: Making Production of Solvents Ecologically Cleaner
Leader: Demeu Ltd. Almaty, Kazakhstan
Partner: Sierra Engineering Services, Irvine, CA,USA
Grant Total: $49,452
Summary: The main goal of the project is to make production of solvents ecologically cleaner at Demeu plant. The partners will develop a feasibility study on waste reduction and control of water and air pollution in the solvents production area. Cooperation with the partner company will enable the leader to establish environmentally friendly production of solvents.
Results: A feasibility study on waste reduction and control of water and air pollution, a list of recommendation, and a plan for adopting the best technology options will be developed.

12) Title: Conversion of Solid Waste into an Economically Viable Product
Leader: CJSC Alash, Almaty, Kazakhstan
Partner: K.R. Komarek, Inc., Elk Grove Village, Illinois, USA
Associates: Institute of Metallurgy and Ore Benefication of the National Academy of Science, Almaty, Kazakhstan; OJSC Ispat-Karmet, Temirtau, Kazakhstan
Grant Total: $49,973
Summary: The goal of the project is to study the feasibility of using briquetting technology to convert the waste from the production of calcium carbide into an economically viable product. The partners will study and analyze the current production operations, the feasibility of using briquetting technology on the waste and the different methods of doing so, and a technical and financial evaluation of the different methods. By doing this, the partners will identify the best market-based solution to the waste problem. The partnership was facilitated by a QRA awarded to the American partner.
Results: The partners will produce a feasibility study that evaluates three methods of using briquetting technology, as well as a feasibility study that addresses the possibility of using the briquettes as a metallurgical additive.

MACEDONIA

13) Title: "BioPrespa" Feasibility Study
Leader: Municipality of Resen, Macedonia
Partner: HydroQual, Inc., NJ, USA
Partner: Fluid Project, Skopje, Macedonia
Grant Total: $50,000
Summary: The overall goal of this project is to improve Lake Prespa's environmental conditions by designing an efficient wastewater treatment system in the Municipality of Resen. The team will conduct a feasibility study to assess and recommend viable options for collection and treatment of sewage water. This study will include the evaluation of a few technology alternatives and will be the basis for cost estimates in order to pursue investment opportunities.
Results: A feasibility study that includes best practice models to solve the environmental problem of wastewater entering the lake.

14) Title: Modernizing the Landfill and Solving the Problem with Solid Waste Management in Resen
Leader: JKP " Proleter", Macedonia
Partner: Hydroprojekt CZ, a.s., Czech Republic
Partner: GEING, Krebs und Kiefer International, Macedonia
Grant Total: $49,975.25
Summary: The major goal of this project is to present options for the waste disposal system, waste collection and waste transport in Resen, Macedonia. The Czech partner will provide options for reconstructing the existing landfill. The final study will show if recycling and composting are suitable and an analysis of the quality and types of waste will also be included.
Results: A proposal for a waste management system and preliminary designs for the system.

ROMANIA

15) Title: Cleaner Production Options for a Ceramic Sanitaryware Factory
Leader: Bianca Romana SRL, Ploiesti, Romania
Partner: Environmental Management, ID, USA
Partner: SC "Petrom" INCERP Cercetare, Ploiesti, Romania
Grant Total: $44,915
Summary: The objective of the project is to improve the production process of ceramic sanitaryware by reducing waste and emissions while increasing energy and other resource efficiency. First, the Partners will investigate the sources of waste, emissions and inefficiency by conducting an analysis of critical material and flow at the plant. Based on the results, they will develop several good housekeeping procedures to increase resource efficiency and reduce emissions. Several cleaner production options will be presented for process/equipment modification, such as water/waste reuse, dust emissions reduction through improved filtration or containment, and increased energy efficiency through heat recovery or energy conservation. Finally, a workshop will be organized to disseminate project results.
Results: Project results include an air quality self-monitoring scheme, a manual on good housekeeping measures for ceramic sanitaryware manufacturers, a technical report on cleaner production options, and workshop materials.

16) Title: Pilot Project for Recycling the Municipal Waste in Bistrita City
Leader: Bistrita City Mayoralty, Romania
Partner: Resource Recycling Systems. Inc., MI, USA
Associate: Urbana SA Bistrita, Romania; SC Hicart SA Prundu-Bargaului, Bistrita, Romania; SC Codrisor SRL, Bistrita, Romania; SC Remat, Bistrita, Romania
Grant Total: $50,000
Summary: The US Partner and the Associates will develop a pilot collection, processing and marketing scheme for paper products collected from schools, businesses, residential areas, and institutions. Assisted by the partner, the City will prepare the procurement bid documents, and will upgrade the waste collection and disposal services by implementing a long-term service contract with local providers. A long-term recycling/solid waste service contracting strategy will be developed by the US company. The partnership is a result of a partner match conducted by EcoLinks and it was facilitated by a QRA awarded to the US company.
Results: The main results of the project will be an assessment and pilot recycling program as well as model procurement documents for Bistrita city.

17) Title: Efficient Energy Consumption, Minimum Climatic Changes
Leader: SC Tufon SA, Craiova, Romania
Partner: Thermal Desorption Technology Group LLC, Budapest, Hungary
Partner: MARCH CONSULTING spol. s.r.o., Prague, Czech Republic
Grant Total: $45,000
Summary: The main purpose of this project is to increase the energy efficiency of the technological process and to reduce the energy consumption at SC Tufon SA. The result from the energy audit will be a major reduction of the greenhouse gas emissions. At the end of the project, technical solutions will be provided for reducing energy consumption and being more efficient.
Results: The partners will present an energy audit and the leader will be able to calculate the cost of expected investment. A report will provide technical solutions for reducing energy consumption during the production process and improving working conditions in the production hall.

18) Title: Waste Water Management at ICERP S.A. for Complying with the Legal Norms
Leader: S.C. ICERP S.A. Ploiesti, Romania
Partner: Oshman Group, LLC, Chester, VA, USA
Grant Total: $50,000
Summary: ICERP S.A. discharges wastewater that contains petroleum products and organic and inorganic compounds into the city sewer system. With the help of Oshman Group LLC, they will install efficient monitoring systems to monitor the quality of treated water at the outlet to the city sewer system. This new system will measure the level of hazardous products in the water.
Results: The major result of this project is to identify a cost-effective compliance program for S.C. ICERP S.A. Also another result is the development of options for managing the wastewater and for providing control/pre-treatment models.

19) Title: Alternatives for Upgrading the Water Pre-Treatment Plant and for Improving the Water Management System of S.C. Dorobantul S.A.
Leader: S.C. Dorobantul S.A., Ploiesti, Romania
Partner: Aponowich, Driscoll & Associates, Inc., Atlanta, GA, USA
Grant Total: $50,000
Summary: Dorobantul's production will be evaluated in order to reduce waste generation as much as possible. Then, wastewater treatment and the sludge management alternatives will be evaluated, to determine the most cost effective and environmentally acceptable alternatives. Each alternative will be evaluated using life cycle costs and an appropriate discount rate. A final recommendation will be made on the most viable alternate for further implementation.
Results: The major result of this project is the evaluation report of in-plant process flows and pollution prevention techniques. The final report will summarize and develop the Cost of Implementation and Investment Plan for SC Dorobantul.

20) Title: Technical Alternatives for Improving the Water Management System of Petromidia
Leader: S.C. Petromidia S.A., Romania
Partner: Harza Engineering Co., Chicago, IL, USA
Grant Total: $50,000
Summary: The goal of this project is to improve the efficiency of Petromidia's operating and wastewater treatment systems in order to significantly reduce the raw water intake and concentrations of pollutants in the wastewater that is discharged into the Black Sea. Another aspect of the project is increasing the percentage of reused water in the technological process and reducing water consumption.
Results: A technical report that assesses the treatment efficiencies of the water and wastewater facilities at the plant, evaluates alternatives that should be considered, and recommends modifications/improvements.

21) Title: Reducing Losses in the Thermal Energy Distribution Network
Leader: Iasi District Heating Company, Iasi, Romania
Partner: Cavanaugh & Associates, P. A., Winston Salem, NC, USA
Associate: Regia Autonoma Judeteana Apa Canal Iasi, Iasi, Romania; S. C. Expert Grup, Iasi, Romania; Citadin, Iasi, Romania
Grant Total: $50,000
Summary: The goal of the project is to reduce the loss of heat in the district heating system due to leakages. The partners will test the feasibility of using leak detection equipment. In order to test the feasibility of the technology, the partners will establish a pilot project to try the technology at two substations in the heating network. In addition, the partners will study the problem from a financial point of view in order to determine the costs, benefits, and the potential rate of return of any future investment in leak detection equipment for the system. The partnership was facilitated by a QRA awarded to the leader.
Results: The partners will determine if the detection equipment can function as intended and will decide, based on economic factors, if the project should be continued to the implementation stage.

RUSSIA FAR EAST

22) Title: Feasibility Study on the Production of High-Quality Livestock Feed from Stillage.
Leader: "OAO Likerovodochnyi Zavod" (Open Joint Stock Company), Yuzhno-Sakhalinsk
Partner: Katzen International, Inc., OH,USA
Grant Total: $49,985
Summary: The project aims at minimizing the discharge of thin stillage (more than 4,000 tones annually) resulting from the production process that is ultimately deposited into the city landfill. An initial assessment will analyze the waste volume, raw materials and water use, and test the stillage characteristics. The project will also study the market and demand for livestock feed as well as waste transportation issues. A feasibility study and a business plan will be developed at the end to evaluate the most effective technologies and solutions that provide for the extraction of animal feed components from the waste while minimizing the water consumption reduction. The partnership was facilitated by a QRA awarded to the Russian plant.
Results: A feasibility study, including a cost-estimate of proposed options and a business plan.

23) Title: Vladivostok Drinking Water Management Project
Leader: Vladivostok Municipality, Russia
Partner: Utility Service Associates, WA, USA
Grant Total: $43,282
Summary: The project will develop a water system management plan for the city to conserve water and energy resources by eliminating leaks and reducing water losses. The municipality's employees will be trained in water management methods used in the US. The US Partner will develop programs for management of high water flow pressure control in the distribution network, in-house leak detection and conservation, and improvement of the water loss accountability in Vladivostok. The partnership resulted from a partner matching conducted by EcoLinks and was facilitated by a QRA awarded to the leader.
Results: The main result of the project will be a water management and conservation program that will focus on high water flow pressure control improvement, in-house leak detection, and implementing a better accountability methodology for the city.

24) Title: Community Solid Waste Sorting and Recycling Project in Khabarovsk
Leader: Community Service Enterprise # 1, Khabarovsk, Russia
Partner: Association of Oregon Recyclers (AOR), Portland, OR, USA
Grant Total: $50,000
Summary: Based on the experience of the US partner, Community Service Enterprise # 1 intends to create a model system for collecting, sorting, transporting and recycling solid waste materials in a housing district of Khabarovsk City. The project involves several stages: designing of pilot recycling depots, selecting equipment, training depot managers and educating the public on recycling. Association of Oregon Recyclers will provide experience, training, consultation and evaluation of the project. The partnership was facilitated by a QRA awarded to the leader.
Results: The operation of pilot recycling depots in the project area. Also lists of potential markets for different recyclable materials and a small manual for operating and maintaining the collection depots will be given.

UKRAINE

25) Title: Methods to Control Over-streams of Municipal Solid Waste for Lviv City Landfill
Leader: Department of Housing & Communal Services Lviv Region, Ukraine
Partner: HVAC & Geotech Systems Inc., Glenview, IL,USA
Partner: Scientific & Production Company "SENS"
Grant Total: $48,320
Summary: This project focuses on identifying alternatives for improving the landfill for Lviv City. An assessment based on the adaptation of new technologies will focus on the following areas: rehabilitating the landfill and using the methane gas.
Results: An assessment report for rehabilitating the landfill including using the landfill gases. Also a database will be created on the landfills in Lviv region and to estimate the greenhouse gas reserves of Lviv City. After the assessment, an Action Plan will be developed for the city.

26) Title: Solving Environmental Problems of Chemical and Pharmaceutical Enterprises
Leader: Farmak Chemical and Pharmaceutical Plant, Kiev, Ukraine
Partner: TLK Consulting, Kirkland, WA,USA
Associates: Pivdenteploenergomontazh, Kiev, Ukraine; Technomer Energiya, Kiev, Ukraine; Ecomedservice, Kiev, Ukraine
Grant Total: $48,500
Summary: The goal of the project is to identify areas of energy loss and to evaluate the feasibility of implementing energy efficiency measures. The partners will perform an energy audit of the leader's manufacturing facility. In the course of performing the audit, the partners will develop qualitative and quantitative estimates of the potential for energy savings, and develop an energy management plan. The partnership is a result of a partner match conducted by EcoLinks and was facilitated by a QRA awarded to the US partner.
Results: The partners will prepare an energy audit of the leader's facility, and a method for an integrated solution to energy and environmental problems. In addition, they will conduct a workshop for representatives of chemical and pharmaceutical companies, local governments, and environmental organizations to disseminate the results of the project.

27) Title: A Sustainable Waste Management System for Zaporizhzhya.
Leader: Office on Ecology of Zaporizhzhya Municipal Council, Ukraine
Partner: Cantox, Inc., New Jersey, USA
Partner: Scientific-Technical Industrial Corporation "EcoShield", Ukraine
Grant Total: $ 50,000
Summary: The city of Zaporizhzhya has two landfills that are quickly reaching their capacity. Both are technically inadequate and pose a serious environmental threat due to poor standard of service and the discharge of contaminants into the rivers. Moreover, the city is not taking advantage of the potential revenue that could be earned on the recyclable materials currently disposed of at the city dump. This project will look at alternatives for developing a waste management system and plan.
Results: The project report will include a short list of potential waste systems and the rationale for their selection, a cash-flow model including forecasting costs and revenues that might be generated from various system alternatives, and a business plan for implementing the preferred waste management system.

28) Title: Developing Climate Change Mitigation Strategy for Donetsk, Ukraine.
Leader: Ecology and Environment Department of Donetsk City Council, Ukraine.
Partner: Twenty First Strategies, LLC, McLean,Virginia,USA
Associate: Center for Clean Ai Policy, USA; Ukrainian Environmental Technology Center (UkrNTEC), Ukraine; Advertising Agency "Styler", Ukraine
Grant Total: $ 49,996
Summary: Donetsk is an industrial city that contributes about one third of the pollution in Ukraine. The region is known for its concentration of heavy industry that results in extremely high energy consumption and elevated levels of GHG emissions. The City of Donetsk will carry out a project to evaluate the options for reducing GHG emissions and will develop a local climate mitigation strategy.
Results: The project deliverables include a GHG emissions inventory, a strategy for reducing GHG emissions and a shortlist of promising GHG reduction projects.

29) Title: Minimization and Management of Waste Products in Marganets, Ukraine
Leader: State Communal Enterprise "Blagoustriy", Ukraine
Partner: The Environmental Research and Monitoring Center PP, Poland
Partner: Closed Joint Stock "Dnieprocommunproject", Ukraine
Grant Total: $ 41,748
Summary: The city of Marganets is experiencing a problem with disposing of its household waste. The waste field does not meet the sanitary requirements established in Ukraine - it is not equipped with systems for removing dust and the effects on subsoil waters are not monitored. The city would like to develop a waste management system that would include ecologically safe and economically effective methods of gathering, transporting and processing of the waste products. The partnership is a result of a partner match conducted by EcoLinks
Results: The results of this project will include an audit of the content and the sources of waste in the region as well as a report on both legal and illegal waste dumps and their effect on the environment. Furthermore, a waste management program will be created for Marganets that will include ecological, technological, legal and training aspects.

30) Title: Degasification of Underground Coal Mine and Utilization of Coal Bed Methane
Leader: Stakhanov Mine, Donetsk Region, Ukraine
Partner: Resource Enterprises Inc., Salt Lake City, UT, USA
Grant Total: $ 49,608
Summary: The project team will conduct a coal mine methane drainage and use study for the underground, long wall, coal mining operations at Stakhanov mine. The overall goal of the project is to determine the feasibility of introducing coal mine methane drainage and use technology to Stakhanov Mine through the establishment of an independent drilling and gas utilization service organization based in the Donetsk Coal Basin.
Results: A feasibility study that examines drilling technologies and evaluates the efficiency of degasification wells, as well as, the development of an independent service organization.

31) Title: Environmentally Friendly Recycling Wastes at "VtorMet"
Leader: Joint Stock Company Konstantinovka plant "VtorMet", Donetsk Region,Ukraine
Partner: Environmental Science Services (ESS), Inc., Wellesley, MA, USA
Grant Total: $ 49,998
Summary: The plant recycles discarded Ni-Fe industrial accumulators and produces nearly 5000 tones of ferronickel annually using this technology. This recycling leads to significant gaseous emissions that contain fumes, dust and gas hazardous to the environment. The plant wants to find a way to reduce the amount of emissions by technology improvements as well as by setting up a gas purification system. The overall goal of the project is to identify and assess the environmental problems resulting from recycling discarded Ni-Fe industrial batteries and to identify environmentally friendly and efficient measures to clean up pollution and to improve the processes. The partnership was facilitated by a QRA awarded to the Ukrainian company.
Results: The project deliverables include: a study to identify and evaluate the environmental and technological problems occurring during the process in order to create a cleaner production process, and a final report which lays out the concrete measures for implementing the recycling options including the technology alternatives for the plant.

04/26/01

Annex B
EcoLinks Quick Response Awards
January - March 2001

#	GRANT NUMBER	DATE OF AWARD	IIE NUMBER	GRANTEE	PROJECT TITLE	COUNTRY	PROJECT PARTNER	GRANT AMOUNT	ACTIVITY DATE	INITIATOR/ STAFF	REPORT (Y/N)
Georgia											
1	GE-213	01/04/01	70224388	Design Fuels Corporation	Waste Coal recovery at Tkibuli mine	US to GE	Tkibuli mine, Rustavi mun.	$5,000	Jan-01	Ap/IH	
Poland											
4	PL-222	03/28/01	70224397	Parris International, LLC	Production of insulated windows in Pol	US to PL	OKNO Systems	$5,000	Apr-01	AP/AK	
	PL-221	03/23/01	70224396	EKOLOG Systems Sp.	Waste Management System in Warsaw	PL to US	CP Manufacturing, Inc.	$5,000	Apr-01	TR/PT	
	PL-220	03/21/01	70224395	STOEN SA	Photovoltaics at Warsaw utility	PL to US	Tucson, Li power co.	$5,000	Apr-01	TR/IH	
	PL-214	02/13/01	70224389	Harmony Enterprises, Inc.	Harmony-Ekomech partnership	US to PL	Ekomech Sp. z o.o.	$4,200	Mar-01	TR/PT	
							TOTAL:	$19,200			
Romania											
5	RO-219	03/19/01	70224394	Celsius 2000	High efficiency boilers for pollution red	RO to US	Enercorp, CA	$5,000	May-01	TR/IH	
	RO-218	03/19/01	70224393	Accredited Lab Association	Pollution prevention and CP partnership	RO tu US	Pittsburgh Technology Council	$5,000	Apr-01	Ap/IH	
	RO-217	03/09/01	70224392	Chamber of Commerce Romania	p3 in solid waste management in Romania	RO to US	SWANA	$4,983	Apr-01	Ap/IH	
	RO-216	02/23/01	70224391	Self Reliance, Inc.	Products from distarded materials	US to RO	Metalsid trading, Inc.	$5,000	Mar-01	Ap/IH	
	RO-215	02/16/01	70224390	Env. Business Counc. of NE	develop. Of voluntary standards	US to RO	Asoc. Of Env. Firms	$5,000	Mar-01	Ap/IH	
							TOTAL:	$24,983			
Slovakia											
1	SK-223	03/30/01	70224398	Puchov - Mestsky Urad	Sustainability Partnership Initiative	SK to US	The City of Meadville	$5,000	May-01	AP/PT	
						TOTAL:		$54,183			

Initiator: Tech Rep - TR; Applicant - AP; other-O
QRAs promoting trade in bold - 1/1/01- 3/31/01

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Annex C
EcoLinks Best Practices
January – March 2001

Best Practice #1

Treatment of Wastewater from Abandoned Pyrite Mine in Slovakia

Abstract

In 1991 the Smolnik Mine in eastern Slovakia was abandoned due to economic hardship. The mine, like many other inactive mines in Slovakia, has since become a significant source of water pollution impacting water quality both locally and internationally. Slovakia, a country facing many economic and political challenges after the demise of communism, needs a creative and low cost solution to address this serious environmental problem. Searching for this solution was the focus of this project.

AQUIPUR, a consulting firm in Slovakia and Knight Piesold, a consulting company based in the United States, collaborated to develop a strategy for reducing water pollution associated with the Smolnik Mine. An EcoLinks Challenge Grant provided support to explore the feasibility of using passive treatment technology to improve the water quality of mine effluent.

Several best practices can be learned from this project. This project demonstrates the usefulness and applicability of passive treatment technology for reducing water pollution. The pilot test generated by this project revealed that heavy metal pollutants such as aluminum, copper, and zinc are reduced by almost 70% and acid levels are significantly improved. The pilot also demonstrated that the materials needed to build a passive treatment system are attainable and inexpensive compared to active water treatment systems. While active water treatment requires ongoing maintenance that is costly, passive treatment is low maintenance. Given the effectiveness, applicability, and economic efficiency of this approach, it can be usefully applied to improve other mine waters throughout Central and Eastern Europe.

Name of Project: Feasibility Test for Water Quality Improvement Using Passive Treatment System on Effluent Waters from the Smolnik Mine in Slovakia

Project Area: Water Quality Management

Organizations Involved:

Project Leader: AQUIPUR a.s., Bratislava, Slovakia
Project Partner: Knight Piesold and Company, Denver, Colorado
Associate: Faculty of Sciences, Comenius University, Bratislava, Slovakia

Location of Project: Smolnik, Slovakia

Project Duration: August, 1999 - September, 2000

Problem Statement:

An important consideration in improving water quality in Central and Eastern Europe is minimizing wastewater effluent from inactive or abandoned mines. These waters can be highly acidic and contain heavy metals that are detrimental to human health and aquatic ecological vitality. Mine water treatment, however, can be costly and complicated to implement and maintain. To address water quality problems associated with mine effluents in Central and Eastern Europe, creative and economically efficient ways to minimize and treat contaminated mine waters must be explored.

This project tests the feasibility of a low cost, low maintenance technique for passively treating mine water. The Smolnik Mine in Smolnik, Slovakia is used as a test site. This site is ideal for this project because there is an existing knowledge base on the mine's properties and other remediation efforts are already underway. The Smolnik Mine, once a notable source of pyrite, became inactive in 1991 due to economic constraints. The mine eventually flooded with water leading to acid rock drainage. From eight to twenty five liters per second of acidic water contaminated with heavy metals now flows in the form of underground seepage from the mine into tributaries of the Ruzin Basin eventually crossing the international border into Hungary. The metal content of the Smolnik mine effluent far exceeds allowable pollution levels and has diminished ecological conditions in the Smolnik stream, the Hornad River, and transboundary waters.

The scientific community has shown much concern over the environmental destruction associated with the inactive mine that is owned by the Slovak government. The Slovak government, while concerned for water quality, has not yet been able to dedicate the economic and political resources necessary for attacking the environmental problems associated with the closed mine. Demonstrating feasible and inexpensive ways to improve water quality as this project does, however, may attract more resources and support.

It has to be emphasized that the amount of water that infiltrates the mine has already been significantly reduced. This has been achieved through diverting the surface water to bypass the most intensive infiltration points.

Project Description:

Acidic water contaminated with heavy metals can be treated using active or passive methods. Active methods bear relatively lower investment outlays, however, they have significant operating costs. The

passive treatment technologies, which are based on immobilization of metals by bacteria and by plants in a man-made wetlands are gaining acceptance in many parts of the world. Slightly higher investment outlays of these technologies are counterbalanced by insignificant operation costs.

Passive methods can be aerobic or anaerobic. The choice between the methods is driven by the wastewater chemical composition. For this particular case, it was decided that the anaerobic method would be tested. Anaerobic method utilizes sulfate reducing bacteria and organic matter in the cell to raise the pH and to form the sulfide ions, which combine with the metals to form insoluble sulfides.

The purpose of this project was to determine empirically a feasible plan of an effective, full-scale, passive, anaerobic water treatment system for reducing water pollution associated with the inactive Smolnik Mine. This was done in two phases: 1) bench-scale study, and 2) pilot-scale study. The first phase of the project, the bench-scale study, focused on determining the appropriate mixture of sulfate-reducing agents most effective at reducing the acidity and removing metal contaminants of effluent mine water. The second phase of the project, the pilot-scale study, involved constructing a pilot cell to test the most favorable mixture under continuous flow conditions.

Phase I: Bench-Scale Study

The bench-scale study involved preparing four different sulfate-reducing bioreactors. The bioreactors each contained different combinations of crushed limestone, aged sawdust, moldy hay, and aged cow manure. The flow from each bioreactor was tested to determine which of the four cell mixtures was most effective at improving the pH and reducing the amount of heavy metals. This test was performed under discontinuous flow conditions. Once the appropriate mixture was determined, it needed to be tested under continuous flow conditions.

Phase II: The Pilot-Scale Study

The pilot-scale study involved the construction of the anaerobic sulfate-reducing, 12m x 6m x 1m cell using the most effective sulfate-reducing mixture determined by the bench-scale study. The location of the cell was selected to allow gravity flow from the mine to the cell. The cell was filled with 14,700 kg of limestone, 19,000 kg of old sawdust, 4,250 kg of hay, and 5,600 kg of manure. Then the cell was tested under constant flow conditions and the output was periodically monitored for pH, temperature, conductivity, redox, iron, aluminum, copper, zinc, sulfate, magnesium, and calcium. The flow varied from 8,000 to 13,000 liters per day. The experiments lasted approximately 5 months. Based on the results of the pilot-cell experiments, a plan was constructed for a full-scale treatment system.

Upon completion of Phase I and Phase II, the project results are to be presented to the Slovak Ministry of Environment and the Slovak Ministry of Economy in hopes of achieving future support for the construction of a final passive water treatment system. Research results obtained from project were shared at an International Environmental Symposium in Prague and published in conference proceedings.

Outputs/Results:

Through this project, it was determined that passive water treatment technology is an effective, feasible, low cost solution for treating mine effluent water at the Smolnik Mine. It was further indicated that this technique might be favorably applied to other similar mines throughout Central and Eastern Europe to improve water quality. The following points specify the outputs and results of this project:

The project demonstrated that the pilot cell effectively and consistently reduced heavy metals by up to 70%, and improved the pH of the water even when the cleansing cell was overloaded. The test revealed that the sulfate-reducing cell could eliminate metals in loading conditions that are much higher than anticipated.

- Based on findings from the pilot test, a set of design parametrs was obtained and a conceptual design for a complete treatment system was developed.
- By running the pilot test, the challenges and opportunities to using the passive treatment system were identified. The problems identified in the pilot cell test were corrected for the final full-scale design of the treatment system and will thus be avoided in this and other future applications of this technique. For example, the trial test cell showed that feed pipes can become clogged with iron hydroxide precipitates. To remedy this in the final design of the full-scale treatment system, it is indicated that feed pipes are to have smooth walls and be easily accessible for cleaning purposes. The pilot-cell study also revealed that the system can handle an influx six times larger than originally predicted by the bench-scale tests. Since the cells can handle a larger flow, fewer cells can be used conserving the amount of land needed to build the system. Note, however, that this decreases the longevity of the cells by half.

Due to the experience gained through testing the passive water treatment technology at the Smolnik Mine, AQUIPUR now has the knowledge and experience to implement passive treatment systems for other inactive mines in the region as well as train others in applying the passive water treatment technique for its application throughout Central and Eastern Europe.

This project affirmed a low-cost solution to water pollution associated with inactive mines. Many other water treatment approaches require more costly and less accessible materials and sustained maintenance and monitoring. The passive water treatment system, however, employs inexpensive materials that are more readily available and requires only minimal, periodic maintenance. Through this test pilot it was also discovered that if the cell is built on an incline, water enters the cell via gravity, censequently a pump is not needed, thereby reducing the costs of this technique even further.

In addition to economic savings through exploring low cost water treatment methods, this project built social capital in the form of network formation and information exchange. This project engaged a partnership between the Slovak consulting firm, AQUIPUR, the Faculty of Sciences at Comenius University in Slovakia, and a US firm, Knight Piesold. This network allowed for the exchange of information and generated the implementation capacity to develop the plans for a full-scale passive water treatment system. Valuable knowledge was also obtained on how to collaborate effectively to improve the success of the project.

Costs of EcoLinks Project:

The total expenditures for the project were $ 54,822 of which $36,310 was funded through an EcoLinks grant and $18,512 was provided as cost share.

Expected Environmental and Economic Benefits:

Environmental Benefits

The environmental benefits of this project are derived through providing the technological capacity for constructing passive water treatment systems to reduce mine water pollution. The potential for water quality improvement using the developed system was demonstrated by the results from testing the pilot-cell discharge. The last data set gathered for metal content of discharge from the pilot-cell is presented in the table 1:

Tab.1 Results of pilot scale tests

Component	Concentration before treatment [ppm]	Concentration after treatment [ppm]
Aluminum	165	3.25
Copper	6.29	0.08
Zinc	21.7	0.36
Manganese	44.9	37.4

Total iron	617	322

Altogether 70 % of metals were removed. Sulfate flow was reduced from 18.7 moles/day/m3 to 1.38 moles/day/m3. Note that while these readings were taken in September, the readings were also just as impressive at the beginning of spring in May when flow rates can be much higher (by 50 %). The pilot test also revealed that the pH was increased by one to two units reducing the acidity of the water.

Economic Benefits and Financial Analysis

The passive treatment system developed in this project is less costly than an active treatment system. The materials for a passive treatment system are less expensive and the maintenance and monitoring are less demanding. A chemical treatment option was considered for improving the Smolnik Mine effluent but due to costs it was dismissed. Further, an active treatment system produces a sludge by-product requiring further investment while the passive treatment generates insignificant amount of solid waste as the content of the cells is operational typically around twenty years.

The table below shows details concerning cost analysis of passive and active treatment of wastewaters from Smolnik mine:

Tab. 2: Comparison of costs of active and passive methods of water treatment for the case of Smolnik mine

	Active method	Passive method
Investment outlays [$ million]	2.0	4.1
Operation costs [$ million/year]	0.5	0.0
Annualized cost (over 15 years, 6 % discount rate) [$million/year]	0.71	0.42

The result shows that the passive technology annualized costs are $ 0.42 million, almost twice lower than the annualized costs of an active method.

Project's follow-up

AQUIPUR and Knight Piesold seek local and international funds for a full-scale application of the treatment system from the Slovak Ministry of Economy and US Trade and Development Agency and US Environmental Protection Agency.

Transferability:

The passive water treatment technique can be easily applied to improve water conditions associated with other similar inactive mines in Slovakia, Poland, Germany and perhaps throughout Central and Eastern Europe. Other applications of this technique can benefit from the lessons learned in the pilot testing of this method at the Smolnik Mine. For example, the pilot test revealed that the cells could handle higher loads than originally anticipated. This knowledge can be easily transferred to others applying this technique.

Lessons Learned:

The following lessons were learned during this project:

A clear work plan and regular site visits by the key parties involved in the project improves project implementation, the work plan should outline not only the time schedule but also communication schedule

More collaboration (e.g., more communication) is needed to secure consistent data collection and reporting of results.

Several unexpected insights were gained from the research alone. 1) Acquiring sufficient land to locate the system can be difficult. Multiple sites may be needed to have sufficient space for the entire

treatment system, or fewer cells can be used. 2) Locating the cell where water can flow into it by gravity eliminates the need for a pump. 3) There can be problems with vandalism and materials being taken from the site.

Additional Information:

Contact Data

Project Leader	Project Partner	Associate
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EcoLinks Grant Program
Best Practice #2

Underground Pollution by Petroleum in Romanian Refinery

Abstract

The Astra Romana Oil Refinery has been active for more than a century. While an economic asset to Romania, it has led to dangerous accumulation of petroleum residues in underground water resources and soil in the area surrounding the refinery. Still active, the refinery makes efforts to implement spill prevention measures aimed to reduce the contamination of ground water and soil resources with petroleum and mitigate the environmental and human health risks. For many decades safe clean-up of accumulated spilled and leaked petroleum from the refinery has been desperately needed. The prevention of further contamination has become absolutely critical.

Astra Romana is one of many refineries that contribute to hydrocarbon contamination of soil and water. While several methods have been used to remove refinery-generated petroleum from soil and water in Romania, they have proven costly in terms of economic efficiency and environmental and human health risks. This project is considered as a Best Practice as it demonstrates the feasibility and effectiveness of American technology that has been transferred to Romania and used to recover petroleum from contaminated water and to prevent the spread of further contamination in ground water resources.

The technology was tested using a pilot, double-pump system that was installed to recover petroleum from two extraction wells in the refinery. The pilot system recovers 5 t of petroleum per month. The simple payback time of the pilot system, as well as of the complete, twelve-well system that will be installed, is between 3.5 and 4.5 years.

Name of Project: Implementation of a Cleaner Technology to Contain the Underground Pollution by Petroleum in the Vicinity of the Astra Romana Refinery in Ploiesti, Romania.

Project Area: Water Quality Management

Organizations Involved:

Project Leader: Astra Romana Refinery (Ploiesti, Romania)

Project Partner: Leggette, Brashears & Graham, Inc., White Plains, NY, USA

Associates:

INCERP CERCETARE, Ploiesti, Romania

TL Stevens Well Company, Maple Plain, MN, USA

"People and Environment", Ploiesti, Romania

TIAB, Ploiesti, Romania

FORADEX, Bucharest, Romania

Environmental Protection Inspectorate, Ploiesti, Romania

Location of Project: Ploiesti, Romania

Project Duration: September 1999 - August 2000

Problem Statement:

The Astra Romana Oil Refinery in Ploiesti, Romania, has been both an economic asset as well as an environmental hazard for decades. First established in 1880, it was the largest private refinery in Romania. Before the World War II, there were 12 oil refineries operating around Ploiesti and they were used to process almost 80 % of the oil in Romania. Among these 12 refineries, Astra Refinery used to process some 30% of the total quantity processed in Ploiesti area (and almost 25% of the total oil processed in Romania in 1939). All these oil refineries have contributed to water pollution and soil contamination with increasing severity since World War II, as caused by bombardments during the war, major earthquakes of 1940, 1977, and 1986, pipeline ruptures, and product spills and leakages. Astra Romana and other refineries in the Ploiesti vicinity, as well as the underground network of transport pipelines have also contributed to further contamination of soil and ground water in Southern Ploiesti. Leaked petroleum has accumulated in the free-phase layer of variable thickness above the groundwater (i.e. up to seven meters deep underground) over a 400 – 500 hectare area surrounding the refinery. In addition to soil and water contamination, leaked petroleum residues are a source of hydrocarbon vapors that may infiltrate the basements of surrounding residential homes.

Different methods for removing the residual petroleum from soil and water have been attempted. These methods, however, have had deleterious environmental and human consequences and have been energy-intensive. For example, small businesses and private individuals have been removing free-phase petroleum floating on ground water using open excavations. Removal of leaked petroleum through open excavations has spread ground water contamination and increased fire and asphyxia hazards. Several people have died from vapors released from the excavation sites. Farmland has been destroyed. Mechanically driven mobile belts have also been used to remove leaked petroleum, but have proven to be inefficient. An

environmentally sound and economically efficient method for removing and recovering petroleum from the surrounding refineries has become desperately needed.

The purpose of this project was to explore an environmentally sound and economically efficient way to minimize petroleum contamination of soil and water resources in areas surrounding oil refineries. To test the feasibility of a clean technology system, a monitoring and prevention plan was developed and two double pump systems were installed at the Astra Romana Refinery in Ploiesti, Romania. The pump systems were provided by the American Partner to the project.

Project Description:

This project was to assess and minimize soil and water contamination from petroleum leaked in the vicinity of Astra Romana Refinery.

The project consisted of four main activities:

Activity 1. The extent and impact of petroleum contamination in and around the Astra Romana Refinery was determined. Existing files on data gathered from monitoring wells around the refinery were reviewed. Current data on the status of petroleum residue, contamination of soil, water, and land, and the impacts and degree of inefficiency of previous free-phase petroleum removal attempts were gathered and analyzed. This was conducted with the assistance of INCERP, an associate of Astra Romana Refinery.

Activity 2. Spill assessment was conducted. Prevention plan was developed. Field investigations of the oil leakage sites were made. Spill detection and control systems were evaluated and updated to produce a new general plan for spill prevention including recommendations for implementation. The plan was formulated by Legette, Brashers and Graham, the American Partner.

Activity 3. Preparation and implementation of state-of-the-art technology. Evaluation of system operation was conducted.

The double-pump system technology was selected for this site due to the relatively high permeable sediments and the large accumulation of petroleum. High-risk contamination areas on the site were evaluated and the most suitable intervention locations were identified. Based on hydrological and geological status assessments of these suitable locations, specific procedures for installing extraction/recovery wells were determined. Two wells were drilled by FORADEX, an associate of the project, and tested for performance.

Hydrocarbon recovery and ground water extraction equipment from the United States was acquired and installed. A control system and two main pumps, a submersible water pump and a petroleum recovery pump, were installed in each extraction/recovery well. The double pump system allows for the safe extraction of petroleum residues floating on the surface of water. The water pump, which extends just below the water table, takes in ground water forming a cone of depression. The smaller product pump located above the water table recovers petroleum floating on top of the water. The cone of depression is maintained by a sensory activated water pump allowing petroleum residues to accumulate and be continuously removed from the water surface. Further, the spread of contamination is avoided by preventing the movement of ground water and petroleum by continuously pumping water out.

Start-up activities were completed and the system was tested. The monitoring wells were observed for petroleum accumulation. Upon calibration of pumps and controls, removal of hydrocarbons was observed and evaluated.

Activity 4. Information sharing on the use of cleaner technology for environmental remediation and pollution prevention and control.

Information on the application of this technology was made in several ways. A workshop was conducted and a public technical report was produced. A workshop on the application of the technology was conducted which included presentations, a question and answer period, and field visits to the site. A technical report on the system was produced for the public that details the findings of the results of this project. This report was shared during a workshop on the technology and is intended for further distribution to local government and the business sector.

Outputs/Results:

Several benefits were generated through this project:

A framework for applying the technology to other similar sites was established.

Compared to other previously used methods, preliminary testing of the double pump system revealed that this method was the most effective at recovering petroleum and minimizing further contamination of soil and water. After two months of operation, ten tons of petroleum were removed from the subsurface.

A spill monitoring and control plan was generated for the Astra Romana Refinery.

Experience doing collaborative projects was gained.

Information about the project in the form of a public technical report, an awareness brochure, slideshow presentation, photo album, and final project report were produced.

A workshop was conducted.

Costs of EcoLinks Project:

The total expenditures for the project were $74,995 of which $48,359 was funded through an EcoLinks grant and $26,636 was provided as cost share.

Expected Environmental and Economic Benefits:

Environmental Benefits

The two recovery/extraction wells with double pumps installed at Astra Romana Refinery collectively can recover 200 liters of petroleum per day. The recovery system, during its first two months of activation, is attributed with removing ten tons of petroleum residue floating on ground water.

Implementation of a full-scale system of 10-12 extraction/recovery wells will prevent even further deterioration of soil and water resources by removing 250-300 tons of petroleum per day. By pumping out petroleum residue floating on ground water, the system prevents against further hydrocarbon contamination by significantly reducing free-phase petroleum migration from contaminated areas.

There are no environmental and human health risks from applying the technology itself.

Economic Benefits

Operation of the double-pump system for the removal of petroleum from contaminated soil and water resources has several economic benefits:

- separation of petroleum takes place in the well (no additional processing is needed);
- petroleum can be recovered and reprocessed;
- system features low maintenance costs and requires medium capital investment.

The largest savings involved in using this system, however, result from the avoided clean-up costs through the prevention of further contamination:

- removing ten tons of free-phase petroleum prevents soil contamination through further petroleum movement and allows for savings of $14,000 - $ 45,000, depending on the soil clean-up technology that would be considered for application
- theoretically, removing 10 tons of free-phase petroleum from the subsurface leads to preventing contamination of 8 – 10 million cubic meters of ground water and allows for savings of $4 – 20 million in water clean-up costs.

In the case of the Astra Romana Refinery, leaked petroleum spread through the soil and water at a rate of 30 meters per year. Installing a complete system of 10-12 extraction/recovery wells at the Astra Romana Refinery could prevent this spread and allow for a total savings of $40,000 – $50,000 per year (the value of estimated recovered petroleum that can be reprocessed as crude).

Financial Analysis

The cost of installing a complete system/barrier of 10-12 extraction wells at Astra Romana Refinery would amount approx. $ 120,000 (including well installation & development, water & petroleum pumps, control panels, power supply & water discharge lines, but excluding geology & hydrogeology survey on local subsurface conditions that are already completed).

Yearly operation & maintenance costs for a 12-well recovery network would amount to approximately $10,000. Groundwater monitoring costs for a network of 24 monitoring wells adjacent to the extraction/recovery wells would add $3,800-4,000 annually.

The estimated yearly quantity of petroleum possibly recovered from the subsurface through the 12-well recovery network is between 250-300 tons (around $40,000 – 50,000).

The table below summarizes the estimated costs and benefits:

Tab. 1 Financial analysis for a system of 12 extraction wells

Investment outlays [$]	120,000
Operation & Maintenance Costs [$]	10,000
Monitoring [$]	3,800 – 4,000
Value of the petroleum recovered [$]	40,000 – 50,000
Simple Payback Time [years]	4.6 – 3.3

The Simple Payback Time is relatively low, especially when taking into consideration the fact that the benefits from avoiding soil and water contamination were not taken into account during calculations.

Transferability:

This project provides a framework for easy transferability of the technology to other sites in Romania. This system, adjusted for local conditions, could be applied to other similar refineries in Romania to help minimize the degradation of soil and water conditions.

Lessons Learned:

The following lessons were learned during this project:

- Face-to-face meetings and training demonstrations facilitate project implementation.
- By defining roles and tasks, collaboration is enhanced.
- Multi-expert, multi-disciplinary participation improves the capacity for environmental problem solving.
- Collaboration across different organizations also improved the capacity for project development and implementation.
- Difficulties arise in project implementation due to unforeseen circumstances. For example, each site will be different and may require different preparation. The monitoring wells on this site, for instance, had to be cleaned out. Also, one of the water pumps broke and a local equivalent had to be acquired. In some cases, however, certain pieces of equipment that might malfunction or break and for which there is no local equivalent have to be imported which stalls implementation.
- Importing needed US-produced equipment can require lengthy customs processing.
- Weather conditions must be suitable for equipment installation.

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EcoLinks Grant Program
Best Practice #3

An Environmental Management System (EMS) for Dredging on the Bulgarian Black Sea Coast

Abstract

The Black Sea provides important economic opportunities for the six countries that line its coast --Bulgaria, Georgia, Romania, the Russian Federation, Turkey, and Ukraine. It is also a vital marine environment supporting diverse biological life. Efforts to promote and strengthen economic vitality in the Black Sea region must incorporate environmentally sensitive methods. Trade and water transportation are two important economic opportunities for countries on the Black Sea. Improving water trade and transportation, however, requires dredging to provide transport vessels with port access. Dredging, while favoring economic opportunities, is detrimental to the environment and must be carried out in a way that minimizes environmental damage. This project outlines an environmental management system (EMS) for dredging activities on the Black Sea in Bulgaria.

The purpose of this project was to develop an EMS that provides a framework for asserting environmentally sensitive dredging activities. The EMS developed in this project includes several elements. An assessment of the status of the coastal and seabed environment and dredging activities in two port areas in Bulgaria, the Port of Varna and the Port of Bourgas was conducted to determine future dredging activities. The institutional and legal setting necessary to carry out dredging activities that minimize environmental damages was explored. An action plan for implementing the EMS including a computerized program to record and compile dredging data to assure monitoring and provide a complete data set regarding dredging activities.

This project is a best practices because it generates a method for conducting dredging activities that provide economic benefits and are less detrimental to the environment. While dredging itself provides significant economic opportunities for trade and marine transportation, the implementation of the EMS developed in this project: 1) would reduce dredge disposal costs because less dredge material is generated; 2) would prevent costs associated with environmental damage (e.g., violation fines and clean-up costs); and 3) would allow dredging companies to improve their ability to operate in a free market system by improving their bidding status due to favorable environmental practices. Implementing an EMS for dredging on the Black Sea would minimize the environmental impacts of dredging by: 1) reducing the suspension and dispersal of contaminants in the water column (e.g., visibility of suspension-cloud is reduced to 50 meters) which negatively impact marine life, human health, and other economic enterprises such as tourism, 2) reducing polluted air emissions by improving the energy efficiency of dredge material removal (e.g., concentration of dredge material removed is increased by 10%), 3) improving the coordination of management responsibilities providing a greater capacity to assure the implementation of environmental policies and laws, and 4) raising awareness and providing training in environmentally sensitive dredging increasing the application of EMS dredging activities.

Name of Project: Basic Structure of an Environmental Management System (EMS) Related to Dredging Works on the Bulgarian Black Sea Coast

Project Area: Cleaner Production

Organizations Involved:

Project Leader: Black Sea Coast Association (BSCA), Varna, Bulgaria
Project Partner: Ogden Beeman & Associates, Inc., Portland, OR USA
Project Associate: QUEST Management International, Englewood, Colorado USA

Location of Project: Black Sea Coast, Bulgaria

Project Duration: July 20, 2000 – January 20, 2001

Problem Statement:

Countries surrounding the Black Sea have experienced especially turbulent times due to political instability that had dramatic impacts on their economy. Bulgaria, for example, recently emerged from a period of economic crisis. Efforts that encourage economic growth are critically important to Bulgaria's future. Two main seaports of industrial significance in Bulgaria, the Port of Varna and the Port of Bourgas, provide opportunities for water transport and trade growth. To promote economic activities at these port sites, the approach channels and port vicinity must be deepened and maintained and embankment levels must be regenerated through dredging.

In the port and harbor areas such as Varna and Bourgas in Romania, years of industrial activity and non-point source enterprises such as agriculture have polluted the surrounding waters and seabed. Dredging disturbs and removes the sediment in which chemical and toxic substances are imbedded for the purpose of providing space for vessel transportation. Dredging in this area would stir up heavy metals and inorganic and organic compounds causing damage to marine ecological systems, human health, and the tourist industry. The ecological status of the Black Sea has been declining and dredging activities should be conducted in a way that minimizes the suspension and dispersal of these contaminants which would cause damage to an already sensitive ecosystem. This project outlines an Environmental Management System (EMS) to provide a framework for dredging activities that maximizes economic opportunities and minimizes environmental impacts.

Project Description:

The purpose of this project was to establish an Environmental Management System (EMS) for dredging in the Black Sea on the Bulgarian coastline around two port sites, the Port of Varna and the Port of Bourgas. To accomplish this, three main activities were conducted:

Activity #1: Assessment of current conditions, expected development and demand for dredging.

An assessment of the existing and anticipated port activities and expected dredging requirements was conducted. The assessment included determining the trends in ship and cargo type and cargo handling operations. For example, more modern vessels are up to two meters deeper than earlier carriers. Dredging, therefore, must be deep enough to accommodate newer vessels.

Hydrographic information and data, sediment types, historic dredging activities, available disposal sites, and equipment and resources of Bulgarian dredging companies were determined to assert the specific capacity for EMS dredging on the Bulgarian Black Sea coast.

A legislative framework for dredging in Bulgaria was considered. A review of international and regional law and policy considerations and sediment management standards was conducted.

Activity #2: Development of an EMS conceptual framework for dredging.

- The regional environmental conditions and marine impacts of Bulgarian dredging operations were determined. The elements of an EMS appropriate for the Bulgarian context were asserted. They included: environmental policy; environmental aspects and impacts of dredging; legal requirements; objectives and targets; environmental management program(s); structure and responsibility; training, awareness and competency; communications; EMS documentation; document control; operational control; emergency response; monitoring and measurement; non-conformance and corrective/prevention action; record keeping; dredging EMS auditing; and management review.

- A process for outlining information exchange and clarification of roles and responsibilities of involved parties necessary for implementing a dredging EMS were developed.

- An assessment of the existing framework for dredging activities was conducted and gaps were identified. Based on the results of this assessment, an action plan was then established for initiating a dredging EMS.

- A report, "Reducing Contaminated Sediment Impacts at Dredging Areas" by B. Savov, V Pentchev, and M. Johnson was presented at the Second International Conference on Port Development and Coastal Environment.

Activity #3: Guidelines and Recommendations for Implementation

System requirements were developed. They included: a dredging contractors EMS policy; a dredging EMS implementation plan; an EMS computer-based manual outlining procedures and guidelines; an outline of technical requirements such as machinery and software; description of monitoring requirements; and an EMS training program.

Coordination activities with local dredging contractors were initiated.

The results of this project were shared with interested Bulgarian companies and representatives of governmental bodies including the Ministry of Environment and Waters, and port administrators.

Outputs/Results:

This project provides a methodology for reducing the environmental impacts and costs of dredging. Several products were generated to provide the capacity for environmentally sensitive dredging. They include the following:

- Assessments of the current dredging framework and activities and requirements and the gaps therein.

Dredging Contractors EMS Policy: guidelines for dredging contractors using an EMS.

Dredging EMS Implementation Plan: steps that need to be taken for applying an EMS to dredging activities.

Technical Requirement Specifications (including equipment and software needed).

EMS Monitoring Requirements including the technical requirements, issues regarding monitoring during dredging, data collection, etc.

Procedures, documentation, and guidelines integrated in an EMS Computer Based Manual. The EMS computer program facilitates record keeping regarding hydrographic data, dredging records, sediment data, and environmental monitoring data. This information is important for evaluating activities and providing a general database of information regarding dredging activities and impacts.

EMS Training Program that trains relevant personnel in the environmental aspects of dredging operations, EMS implementation and the operation and quality control of the EMS computer software.

Workshop introducing project results to major Bulgarian companies.

Published special report titled, "A Contribution to Environmental Management Strategy of Dredging Works on Bulgarian Black Sea Coast." This was presented at the International Conference "Black Sea-2000", November 6-8, 2000, Varna, Bulgaria.

Productive and cooperative relationships were established between parties involved in or concerned about dredging activities.

Costs of EcoLinks Project:

The total expenditures for the project were $47,746 and were covered by an EcoLinks grant totaling $48,600. In addition to this, $26,419 was contributed as cost share by the grantee.

Expected Environmental and Economic Benefits:

Environmental Benefits

With the implementation of an EMS several environmental benefits are generated.

An EMS applied to dredging activities reduces the spread of sediment pollutants (e.g., lead, copper, zinc, cadmium, nickel, chromium, arsenic, mercury) into the water column and across the seabed where they interrupt important marine life cycles. The visibility of the suspension-clouds is decreased to a distance of approximately 50 meters.

Reducing the water content of the dredged material reduces the amount of dredge waste. An EMS improves the discharge of return water by 80% of its present level. This reduces the amount of energy needed to process dredged material and puts less impact on disposal sites. For example, the concentration of dredge material removed is improved by 10%.

Energy efficiency of the dredge removal process is improved.

There is better management across institutions which improves compliance with environmental laws and policies including sustainable coastal zone development.

An EMS reduces conflicts between dredging contractors, central and local authorities and non-governmental organizations since it addresses environmental impacts.

Generating the EMS itself provided opportunities for building important networks and generating and sharing information that is needed to improve the environmental aspects of dredging.

Economic Benefits

Several economic benefits can be derived from an EMS. They include:

The implementation of the EMS developed in this project would lead to a reduction in overdredge, i.e., more competitive prizing.

Costs for dredge disposal are reduced since the water content of the dredged material is lessened through the application of an EMS.

Costs associated with non-compliance with environmental laws and regulations are reduced.

Companies that apply an EMS approach improve their bidding status.

Transferability:

The process and the materials involved in developing the EMS for Bulgaria could be applied in other countries where the environmental impacts of dredging activities are not sufficiently considered.

Lessons Learned:

The following lessons were learned during this project:

Transferring technological experience from one country to another (Bulgaria and the United States in this case) requires adjustments for a different legislative framework and different standardization levels by extensive exchange of expertise and regional knowledge.

Flexibility and strong cooperation amongst the involved parties is needed to alleviate the difficulties associated with coordinating project activities in an unstable political, economic, and social environment. Also, monitoring evolving legislative issues is helpful.

Bulgarian dredging companies could benefit greatly from expertise on the design and implementation of EMS, additional equipment to do monitoring, improved dredging vessels that are less damaging to the marine environment, and investments to support these needs.

A serious challenge to implementing the EMS developed in this project is acquiring sufficient financing to cover the costs of equipment, software, hardware, etc.

Early preparation to establish relationships between those advocating an EMS approach and those who will implement it improved the success of this project.

Additional Information:

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EcoLinks Grant Program
Best Practice #4

Energy Audit at Romanian Petrochemical Plant

Abstract

OLTCHIM is one of the biggest manufacturers of chemicals in Romania. It produces several products including vinyl chloride, propene oxide and chlorinated substances. Steam, electricity and natural gas are used intensively to produce these various chemicals and make up 30% of the company's operating costs. This energy consumption leads to high emissions including nitrous oxide and carbon dioxide that ultimately contribute to global climate change. To improve the efficient use of energy resources and reduce greenhouse gas production, the focus of this project was twofold: 1) to conduct an evaluation of the company's energy use, and 2) to develop a plan for introduction of energy efficiency measures combined with emissions reduction and improved economic efficiency.

With the support of an EcoLinks Grant, this project generated several possibilities for reducing pollution and improving economic efficiency. The project showed that an annual reduction of up to 9,000 tons of nitrous oxide and 326,000 tons of carbon dioxide could be achieved by introducing energy efficiency measures. Economic benefits of implementing the project recommendations would result in a savings of $1 million/year in the short-term. The implementation of the long-term measures would provide a savings of $1.9 million/year. The payback time for identified energy efficiency measures varies from a couple of months to 5 years.

The project is considered as a Best Practice for other chemical industry plants. The methodology applied during its implementation allowed for efficient identification of energy losses in very complicated technological schemes of particular process lines.

Name of Project: Energy Audit and Feasibility Study of OLTCHIM SA Petrochemical Plant

Project Area: Cleaner Production

Organizations Involved:

Project Leader: SC OLTCHIM SA, Ramnicu Valcea, Romania
Project Partner: Robert A. Watts, Consulting Engineering, Annapolis, MD USA
Associates: Petrodesign, Bucharest, Romania

Location of Project: Valcea, Romania

Project Duration: January 10, 2000 to July 10, 2000

Problem Statement:

OLTCHIM is one of the largest manufacturers of chemicals in Romania. It operates several plants producing a variety of products such as polyvinyl chloride and propene oxide. These plants are energy intensive and generate carbon dioxide and nitrous oxide that contribute to global warming. Emissions are also responsible for the degradation of local air quality. The purpose of this project was to improve energy efficiency at OLTCHIM providing economic and environmental benefits.

Romania has experienced a difficult transition from the socialist era and suffers from a lagging economy and low levels of investment relative to the advanced transition countries of Central Europe. Growth in the industrial sector must be a priority for Romania for economic and social reasons, however, it is essential that new and existing industrial activities conform to international standards for environmental performance. Socialist-era plants typically utilize energy inefficiently, making improvements in efficiency and fuel composition and quality an optimal area for solid and immediate returns on environmental investments. With the support of an EcoLinks Grant, a consortium consisting of OLTCHIM, a US engineering firm, and a Romanian consulting firm collaborated to determine how to improve energy efficiency at OLTCHIM.

Project Description:

This project can be divided into two phases: 1) Project Planning and Training, and 2) Project Implementation. The purpose of these activities was ultimately to improve energy efficiency at OLTCHIM by identifying and recommending corrective measures where energy was being wasted. The environmental goals included reducing greenhouse gases and energy resource conservation.

Phase I: Project Planning and Training

Project Initiation: The project began with several meetings to coordinate the different participants including OLTCHIM SA, Robert Watts Engineering Consulting, and Petrodesign. Training materials for OLTCHIM were prepared and a training session was conducted with OLTCHIM.

Phase II: Project Implementation

Energy Audit, Steam Plant: The first major step of the implementation of the project involved conducting an energy audit. The steam plant, one of several plants at

OLTCHIM, was evaluated regarding the equipment used and the steam, air, water, and fuel flows. The following major recommendations for improving the steam plant were provided:

- boilers should be converted from methane to methane/hydrogen mixture (hydrogen is manufactured on-site),
- condensate return lines should be installed,
- combustion and exhaust air fans should be replaced,
- deaerating equipment should be installed,
- boilers' automatic control system should be upgraded,
- heat exchangers should be repaired where necessary.

Energy audit, process lines: A process audit was conducted which involved measuring and recording energy consumption at the different divisions and plants at OLTCHIM including the chloralkali electrolysis plant, the chlorinated products plant, the vinyl chloride plant, the polyvinyl chloride plant and the propene oxide plant. The consumption of electricity, steam, water, and methane gas by each piece of operating equipment was calculated. The equipment with the highest energy consumption was identified. The total electricity consumption of each division and installation was then determined and the daily energy consumption for each division was calculated. To determine energy loss, the difference between energy delivered and energy consumed for each division was determined. Recommendations for equipment, electrical substations, and process lines were made. The examples include:

- adding heat recovery equipment,
- adding certain unit operations to improve entire processes,
- replacement of pumps, fans, compressors, and motors,
- retiring some electrical substations or disconnecting them and leaving as spare ones.

Assessment of emissions avoided: The effects of excess energy use on the emission of nitrous oxides and carbon dioxide were calculated. Also, an analysis of different fuel types used to generate energy was conducted to determine the most feasible, efficient, and least polluting source.

Transfer of Technological Information: A visit to a chemical plant in the USA was organized for OLTCHIM representatives from Bucharest, Romania to visit and learn from practices in the United States. OLTCHIM representatives visited Reichhold Chemical in Jacksonville, Florida and gained several new ideas for improving the efficiency of their plant.

A review of the legislation regarding the generation of steam and electricity was conducted by OLTCHIM. Steps were taken by OLTCHIM to access less polluting fuels when possible.

Plan Implementation and Evaluation: The findings generated through the energy audit and feasibility study are to be implemented over the next five years. Based on an

evaluation of costs, payback, and expected life of needed equipment, short-term and long-term plans were generated. Those improvements that can be implemented with minimal cost shall be activated within one year. Other proposals generated from this project shall be implemented over a longer term as sufficient funding mechanisms are put into place and sufficient preparation is done.

A method for verifying projected energy savings was then developed. The method involved seven steps:

establish base line from which to measure annual savings;
determine new energy use;
compare these readings with the base line;
determine cost of plant modification;
review and evaluate results;
calculate emissions reductions; and
produce annual report that itemizes costs of plant modifications, annual savings from plan implementation, emissions reductions, and next steps for long-term plan implementation.

Project Finalization: General meeting of all project partners was convened and a final feasibility study was produced.

Outputs/Results:

- A precise database on OLTCHIM energy consumption and energy losses was produced.
- Several short and long term measures to decrease energy losses were identified, thoroughly assessed and proposed for implementation.
- A report titled, "The effect of power excess on nitrous oxide and carbon dioxide emissions" was compiled.
- New possibility for using less polluting energy source (i.e., fuel mixture comprising hydrogen) was evaluated.
- A good working arrangement between OLTCHIM and an US firm was developed which may be applied to future projects that also provide environmental and economic benefits.
- OLTCHIM personnel acquired sufficient knowledge and skills to perform energy audits in their plants as well as for other similar companies.

Costs of EcoLinks Project:

This project was made possible by an EcoLinks Grant of $50,000 and a cost sharing contribution by grantees of $41,693.

Expected Environmental and Economic Benefits:

Environmental Benefits

With the implementation of the project recommendations, an annual reduction of up to 9,000 tons of nitrous oxide and 326,000 tons of carbon dioxide would be achieved.

Economic Benefits and Financial Analysis

The implementation of the short-term measures recommended by this project would allow a savings of $1 million with varied pay back periods. The implementation of the long-term measures would provide a savings of $1.9 million. Table 1 presents examples of energy saving measures, their costs, expected annual savings and a payback period.

Table 1: Examples of identified energy saving measures – financial data

Energy saving measure	Investment outlays [$]	Annual savings [$/year]	Simple Payback Time [years]
Single boiler conversion to CH4/H2 mixture	100,000	173,000	0.6
Replacement of combustion and exhaust air fans	84,000	120,000	0.7
Adding waste water heat recovery system to waste water discharge line	280,000	372,000	0.8
Adding heat recovery furnace at dichloroethylene cracking furnace	250,000	230,000	1.1
Pump replacement at chlorine removal plant	980	2,100	0.5

Transferability:

While the project generated specific analyses relevant to OLTCHIM, some of the analysis applies to equipment and energy consumption in general which can be usefully applied to other settings with similar features. Hence, the latter can be transferred to other contexts with ease. Also, the methodology of energy audit based on thorough process analysis and identification of main energy consumers along the process lines is transferable to other chemical plant utilizing similar technologies.

Lessons Learned:

- Initial meetings in Romania and the site visit to a US chemical plant assisted with building cooperation amongst the project members.
- Obtaining visas for overseas travel cannot be assured and may be rejected for reasons unknown. In the case of this project, two representatives from Romania were to attend a workshop in Washington, DC but were denied visas for unknown reasons.
- Having a record of basic energy requirements and excess energy use is essential for future planning regarding operations and equipment replacement.

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Ecolinks Grant Program
Best Practice # 5

Modernization of Municipal Solid Waste Management in Bulgaria

Abstract

Solid waste management in the Danube Region in Bulgaria engages several environmental and economic challenges. Agricultural waste and manure is increasing from the urbanization of the agricultural sector since the collapse of communism. Appropriate methods for handling this organic waste have not been established. Many active dumpsites do not meet environmental standards, and threaten groundwater supplies and ultimately impact the Danube River. The collection and disposal of solid waste is frequently done by inefficient means. These problems are exacerbated by the lack of coordination across the region to assess needs and coordinate solid waste management services across the municipalities and with the private sector. Modernization of solid waste management provides a basis for overcoming these challenges.

The Project was implemented in partnership between the Association of Danube River Municipalities (Project Leader), CalRecovery, of California, USA (Partner), and the Institute for Environmental Strategies, Sofia, Bulgaria (Local Partner). It explores and initiates several creative ways for modernizing solid waste management in the Danube Region in Bulgaria. To determine an appropriate pathway to modernizing solid waste management, several key actions were taken: 1) a diagnostic survey was conducted to assess the challenges and opportunities of solid waste management, 2) based on the results of the survey, appropriate technical assistance was developed to target specific needs, and 3) two workshops were held to share information and initiate and build collaborative efforts for implementation of a regional, modern solid waste management program. Based on the survey and the workshops several subprojects were initiated including developing a composting program for organic waste, upgrading equipment, improving cooperation amongst the municipalities and establishing partnerships with the private sector.

The project is considered as a Best Practice for two primary reasons. First, it provides a model for regional collaboration in addressing solid waste management that allows for the efficient use of resources across communities. Second, the Diagnostic Research of Municipal Solid Waste Management (MSWM) of the Danube Region, prepared within the project, is a demand-driven tool that is useful in targeting technical assistance to communities and identifying opportunities for improvement in solid waste management.

Name of Project: Modernization of Municipal Solid Waste Management in Partnership with the Private Sector: A Danube River Initiative

Project Area: Cleaner Production

Organizations Involved:

Project Leader: Association of Danube River Municipalities (ADRM)

Project Partners:
Institute for Environmental Strategies, Ltd., Sofia, Bulgaria
CalRecovery Inc., Hercules, CA, USA

Location of Project: Danube Region, Bulgaria

Project Duration: August 1, 1999 – November 30, 2000

Problem Statement:

Communities throughout Eastern and Central Europe have suffered greatly under the stresses of transitioning to a market economy. Municipalities are especially hard hit by such changes as they face the immediacy of local problems, the high competition for limited support resources, and the difficulties associated with applying international integration policies of the European Union (EU) at the regional, "on-the-ground" level. One area that specifically reflects all of these challenges is the management of solid waste. Many regions in Central and Eastern Europe continue to rely on traditional solid waste management methods. Poorly managed dumpsites, out-of-date equipment, and a lack of collaboration amongst municipalities and between municipalities and the private sector contribute to environmental degradation and economic hardship. There is a need to explore modern solid waste management approaches that include fewer, well-planned dumpsites, modern equipment, and regional collaboration.

The Danube Region in Bulgaria is a prime site for considering the modernization of solid waste management. The population of the Region is about 730,000 and its total area is 8,800 km^2. The Region is mainly rural and it is divided into twenty-four municipalities, members of the Association of Danube River Municipalities. Of the twenty-four municipalities, twenty have organized waste management services and reported on the quantities and composition of waste. Total waste generation in these twenty municipalities (490,000 people) is 333,000 tons/year.

Project Description:

The main project goal was to advice on the modernization and environmental improvement of municipal solid waste management (MSWM) and to create opportunities for public private partnership in the MSWM for the Bulgarian Association of Danube River Municipalities (ADRM). The main project's objectives were as follows:

- Formulate cost-effective and market-based solutions to MSWM
- Transfer of techniques for waste minimization
- Enhancing public awareness of good practices in MSWM
- Promote regional cooperation between municipalities
- Transfer of techniques for the establishment of public-private partnerships (PPP)
- Promotion of private investment in MSWM in the Region

The project consisted of five main processes: an initial workshop; diagnostic assessment using a survey; interviews and field research; technical assistance and the development of subprojects, and a final workshop.

1) Initial workshop: The workshop titled, "Practical Approaches for Modernization of Solid Waste Management," provided a forum for collaboration between project participants and between project participants and municipality representatives. Thirty-seven people representing the municipalities, NGOs and the media attended. This workshop stressed the exchange of information between project participants and municipality representatives about possibilities and problems with solid waste management in the Danube Region. For example, one daunting problem that municipalities face regarding solid waste management is insufficient means to deal with large amounts of agricultural waste. Through this exchange between project members and attending municipalities, a work plan for initiating a composting program was developed.

2) Diagnostic Research of MSWM of the Danube Region: A survey was based on extensive interviews and field visits regarding the status of solid waste management in the Danube Region of Bulgaria. The target audience of the Survey comprises:
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     xternal funding agencies;
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     otential private strategic investors.

   The data gathered included information about the equipment, methods, costs, and management structure involved in collecting and transporting solid waste. The

survey was used additionally as a diagnostic tool to determine the opportunities for improving solid waste management. The main problems identified during the survey were as follows:

Organization of MSWM

Existing organization is inefficient;
The frequency of the waste collection is rare;
The vehicles are not full on some trips to the landfills;
Only the main towns have organized service;
There is no separate collection for agricultural waste and manure and ash.

Waste Generation

- There is no reliable measurement of generated waste;
- The amount of the generated agricultural waste and manure is high and is mixed with household waste.

Equipment and vehicles

The vehicles are obsolete and too expensive to operate and maintain;
The containers are too old and too few.

Landfills

There are too many authorized landfills;
Almost all are uncontrolled and without a guard;
Landfills in the smaller towns are mainly used for disposal of agricultural waste and manure.

Financial issues

The waste fee is insufficient to cover the cost for waste management;
The expenses for maintenance and repair are too high.

Basic recommendations resulting from the Survey are as follows:

Organization

- New know how should be implemented for modern waste management through modernization of municipal waste management companies, and privatization of the service or the company;
- Organized waste management should be introduced to all settlements.

Waste Generation

- Measurement stations should be installed in some of the landfills;
- Agricultural manure and organic waste should be handled separately and wherever feasible through composting.

Equipment and vehicles

Modern vehicles with compacting systems should be introduced;

The old containers should be gradually replaced and standardized;
Most of the landfills should be closed;
At first, there should be no more than one landfill in each settlement, later landfills should become regionalized.

Financial issues

- Replacement of the existing vehicles with modern equipment will reduce the operation costs;
- Use fees should be introduced on guarded landfills.

The results of the survey, interviews, and field visits were then used as a basis for targeting technical assistance to design and carry out the following subprojects:

Modernizing equipment and introducing more efficient management practices in MSWM

Establishing public private partnership

Improving landfilling practices and rehabilitation

Identifying opportunities for cooperation between municipalities in developing regional landfills

Minimization of the waste by composting of agricultural and organic waste

Promoting micro-enterprises for MSWM in towns without organized services.

3) Subproject Development and Technical assistance on MSWM: The technical assistance provided to Municipalities was demand driven. The Municipalities (members of ADRM) agreed with the Project Team Members as to their needs for assistance and the method of delivering it. The initiated subprojects were as follows:
    a) Modernization of the Waste Collection Equipment in Belene, Nikopol and Gulyantzi";
    b) Cooperation between the Municipalities for Construction of a Regional Landfill for Household Waste in Oriahovo";
    c) Waste Minimization in Borovo Municipality";
    d) Privatization of MSWM in Vidin Municipality";
    e) Environmental Service by Small and Medium Enterprise in Tsenovo"; and
    f) "Public Awareness Campaign."

A list of typical documents generated for every subproject includes multi-option financial analysis of different solutions, analysis of legal options for cooperation between institutions, draft agreements for cooperation, applications to Environmental Agencies (like National Environmental Fund) for financial support, tender documents, draft contracts, and promotional materials. Within subproject c), the pilot composting project was implemented that provided necessary data for development of Guidelines for collection and composting of organic waste and manure.

4) Final workshop for planning follow-up activities: In this workshop, alternatives and recommendations from each subproject were presented. These alternatives and recommendations are published in a paper, "Guidelines on Modernization of MSWM." Follow-up activities were discussed.

Outputs/Results:

Several products were generated through this project:

Published results of the diagnostic survey on solid waste management in 24 municipalities that outline waste management needs and opportunities for improving solid waste management in the Danube Region in Bulgaria.
Templates for building public-private partnerships including examples of contracts for services and tender documentation that can be used under other similar circumstances were generated.
Upon the successful application for funds from the National Environmental Fund in Bulgaria, two member municipalities in the Danube Region were supplied with a modern waste collection vehicle and containers.
Six subprojects were developed and implemented that yielded important information for modernizing solid waste management. Recommendations and alternatives for reducing waste, reducing the costs of waste collection and disposal, and improving opportunities for the construction of a regional landfill and for collaboration with the private sector were generated.
Two workshops were conducted that strengthened collaborative ties in the Region and helped to identify local problems, coordinate solid waste management both amongst municipalities and between municipalities and the private sector, and explore different funding mechanisms.
The public awareness campaign specifically generated several designs for an informative brochure and posters, two case studies, and an overall public awareness campaign strategy. The survey results were published with EcoLinks in a document titled, "Survey of Municipal Solid Waste Management in the Danube Region."

Costs of EcoLinks Project:

The total expenditures for the project were $49,972 of which $37,492 was funded through an EcoLinks grant and $12,480 was provided as cost share.

Expected Environmental and Economic Benefits:

Environmental Benefits

The project's goal was to improve management of more than 330,000 tons of solid waste generated by Danube River Municipalities every year. Examples of environmental benefits derived from the efforts that make up this project are as follows:

The collaborative purchase of new trucks and containers for transportation and disposal of waste reduced air pollution from fuel exhaust since there were fewer trucks carrying fuller loads and making fewer trips to the dumpsite. Trucks with compactors require fewer trips to the dumpsite.
The recommendations for implementing a composting program for organic waste provided ways for minimizing waste, reducing water pollution, and improving soil conditions. The implementation of a composting program would divert organic waste from the landfills avoiding increased contamination of groundwater and environmental damage to the Danube River. Through composting, organic waste is transformed into a useful material that improves soil quality.
The feasibility of constructing a modern, regional landfill was explored. If implemented, a modern regional landfill would be more sanitary than localized, unregulated landfills. A modern landfill is more effective in preventing leachate than localized landfills that tend to be poorly regulated.
With the promotion of public-private partnerships, the municipalities could take on a stronger regulatory role while allowing the private sector to take care of waste collection and disposal activities.

With improved regulation of solid waste collection and disposal, environmental damages can be minimized.

Economic Benefits

Each subproject provided alternatives for generating several economic benefits. The economic highlights informed by these subprojects are summarized as follows:

Modernization of the waste collection machinery and equipment reduces annual expenses of waste collection and disposal.

Purchasing co-shared machinery with a five-year payback period (as promoted by the Bulgarian National Environment Protection Fund) and weekly collection can reduce county annual expenses associated with waste collection and disposal approximating fifty percent. In some counties annual costs are reduced by more than fifty percent. Belene County could reduce annual expenses for machinery and containers and direct expenses of waste collection from $43,943 to $22,199, reducing its annual costs by $21,744. In Oriahovo County, the existing collection system costs $26,657 per year. With upgraded co-shared equipment, annual costs would be $10,508, an annual savings of $16,149. With a twice-a-week disposal scheme, expenses would be even less with 15 to 20% cost reduction compared to the existing waste collection and disposal system.

Privatization of municipal solid waste alleviates the financial and management burdens of solid waste management on municipalities.

By opening up solid waste management to private enterprises, certain economic benefits are accrued. Municipalities may be entitled to dividends from sold shares. Capital flow is increased and can be used to invest in new equipment that can lead to further savings. Municipalities can take on a predominantly regulatory role possibly decreasing their workload.

A regional landfill is less costly for collaborating municipalities than the reconstruction of existing landfills by individual counties.

It is less costly to engage counties in a collaborative effort to construct a regional landfill than to reconstruct municipal landfills. For example, with four participating counties of the Danube Region including Oriahovo, Kozlodui, Mizia, and Kneza, the expenses associated with the construction of a regional landfill would be $1,819,588. The total reconstruction value of existing municipal landfills would be more costly at $3,729,700. Constructing a regional landfill, therefore, could provide a savings of $1,910,340.

Waste reduction through composting provides fertilizer that can be sold rather than adding non-household waste to municipal landfills.

Several economic benefits are accrued from composting organic waste. Composting organic waste diverts waste from 1) unregulated sites where it causes environmental damage which is costly to mitigate, and 2) the municipal landfills where the increased load adds to transportation costs and unnecessarily burdens on landfills meant solely for household waste. In some communities, manure constitutes 70% of the total waste generated. Further, compost is fertilizer, which can be used as an in-kind payment to employees who help to process the organic waste or sold to cover composting fees. Further, the compost product generated from agricultural waste and manure increases soil value and improves agricultural crop yield.

Transferability:

Regionalization of solid waste management and updating equipment allows for creative problemsolving and the efficient use of resources across localities. The use of a diagnostic survey targets technical assistance that addresses the particular problems of different localities and yet can inspire regional solutions. This averts a cookie cutter approach and allows for problems to be defined at the local level while broadening the possibilities for creative solutions that can only be generated at the regional scale.

Lessons Learned:

The following lessons were learned during this project:

Local government elections can delay project implementation as transition to the new governing body takes place. Further, support from newly elected officials may need to be recruited and adjustments to the project may have to be made to consider their perspectives.

"Thinking regionally" is generally new to Bulgarian municipalities. It may be necessary to train municipalities to think at the regional level to help them to conceptualize and implement projects at the regional scale.

To enhance the occasion for public-private partnerships, the needs and interests of the different parties should be clarified.

The viability of commercial activities regarding solid waste management needs to be clearly articulated to municipalities in order for them to consider it a priority agenda item.

A low-cost alternative to the EU-standard landfill should be explored because municipalities may not be able to financially support high-technology landfill operations.

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