ENVIRONMENTAL COMPONENT OF THE SAMARA REGIONAL INVESTMENT INITIATIVE

RUSSIA FINAL REPORT

Implemented through the Environmental Action Programme Support Project

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SECTION I

Introduction

A. EAPS Background

As Central and Eastern Europe (CEE) and the Newly Independent States (NIS) make the transition to open markets and democratic institutions, they face costly health and financial burdens from pervasive environmental contamination and mismanagement of natural resources. To address particularly harmful environmental problems, in April 1993 environmental ministers from Eastern and Western Europe developed and adopted the Environmental Action Programme in Lucerne, Switzerland. The program established a partnership between CEE, NIS, and Western countries, in which CEE and NIS countries undertake policy and institutional reforms, and Western governments and international financial institutions assist these reforms and the priority projects created to advance them. Through its Environmental Action Programme Support (EAPS) project, USAID supports the Environmental Action Programme and continues earlier activities in environmental management and economic development in the CEE and NIS regions.

EAPS primarily provides technical assistance for project selection and development and financial investment packaging. The project also provides assistance in institutional evaluation, capacity building, training, information dissemination, and work related to assessing and financing environmental projects, strengthening environmental funds, and improving environmental regulation and compliance. In addition, EAPS provides grant assistance for equipment to upgrade environmental performance.

B. EAPS in Russia: The Environmental Component of the Regional Investment Initiative (RII) in Samara

The Regional Investment Initiative (RII) is a collaborative effort between the United States and Russian governments, regional authorities, and private sector entities. The purpose of the RII is to improve the investment environment and promote investment to enterprises in selected regions of Russia. The Samara Oblast has been selected as an RII region.

The U.S. Department of State and USAID have launched a program to study the obstacles to expanding business and investment activities in the Samara Oblast. A major obstacle to attracting investments to Samara is the state of severe environmental degradation and generally poor environmental management practices throughout the oblast. Accordingly, the Samara RII program includes an environmental component aimed at promoting management practices and investments that simultaneously improve environmental performance and production efficiency, and make the region’s enterprises more appealing to investment capital sources.

USAID/Russia selected USAID’s EAPS project to carry out the environmental component of the Samara RII. EAPS was selected because the central activity of the environmental component was to provide technical assistance for identification, packaging, and financing of environmental investments, an area in which EAPS has established an excellent track record.

The environmental component of the Samara RII also includes an environmental Health Risk Assessment project that has been implemented by the Moscow-based Center for Health Risk Assessment under a separate scope of work.

B1. Program Goals and Objectives

The August 1998 economic crisis in Russia made it unrealistic to concentrate at that time on financing for major environmental investments. Instead, the environmental component of the Samara RII was restructured to concentrate on activities intended to promote identification and implementation of no-cost/low-cost measures to improve environmental and economic performance of Samara enterprises.

The emphasis was placed on demonstrating the link between sound environmental practices and sound business practices in a manner that requires little or no financial burden on the part of enterprises. Improving environmental management practices and environmental performance of Samara industrial enterprises will increase the appeal of the region's enterprises to investment capital sources and expand business and investment activities in the Samara Oblast.

The main goals of the EAPS project in Samara were: a) demonstration of economically advantageous approaches to solving environmental problems, b) demonstration of the benefits of good environmental management practices that may improve the appeal of Samara enterprises to lenders and investors, and c) promotion of economic growth that is environmentally sustainable.

The performance objectives were as follows:

- Implementation of no-cost/low-cost pollution prevention and cost-saving measures at the chosen Samara industrial enterprises for simultaneously improving their environmental and economic performance

- Demonstration and dissemination of the lessons of experience with no-cost/low-cost pollution prevention measures

- Familiarization and promotion of environmental management system (EMS/ISO 14001)

B2. EAPS Activity Streams

To achieve program objectives, three streams of project implementation activities were designed:

1. Determination of pollution prevention no-cost/low-cost measures and technical assistance with their implementation at Samara partner enterprises

2. Demonstration and dissemination of experience on no-cost/low-cost measures by means of media coverage and seminars

3. Familiarization and promotion of environmental management system by conducting educational workshops and providing consulting services in EMS/ISO 14001 implementation

B3. EAPS Operational Management

Overall direction for the program was provided by the EAPS home office at Chemonics International, Inc. in Washington, D.C., in close continuous consultation with USAID/ Washington and USAID/Russia. The Volga Department of Russian Engineering Academy (VDREA) served as the program office in Russia and was the principal partner implementing organization (subcontractor). While the home office provided supervision, day-to-day operational management was delegated to the VDREA office. The NGO Ecoline, headquartered in Moscow, was the principal source of technical assistance and expertise for the program from within Russia outside the Samara area.

The EAPS project manager from Chemonics' home office was directly accountable to USAID for performance of the program. The program office in Russia (VDREA) was managed by the project coordinator, who supervised Samara project activities, collection of relevant technical data, and project status report preparation to the EAPS project manager. He was also liaison to the Samara State Environmental Committee, Samara Oblast Administration, and all Samara partner enterprises that participated in the project.

B4. Samara Enterprises and Organizations Involved in the Project

Following are the primary Samara organizations that provided support and coordination during the period of project implementation:

- Office of the Coordinator (U.S. State Department), Samara Regional Investment Initiative
- Samara Oblast Administration
- Samara State Environmental Protection Committee
- Samara Oblast Social and Ecological Rehabilitation Fund

Project activities and technical expertise were directed to the following Samara industrial enterprises, whose participation was voluntary and which were jointly approved as partner enterprises by the EAPS home office, USAID/Moscow, Samara RII, Samara Oblast Administration, and Samara State Environmental Protection Committee:

- Samara Bearing Plant
- Samara Cable Company
- Samara Rodnik Vodka Company
- Yukos Novokuybisevsk Oil Refinery
- AvtoVAZ Auto Maker
- Samaraenergo (Samarskaya Heat Power Station)
- Samara Metallurgical Plant (involved during the programme)

See Annex A for a list of participants from Samara enterprises and organizations who were involved in the project.

SECTION II

Summary of EAPS Activities

A. Opening Seminar

The environmental component of the Samara RI was launched in November 1998 with a one-day opening seminar at the facilities of the Volga Department of the Russian Engineering Academy (VDREA) in Samara. The roundtable meeting included selected regional and local administration officials and management staff of partner enterprises. Discussions focused on:

- Objectives of the environmental component of the Samara RII in the context of the overall RII and its other components
- Component activities of the work plan and how they will be carried out, the aims of each activity, and how the three fields of activity relate to each other
- Roles and responsibilities of the partner organizations and enterprises in the program
- Questions and comments of participants

Outcome. At the end of the seminar, partner organizations and enterprises had gained a thorough understanding of the environmental component of the Samara RII and its principles and objectives, reached agreement on how each component will be carried out, and provided input on program implementation.

For more information see the Opening Seminar Report. (See Annex B, page 2, under “Other Project-Related Reports.”)

B. Activity Stream 1 — Determination of Pollution-Prevention No-Cost/Low-Cost Measures and Technical Assistance, with their Implementation at Samara Partner Enterprises

In-plant environmental pollution-prevention assessments were conducted during February and March 1999 at the following enterprises: Samara Cable Company, Samara Bearing Company, Novokuybishevsk Yukos Oil Refinery, and Rodnik Vodka Company (Bottling Plant and Novobuyansky Distillery).

Senior management of each enterprise recommended one part of their plant operations be the focus of the assessments.

The objective was to demonstrate the benefits of conducting in-plant environmental assessments aimed at identifying approaches and solutions to cost-effectively manage pollution. Emphasis was given to identifying no-cost/low-cost methods for controlling and managing pollution, waste, and energy inefficiencies.

B1. Preparations for In-Plant Environmental Assessments

The steps described below were followed in carrying out this activity:

1. Create assessment teams (November 1998-December 1998)

The EAPS home office and Ecoline identified the principal technical specialists whose experience and skills were most relevant for carrying out the technical part of the program. VDREA identified and engaged local experts. Four assessment teams of experts and technical specialists provided by partner enterprises were assembled and led by team leader Dr. Nicholas Cheremisinoff.

2. Collect relevant information for in-plant environmental assessment (December 1998-February 1999)

The team collected general information about the operations of the facility, the specific shop area chosen for the assessment, and the waste issues and energy demands. The information collected was based on pre-assessment questionnaires provided to the enterprises by Dr. Cheremisinoff. The information received was sent to the EAPS home office for detailed analysis.

3. Conduct preparatory in-plant assessment meetings (January 1999-February 1999)

During the preassessment period, VDREA conducted meetings with the Samara experts and the senior management of partner enterprises to:

- Prepare managers and selected workers for the environmental assessments and involve them in planning the assessments
- Familiarize plant personnel with assessment procedures and objectives, and actions that should be undertaken to prepare for the assessments
- Plan the assessment schedule and discuss possible difficulties
- Develop specifications and formats for assessment reports

4. Hold training workshop (February 1999)

The assessment teams conducted a one-day workshop with members of the four cooperating enterprises to orient them on program objectives and introduce a formal methodology for conducting in-plant pollution-prevention assessments. The EAPS-prepared guide, “In-Plant Environmental Assessment Sourcebook: A Guide to Pollution Prevention Planning,” was used as a training manual. During the workshop, attendees were organized into four groups, each comprised of an enterprise representative(s) and members of the Russian-American assessment team. The groups reviewed information obtained from a preassessment questionnaire designed to gain information on plant operations in advance of the team’s in-plant assessments. The information on the training workshop, including list of participants, discussions, and agreements is included in the second seminar report.

5. Make initial visit to partner enterprises (February 1999)

Led by the EAPS project manager, the group, consisting of external experts and appropriate Samara experts, representatives of USAID/Moscow, Ecoline, and VDREA, visited partner enterprises. The group spent approximately one half day at each enterprise for orientation, discussions with senior managers on carrying out the assessment, visiting the shop floor of the factory component where the assessment was to be conducted, familiarizing themselves with appropriate plant personnel, etc.

Outcome. This activity resulted in: a) four well-prepared, in-plant environmental assessment work plans and assessment teams, and b) four partner enterprises that participated in planning their respective in-plant environmental assessments and who know what is to be done to prepare their personnel, documents and other conditions to make the assessments efficient and complete.

B2. In-Plant Environmental Assessments (March 1999)

The assessment teams worked for a total of three weeks, of which 12 days were devoted to carrying out the assessments to identify no-cost/low-cost and other measures for improving environmental and economic performance in the partner enterprises. The remaining time was devoted to planning and in-plant meetings prior to the assessments, initial drafting of the assessment reports, and in-plant meetings to review assessment findings.

The in-plant assessment consisted of the following steps:

- *One-half to two-day walk-through of each operation.* In the walk-through, the team focused on specific areas of an enterprise's shop to evaluate waste problems, pollution issues, and energy-saving opportunities. Interviews were conducted with shop operating personnel and local management to gain an understanding of the operation and the environmental and energy-demand issues.

- *Exit interview with the plant technical experts.* At each enterprise, the team reviewed preliminary findings and recommendations with the plant technical experts. Pollution-prevention and energy-saving recommendations were further refined during these meetings.

- *Exit interview with senior management.* The team presented recommendations to the senior management of each enterprise to review assessment findings and recommendations and obtain their comments.

- *Identification of pollution-prevention opportunities.* The pollution-prevention and energy-saving opportunities identified, along with specific recommendations, were detailed in technical reports, translated into Russian, and provided to each enterprise. A summary of the no-cost/low-cost recommendations and their environmental, health, safety, and financial benefits are provided in the Pollution-prevention Assessment Report, Samara, Russia.

- *Exit workshop and the monitoring program*. The team conducted an exit workshop with all program participants to review findings and recommendations. During the workshop, participants organized into groups and developed action plans and schedules for implementing the low-cost/no-cost recommendations. The action plans included a schedule for monitoring performance. Information on the exit workshop, including list of participants, discussions, and agreements, is included in the third seminar report.

Outcome. This activity resulted in an environmental assessment report for each partner enterprise containing:

- Recommendations regarding no-cost/low-cost and other measures for improving environmental and economic performance
- Estimated associated costs
- Guidance for implementing the recommendations
- Estimates of environmental and economic benefits of each recommended measure if implemented
- Recommendations concerning programs for monitoring the results of implementation.

B3. Assistance in Implementation of No-Cost/Low-Cost Assessment Recommendations (April 1999-September 1999)

Throughout the program, progress in implementing the pollution-prevention recommendations and benefits were periodically monitored by assessment teams. The monitoring also offered the opportunity to help facilitate some of the recommendations by providing consulting and, in some cases, equipment that helped reduce pollution.

For each plant, the assessment teams performed the following activities:

a) Explained to plant personnel activities that should to be undertaken to implement the selected no-cost/low cost measures

b) Worked with plant personnel to develop schedules for implementing the required activities

c) Assisted and monitored the implementation activities

d) Worked with plant personnel to develop monitoring programs for measuring and recording the environmental and economic benefits of implemented recommendations

e) Worked with the plant personnel to carry out the monitoring activities described in the program

Outcome. This activity resulted in documentation of implementation costs and environmental and economic benefits of no-cost/low-cost measures that were implemented at each of the partner enterprises.

B4. Results of Pollution-Prevention Programs

The results achieved at each enterprise in terms of pollution reductions and economic benefits are summarized below.

Rodnik Vodka Company. Installation of control valves on bottle washing machines minimized water consumption and reduced wastewater discharges. According to initial calculations, this measure led to a 50 percent reduction in municipal quality wash-water supply and wastewater discharges for three bottle washing machines (savings of 324 m3/day), resulting in annual savings of 478,953 Rubles (based on local prices).

If the plant operates at full capacity, municipal quality wash-water supply and wastewater discharge would be reduced by 648 m3/day, resulting in annual savings of1,724,308 Rubles.

Additionally, it was found during program implementation that minimizing the nozzle size of washing machine injectors would further reduce water consumption and add savings.

Samara Bearing Plant. The installation of localized filtration units at polishing machine stations and implementation of a maintenance program for the existing ventilation system helped to eliminate the emissions that, in turn, eliminated a fire hazard, reduced health risk to workers, and improved productivity.

An automatic relay device was installed on six exterior doors of the shop area for automatic control of heat walls that turns ventilation and heat on and off when exterior doors are operating. This helped reduce electrical energy consumption for an annual savings of 60,000 Rubles.

Use of chemical buffers and bactericide to extend the life of polishing fluids increased the life of polishing fluid by about 50 percent and reduced wastewater discharges, with a consequent annual savings of 150,000 Rubles.

Samara Cable Company. Polishing and realignment of rollers on wire drawing machines (extruders) reduced the particulate emissions of copper dust. By using a portable particle analyzer, the plant developed a diagnostic test and determined the main zones of copper attrition (copper dust). These activities have resulted in:

- Reduced worker exposure to a heavy metal
- Reduced copper contamination to plant storm water
- Improved quality of extruded wire
- Reduced feedstock (copper) material losses estimated at 25,000 Rubles annually

Novokuybishevsk Yukos Oil Refinery. A pollution-prevention implementation schedule has been worked out, but the enterprise put these activities into the of plant’s technical development work plan for 2000-2005.

See tables III-1, III-2, and III-3 in Section III comparing the economic incentives for each implemented pollution-prevention measure based on estimates using local prices (Samara, Russia) and average Western European and U.S. prices.

Reports Provide More Information

- *Samara Bearing Plant Pollution-Prevention Assessment Report*. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999
- *"Rodnik" Vodka Company Pollution-Prevention Assessment Report*. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999
- *Samara Cable Company Pollution-Prevention Assessment Report*. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999
- *"Yukos" Novokuibyshevsk Oil Refinery Pollution-Prevention and Energy-Saving Assessment Report*. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Energy-Saving Measures, May 1999
- *Pollution-Prevention Assessments*: Samara, Russia. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999
- *Pollution-Prevention Assessments Summary Report*. Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, October 1999

C. Activity Stream 2 — Demonstration and Dissemination of Experience on No-Cost/Low-Cost Measures by Means of Media Coverage and Seminars

To increase public awareness of and support for the project, a program of ongoing information dissemination and public education was developed. The plan included actions to ensure advance public awareness and appropriate media coverage of individual program events, and involved educating local media concerning the program and the relationship in general between sound environmental management and sound production practices.

C1. Media Coverage (November 1998-December 1999)

Most of the specific program events were presented as press releases in advance to the mass media. Invited local television and press publicized the results of the project and showed information materials on local television channels.

Four planned articles on the results of the in-plant environmental assessments, implementation of the recommendations, and importance of environmental management systems were published by the local mass media.

A web site for the EAPS project in Samara was designed and established on the Internet at the address <http://www.vdrea.ru/EAPS>. All EAPS project articles were posted to the site, as well as other project materials relevant to the general public.

A 10-minute television spot on results of activities of EAPS project in Samara was prepared for the local TV release to be shown in January 2000. During the spot, representatives from Chemonics, USAID, VDREA, and partner enterprises discuss the outcomes of the EAPS project in Samara.

See Annex B for a list of the main documents and publications released in the framework of the EAPS project.

C2. Demonstrations at the Partner Enterprises (March 1999-November 1999)

To acquaint other enterprises with the experience of in-plant environmental assessments, EAPS invited representatives of the main industrial enterprises of Samara Oblast to participate at the seminars that deal with key project issues, including:

- Presentation of the in-plant environmental assessment procedure
- Findings and recommendations
- Discussion on no-cost/low-cost measures implemented and their benefits
- Wrap-up discussion of implementation procedures and costs, monitoring methods, and additional no-cost/low-cost measures planned
- Relevance to the enterprises represented in the demonstration audience

Outcome. The following Samara Oblast enterprises became acquainted with the experience of in-plant environmental assessments:

- Samara Metallurgic Works
- Samaratransgas Inc.
- Volgahimproject Inc.
- Togliattikaychuk
- Tarasov named Plant
- TogliattiAzot Inc.
- Kuibyshev Refinery

C3. Public Seminar (November 1999)

The public seminar was held at the VDREA conference hall on November 5, 1999 to familiarize the public with the results of the project. More than 70 participants from the organizations cited below attended the seminar:

- State Ecological and Environmental Protection Committee of Samara Oblast and its invited organizations
- Oblast Administration and its invited organizations
- Samara, Togliatti and Novokuibyshevsk City Administrations
- Representatives of the partner enterprises and of the enterprises-observers
- Representatives of the NGO (ecology and ecological development)
- Participants of RII
- Trade-industry organizations (Employers' Council, Association of Businessmen)
- Mass media
- VDREA

The objective of the seminar was to present the activities undertaken during the EAPS project implementation: the in-plant environmental assessment process, no-cost/low-cost measures that were implemented, and the findings of monitoring programs.

Outcome. A wider range of Samara enterprises' managers as well as public officials and the public at large are more aware of the project activities in general and the benefits of the systematic environmental assessment and of no-cost/low-cost environmental improvements.

D. Activity Stream 3—Familiarization and Promotion of Environmental Management System by Conducting Educational Workshops and Providing Consulting Services in EMS/ISO 14001 Implementation

D1. EMS Seminar for Middle Managers (September 1999)

A one-day EMS seminar was conducted at the VDREA facilities on September 24, 1999. The agenda included familiarizing middle managers with the ISO 14000 standard, pollution-prevention philosophy, and the basic principles of EMS.

The objectives of the seminar were to: a) incorporate EMS into the overall management system of an enterprise as means of continually identifying projects that simultaneously improve environmental and economic performance, and b) explain why this increases the attractiveness of the enterprise to potential investors.

Outcome. Seventeen (17) participants from 9 different enterprises became familiar with the basic principles of EMS.

D2. The EMS Seminar for Senior Managers (October 1999)

A half-day EMS seminar was conducted at the Samara State Environmental Committee on October 28, 1999. The seminar emphasized familiarizing middle managers with the ISO 14000 standard, pollution-prevention philosophy, and the basic principles of EMS, including:

- Periodic, systematic review of the interactions of plant operations with the environment
- Identifying practicable measures to reduce pollution or control its effects
- Developing a program for carrying out those measures
- Implementing the program
- Assessing the results
- Incorporating the lessons learned into the next periodic review

The objectives of the seminar were to: a) incorporate EMS into the overall management system of an enterprise as means of continually identifying projects that simultaneously improve environmental and economic performance, and b) explain why this increases the attractiveness of the enterprise to potential investors.

This EMS has been compared with the ISO 14001 international standard. ISO 14001 includes explicit requirements for the environmental policy promulgated by an enterprise's top management, and for such EMS elements as environmental assessment and program planning, implementation, personnel training, internal and external communications, monitoring, documentation, internal auditing, and more. However, a working EMS even in its most basic form would represent an important step in improving performance and investment attractiveness

of Samara enterprises, and would provide a basis for moving toward ISO 14001 implementation and ultimately certification at some point in the future.

Outcome. As a result of this activity, the managers of 10 enterprises came to appreciate the benefits of a systematic environmental assessment and of no-cost/low-cost environmental improvements. They also became familiar with the basic principles of EMS and interested in implementing EMS in their enterprises. In addition, Samara Metallurgic Works asked to participate in the EAPS project as the subject of an initial environmental review within EAPS.

D3. Three-day Environmental Management System Workshop

A three-day workshop was held on November 1-3, 1999 to train specialists from partner enterprises in using EMS at their enterprises. Workshop trainers were Mr. Avrom Bendavid-Val, Dr. Cheremisinoff, and Dr. Sergei Makarov.

The purpose of the workshop was to teach partner enterprise and VDREA specialists the principles and methodology of EMS and to strengthen their skills by conducting an initial environmental review (IER) in December.

In the light of these targets, the workshop agenda was created and included the following issues:

- Pollution-Prevention Program (PP) (philosophy, experience, outcomes)
- Familiarization with the environmental management system (EMS) (terminology, philosophy, concept), and interrelation of EMS and PP
- Main elements of the ISO 14001 standard
- Implementing the ISO 14000 standard
- ISO 14000 standard review
- Strategy and planning
- Main aspects of EMS
- Designing of EMS program's parameters at the enterprises
- Pollution-prevention Program (PP) - technology, audit, practice
- Initial environmental review of the enterprise
- GAP analysis of the enterprise
- In-plant environmental audit
- Final review of the studied material

At the end of the EMS workshop, each participant received a certificate for completing the course. The methodology on conducting an IER was prepared by Dr. Makarov and distributed to each participant. This material was used as a guidebook for conducting an IER in December.

E. Additional Activities Added in the Course of the Program

E1. Express In-Plant Environmental Assessments (May 1999)

Taking into account the growing interest of enterprises that initially had participated only as observers (Samaraenergo and AvtoVAZ), EAPS took the initiative to involve these enterprises more deeply and undertake the additional express in-plant environmental assessments at their

facilities. Both of these facilities are modern by Russian standards, and are already focused on pollution-prevention opportunities. The focus of these assessments covered not only the low-cost/no-cost opportunities, but also large-scale pollution-prevention programs that could be World Bank-type investment issues. A detailed feasibility and cost sensitivity study was recommended for both enterprises to assess an investment strategy for identified projects. This could be done in cooperation with the U.S. Trade and Development Agency and the World Bank. USAID may wish to consider coordinating a technical and business meeting with U.S. firms specializing in production of specified equipment.

For both enterprises, the in-plant assessment consisted of the following:

- An extensive meeting with the senior managers and members of the technical staff to explain the purpose of the visit and to organize a tour of critical operations where pollution and energy losses occur

- A walk-through of operations, focusing on areas for evaluating waste problems, pollution issues, and energy-savings opportunities. During the walk-through, interviews were conducted with shop operating personnel and local management to gain an understanding of operations and the environmental and energy-demand issues.

- Exit interview with the plant technical experts and senior managers to review preliminary findings and recommendations. Pollution-prevention and energy-savings recommendations were further refined during this meeting.

The assessments are further detailed below.

Express in-plant environmental assessment at "Samaraenergo" (Samarskaya Heat Power Station), May 14-18. The assessment consisted of a two-day walk-through of the main plant operations in Samara. Efforts were focused on defining a long-term pollution-prevention program needed for meeting the heat and hot water demands of the city. No-cost and even low-cost measures are likely to have little impact on this plant operation. Samaraenergo has several serious environmental and energy-related issues that need to be addressed through significant modernization programs to strengthen its sustainability.

Generally, attention was given to increasing the thermal generating capacity of the plant. Samaraenergo management strongly recommended that this issue be examined by the assessment team and its technical staff.

The pollution-prevention opportunities are described in the Samaraenergo pollution-prevention assessment report.

Outcome. As a result of this activity, one low-cost pollution-prevention opportunity was identified on the use of low-cost water quality monitoring instrumentation that would provide real-time measurements of water quality for water supplies to the city. In addition, several large-scale pollution-prevention projects were identified that address major environmental issues at the facility and may be viewed as critical infrastructure problems both for the city and the enterprise.

Express in-plant environmental assessment at AvtoVAZ, May 18-21. The assessment consisted of a three-day walk-through of plant operations in Togliatti. The facility is so large and complex that a three-day walk-through was insufficient time for a meaningful pollution-prevention assessment. A walk-through of the following parts of the facility was made during the visit:

- Main car assembly line with focus on paint and body annealing operations
- Compressor shop operations, responsible for supplying service air to various parts of the plant
- Wastewater treatment plant operations, providing service not only for the plant but also for the city
- Drinking water purification operations, providing service not only for the plant but also for the city

Efforts were focused on defining both long- and short-term pollution-prevention programs needed for various plant operations. Several major pollution-prevention opportunities were identified, including a few that were low-cost, but that were mostly major infrastructure and capital-intensive investments. Such changes would be useful in the area of control instrumentation for generalized operations such as compressors, ventilation systems, pumps, and automated painting systems. Modern instrumentation will bring major control flexibility to the plant operations and offers the potential for significant energy savings and reduced pollution in many operations within the plant.

The pollution-prevention opportunities are described in the AvtoVAZ automaker pollution-prevention assessment report.

Outcome. As a result of this activity, two low-cost pollution-prevention opportunities were identified that would reduce: 1) NOx emissions from natural gas burners used for auto paint drying chambers, and 2) toxic hydrocarbon-based solvent emissions from multiple point source discharges. In addition, several large-scale pollution-prevention projects were identified focusing on major energy savings opportunities and water supply issues for the city of Togliatti.

E2. Internet Training Workshop (July)

Internet training for environmental managers was held on July 19-20 for members of the partner enterprises, as well as observing companies (including State Ecological Committee members). Attendees were trained in how to conduct searches at specific Russian and U.S. Web sites that deal with environmental issues, pollution prevention, and environmental management.

EAPS provided its trainers and training materials for this activity. Technical assistance and classrooms were provided by the Harmony Project (RII member).

Outcome. Fifteen (15) specialists undertook training in how to search the Internet for information to help solve environmental problems at their enterprises.

E3. Initial Environmental Review

The Initial Environmental Review (IER) was implemented at the Samara Metallurgic Works (SMW) by specialists who participated in the three-day EMS workshop. Primary assistance was provided by the EAPS project consultants.

Work was initiated by SMW management, which had sought to participate in the EAPS project and become the subject of an IER assessment following the EMS seminar. SMW management agreed to introduce environmental management in accordance with the ISO 14001 standard. To accomplish this, the company initiated activities to organize and develop EMS.

The purpose of carrying out the IER assessment at the enterprise was to:

- Assess the effectiveness of the organization and development of activities in environmental protection, including rational usage of resources, quality control, and labor safety

- Assess available internal reserves, identifying the most promising directions for development of pollution prevention and EMS implementation

- Develop recommendations and suggestions on EMS implementation at the Samara Metallurgical Works

- Increase the awareness and motivation of enterprise management and experts in the field regarding pollution prevention and environmental management

The IER included three stages:

a) *Data collection* (November 1999 to mid-December 1999). Pre-IER questionnaires were administered to the enterprise to be used as a case study at the EMS workshop.

b) *Initial IER and EMS implementation workshop.* A half-day workshop was held on December 14 at the SMW facilities. The IER team met 19 managers from key departments to explain the objectives of the Environmental Management System and the reasons for conducting the IER, and well as the final IER planning that included case studies for participation of the above-mentioned managers in the IER process.

   A brief presentation was given on how to:

   - Conduct a systematic review of the interaction of plant operations with the environment
   - Formulate practicable measures to reduce pollution or control its effects
   - Plan a realistic program for carrying out those measures and obtain senior management input and support for the program
   - Manage implementation of the program
   - Formulate means for monitoring the results of measures implemented

c) *Initial Environmental Review.* Because of the preliminary nature of the work, the IER assessment was limited to foundry operations (shop No. 201). At the same time, the overall effectiveness of the enterprise's EMS was studied, including the activities of departments dealing with quality control, labor safety, industrial safety, and personnel training.

The IER team spent five days at the enterprise. The majority of time was spent identifying areas for evaluating waste problems, pollution issues, and energy-saving opportunities to improve environmental and economic performance. The remaining time was devoted to: 1) planning and in-plant meetings prior to the review, 2) initial drafting of the IER report, and 3) in-plant meetings to review assessment findings. At the conclusion of the IER, in-plant meetings were held to discuss findings and recommendations with the technical specialists and obtain their comments, and to provide additional insights prior to final drafting of the assessment reports.

Outcome: EMS opportunities identified. The IER final report was prepared following the in-plant meeting with senior managers so that comments of plant personnel were incorporated.

The analysis of foundry processes showed that the following aspects of operations have an impact on the environment: 1) energy and material resource use, 2) use of hazardous substances and materials in technological processes, and 3) general culture of production and labor safety. In each area of operations, activities are being carried out to reduce the impact to the environment and health. For instance, measures to reduce natural gas consumption are being implemented via recycling (recuperation) of heat, and raw materials consumption is being reduced by increasing the output of qualitative products in technological conversions. At the enterprise and at the foundry operation in particular, important successes have been achieved in gradually replacing toxic (cryolite) and carcinogenic (asbestos) substances and materials with less dangerous materials. Working conditions at the foundry, which are dictated by the technological processes of metal fusing and casting, pose challenges. Significant efforts are being made to balance quality control activities with labor protection, safety, and training and employee awareness to reduce worker trauma and develop a constructive and productive work culture.

Management understands both the advantages offered by EMS as well as the costs associated with its implementation. Samara Metallurgical Works has an active investment policy aimed at attracting domestic and foreign investors. Activities aimed at pollution prevention and environmental management can result in a favorable environmental image for the enterprise and attract additional investors to the enterprise.

These activities will provide a framework for systematically assessing environmental conditions when introducing EMS at the enterprise.

For more information, see the Report on Initial Environmental Review for Samara Metallurgic Works. (See Annex B, page 2, under "EAPS Project Reports.")

SECTION III

Principal Results and Overall Conclusions

A. Principal Results

The following principal results were recorded for this project:

1. Pollution prevention measures implemented, and associated pollution reduction and cost savings recorded at the three partner enterprises
2. Partner and observer enterprises, VDREA, and broader public educated in pollution-prevention approaches and benefits
3. PP financing penalties waived as a result of appreciation of importance of PP approach by Ecological Council
4. Oblast Administration gained appreciation for the role of good environmental practices in attracting investment
5. Fifteen (15) plant technical specialists trained in using the Internet to research environmental solutions
6. Seventeen (17) middle managers from 9 enterprises educated in the basic elements of ISO 14001 and its implementation during the EMS seminar for middle managers
7. Fifteen (15) top managers of 10 enterprises gained appreciation for the benefits of the systematic environmental assessment and of no-cost/low-cost environmental improvements, and became familiar with the principles of EMS during the EMS seminar for senior managers
8. Thirteen (13) technical specialists trained in the principles and methodology of EMS and conducting Initial Environmental Review (IER) during the three-day EMS workshop
9. Technical assistance provided for implementing ISO 14001 at Samara Metallurgic Works
10. Initial list of priority environmental investment projects (EIPs) identified for “Samaraenergo” and “AvtoVAZ” for creating EIP portfolio
11. VDREA staff trained to provide consulting services in EMS/ISO 14001 implementation

B. Conclusions

Although the pollution-prevention programs were successful in reducing pollution levels and in reducing health risks of exposed workers, the economic benefits achieved at each enterprise were marginal because of government subsidies for inputs such as water and electricity, and low pollution fees. These government subsidies reduce the economic incentives for pollution prevention, and are an important lesson for the Samara Ecological Council to note. Tables III-1, III-2, and III-3 at the end of this section compare the economic incentives for each P2 activity based on estimates using local prices (Samara, Russia) and average Western European and U.S. prices. This comparison shows that as Russia’s cost factors for raw materials and pollution fees

increase, the incentives for P2 become very important to enterprise sustainability. The overall conclusions from the EAPS project are as follows:

- No-cost/low cost pollution prevention works, but we may expect modest bottom-line savings based on present local market conditions.
- Although government subsidies are designed to help sustainability, they deter industry from seeking low-level investment and modernization opportunities and force industry to rely more on large-scale investment and modernization programs.
- Eventually, Russian industry will be forced to meet manufacturing cost levels of free market economies. Low-cost/no-cost pollution prevention measures are an immediate investment on the part of those companies that position themselves well for this transition.

The following principles, which serve as operating guidelines for the enterprises, have been introduced to senior management of partner enterprises and other Samara Oblast enterprises. Management has acknowledged these principles and plans to incorporate them into plant-wide P2 programs. Senior managers understand that continual improvement to process operations by reducing wastes and pollution incrementally improves their profitability. Over longer periods of time, the small-scale improvements can add up to significant savings, which can be reinvested into modernizing operations.

1. Use innovative and cost-effective pollution-prevention approaches to reduce waste and potential risks to human health and the environment.

2. Integrate pollution-prevention into the company through proactive, voluntary efforts that meet or exceed all environmental regulatory requirements.

3. Encourage employees to utilize their knowledge and skills to identify and implement pollution-prevention ideas as well as recognize outstanding employee contributions.

4. Transfer pollution-prevention knowledge within the company and exchange non-proprietary technologies with suppliers and other interested parties.

5. Support non-competitive collaborative research and development of clean technologies among suppliers, technology centers, academia, and government.

6. Publish periodic reports with measurable results to profile continuous pollution-prevention improvements.

7. Support public dialogue on pollution-prevention efforts and opportunities.

8. Use pollution prevention as a basis for systematically moving toward implementing an environmental management system.

Pollution Prevention Through The Eaps Project: Examples Of Improving Bottom-Line Performance

Table III-1. Rodnik Bottling Plant

Pollution-Prevention Project: Water Conservation	**Target Substance(s):** Fresh feed water and wastewater discharge	**Project Description:** Installation of control valves on bottle washing machines enables minimizing water consumption and reduces wastewater discharge.	
EXPECTED RESULTS: • A 50% reduction in municipal quality wash-water supply and wastewater discharges for three bottle-washing machines (savings of 324 m^3/day) • At full plant operating capacity, municipal quality wash-water supply and wastewater discharge is reduced by 648 m^3/day.		**Comparative Estimated Annual Savings:**	
		Rubles based on U.S. prices	*RUBLES BASED ON LOCAL (SUBSIDIZED) PRICES*
		3,352,671	478,953
		12,070,156	1,724,308

Government subsidizing of water rates reduces industry incentives for pollution prevention, making large-scale investments more of a necessity.

Table III-2. Samara Cable Company

Pollution-Prevention Project:	**Target Substances:**	**Project Description:**
Copper Attrition Reduction	Copper	The rollers on wire drawing machines (extruders) cause fine copper attrition at machine rollers. With the use of a portable particle analyzer, the plant has developed a diagnostic test for roller polishing and realignment to reduce the particulate emissions.

Expected Results:	**Comparative Estimated Annual Savings:**	
	RUBLES BASED ON U.S. PRICES	**Rubles based on local (subsidized prices)**
• Reduced worker exposure to a heavy metal • Potential reductions in copper contamination to plant storm water • Improved quality of extruded wire • Reductions in feedstock (copper) material losses Estimated savings are being verified.	25,000,000 min.	25,000

Based on U.S. prices, potential savings to a company from reduced health care risks alone would be in excess of $1,000,000. Potential reductions in heavy metals to storm water could increase this by at least 30%.

Table III-3. Samara Bearing Plant

Pollution-Prevention Project: Reducing Fire and Health Risks	**Target Substance:** Airborne oil mist	**Project Description:** Polishing machine stations are open to the atmosphere, creating severe fire and worker health hazards. The installation of localized filtration units, and implementation of a maintenance program for the existing ventilation system eliminate the emissions.	
Results: • Elimination of a fire hazard • Reduced health risk to workers and improved productivity		*COMPARATIVE ESTIMATED ANNUAL SAVINGS:*	
		Rubles based on U.S. prices	Rubles based on local (subsidized) prices
		well above 25,000,000	Unknown

Pollution-Prevention Project: Energy Efficiency	**Target Substance:** Energy consumption	**Project Description:** Installation of automatic relay device on 6 exterior doors to the shop area automatically controls heat walls.	
Results: • Electrical energy savings by use of inexpensive automatic controls that turn ventilation and heat on-off when exterior doors are operated		**Comparative Estimated Annual Savings:**	
		RUBLES BASED ON U.S. PRICES	**Rubles based on local (subsidized) prices**
		800,000	60,000

Pollution-Prevention Project: Recycle Polishing Stream	**Target Substance:** Wastewater	**Project Description:** Use of chemical buffers and bactericide to extend the life of polishing fluids.	
Results: • Increased recycling times for polishing fluid and up to a 50% reduction in wastewater discharges		**Comparative Estimated Annual Savings:**	
		Rubles based on U.S. prices	**Rubles based on local (subsidized) prices**
		> 500,000	150,000

- In the United States and other countries based on free market economies, health care is a costly expenditure that can affect a company's bottom-line performance. Based on the number of employees exposed to the shop area, the potential savings in health care could be several million U.S. dollars. Government subsidies and ill-defined responsibilities of Russian companies toward health care benefits for workers reduce incentives to reduce health risks and improve productivity.

- Heavy subsidizing of energy costs reduces the incentives to conserve. Based on U.S. cost indices, this pollution-prevention project would have an immediate payback, in contrast to months under Russian government subsidies.

- Higher cost for reagent-grade chemicals and heavy government subsidies for water and wastewater greatly reduce the savings and incentives for these pollution-prevention opportunities.

ANNEX A

Participants in the Program

The U.S. Agency for International Development (USAID), Moscow Mission, Russia

1. Yuri E. Kazakov, USAID Environmental Policy Advisor
2. Elmira V. Starchevskaya, USAID Projects Coordinator

The U.S. Department of State, Samara Mission, Russia

3. Joan A. Agerholm, RII Coordinator

Chemonics International Inc., Washington D.C., USA

4. Avrom Bendavid-Val, Project Manager
5. Jennifer A. McGuinn, Project Administrator,
6. Maegan L. Conklin, Assistant Project Administrator
7. Dr. Nicholas P. Cheremisinoff, Independent Expert

The Russian Engineering Academy, Volga Department, Samara, Russia

8. Yuri V. Mikheev, General Director
9. Alexandr B. Remezentsev, Executive Director
10. Yuri P. Kamaev, Advisor on Policies
11. Maxim A. Epifantsev, Project Coordinator
12. Nikolai G. Gladishev, Leading Environment Expert
13. Elena Yu. Yakovenko, Project Office Manager
14. Yuri P. Sakharov, Project Public Relations Officer

Ecoline, Moscow, Russia

15. Marina V. Khatuleva, EMS Expert
16. Dr. Sergey V. Makarov, Independent Environmental Expert
17. Sergey Yu. Dimon, Environmental Auditor

Samara State Environmental Protection Committee, Samara, Russia

18. Vasiliy A. Pavlovsky, Head of the Committee
19. Valery V. Safronov, Deputy Head of the Committee
20. Mikhail G. Bodrikov, the First Deputy Head of the Committee

Samara Oblast Administration, **Samara, Russia**

21. Vladimir K. Emelyanov, Environmental Policy Advisor of the Governor

Samara Oblast Social and Ecological Rehabilitation Fund, Samara, Russia

22. Yuri S. Astakhov, Head of the Fund
23. Igor O. Rodimov, Deputy Head of the Fund

AvtoVAZ, Togliatti, Russia

24. Arkady Y. Gilboukh, Deputy Technical Director

Samaraenergo, Samara, Russia

25. Vera E. Aleshkina, Environment Specialist

Samara Bearing Plant, Samara, Russia

26. Vladimir I. Skriagin, Leading Engineer
27. Natalia N. Fedorova, Ecologist

Samara Cable Company, Samara, Russia

28. Vladimir M. Gorodetsky, the Deputy Technical Director
29. Galina F. Dorokhova, Head of the Environmental Control Laboratory

Rodnik Vodka Company, Samara, Russia

30. Leonid M. Safronov, Head of Technical Policy Department

Novokuibyshevsk Refinery, Samara, Russia

31. Sergey A. Grishin, the Chief of the Environmental Protection Department of the Refinery
32. Oleg I. Kondratyev, Ph.D., Leading Specialist of the Environmental Protection Department of the Refinery

Samara Metallurgic Works, Samara, Russia

33. Anatoly S. Saveliev, the Chief of the Environmental Protection Department
34. Eugeny P. Ryabov, the Chief of the Quality Department

Independent Experts, Samara, Russia

35. Lubov Yu. Kirichenko, General Director of “Industroyproyekt” Institute, Samara.
36. Dr. Michqail V. Shouvalov, Leading Engineer of ECOS Company (R&D), Samara
37. Galina V. Egorova, Leading Specialist of Samaraneftehimproyect, Samara
38. Valery V. Rybin, Interpreter, Samara, Russia

ANNEX B

Documents and Publications Released

Training Materials

1. In-plant Environmental Assessment Sourcebook: A Guide to Pollution Prevention Planning by Dr. Nicholas P. Cheremisinoff, February 1999
2. Training Materials Book of the Internet Training Workshop, Samara, Russia, July 1999
3. Training Materials Book of the EMS Seminar for Middle Managers, September 1999
4. Training Materials Book of the EMS Seminar for Senior Managers, October 1999
5. Training Materials Book of the three-day Environmental Management System workshop (Vol. 1), November 1999
6. Training Materials Book of the three-day Environmental Management System workshop (Vol. 2), November 1999
7. Training Materials Book of the three-day Environmental Management System workshop (Vol. 3), November 1999

Published Articles on EAPS Project

1. American-Russian partnership in Samara, Published in the "Samarskaya Gazeta" March 14, 1999
2. Ecology and Economics are Related Notions. Published in the "Samarskye Izvestiya" May 18, 1999
3. Sustainable Development of Enterprise through Environmental Management. Published in the VI International Environmental Congress Proceedings, pages 74-75, October 15, 1999
4. "Small but Precious" published. Published in the *Samarskye Izvestiya*, December 28, 1999

EAPS Project Reports

1. Samara Bearing Plant Pollution-Prevention Assessment Report. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999
2. "Rodnik" Vodka Company Pollution-Prevention Assessment Report. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999
3. Samara Cable Company Pollution-Prevention Assessment Report. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999
4. "Yukos" Novokuibyshevsk Oil Refinery Pollution-Prevention and Energy-Saving Assessment Report. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Energy-Saving Measures, May 1999
5. Pollution-Prevention Assessments: Samara, Russia. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, May 1999

6. “AvtoVAZ” Auto Maker Pollution Prevention Assessment Report. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, June 1999
7. “Samaraenergo” Pollution Prevention Assessment Report. In-Plant Environmental Assessment for Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, June 1999
8. Pollution-Prevention Assessments Summary Report. Low-Cost/No-Cost Pollution-Prevention and Abatement Measures, October 1999
9. Samara Metallurgic Works Initial Environmental Review Report, December 1999

Other Project-Related Reports

1. Report on the opening seminar on implementing the Environmental Component of the Samara Regional Investment Initiative, Samara, November 13, 1998
2. Report on the 2nd working seminar on implementation of the Environmental Component of the Samara Regional Investment Initiative, Samara, February 26, 1999
3. Report on the 3rd working seminar on implementation of the Environmental Component of the Samara Regional Investment Initiative, Samara, March 26, 1999

ANNEX C

Principal Staff for the Environmental Component of the Samara Regional Investment Initiative

A. Chemonics International Inc.

Avrom Bendavid-Val, project manager, EAPS/Chemonics. A senior environment and development specialist, Mr. Bendavid-Val has more than 30 years of experience in natural resources management and regional and urban economic development. He has worked for clients at national and local levels in the United States and developing countries, including China, Egypt, Indonesia, Jamaica, Jordan, Kenya, Morocco, Niger, Philippines, Russia, Thailand, Tunisia, Uganda, Zaire, and throughout Central and Eastern Europe, serving as planner, policy and institutional analyst, economic researcher, government official, advisor, trainer, and project manager. Currently, as chief of party for the Project in Support of the Environmental Action Program for Central and Eastern Europe and the Newly Independent States, Mr. Bendavid-Val develops and implements public and private environmental projects in water, wastewater, low-stack emissions, solid waste management, and energy sectors to reduce environmental health risks and promote economic development for this eight-country program. He is author of "Regional and Local Economic Analysis for Practitioners," recognized worldwide since 1975 as a basic text and working reference in economic analysis for development decision making at subnational levels. He is also a certified ISO 14000 environmental management system provisional author. Mr. Bendavid-Val holds an MS in development and regional economics, and a BS in economics from the University of Maryland.

Nicholas P. Cheremisinoff, pollution-prevention expert, EAPS/Chemonics. Dr. Cheremisinoff is a pollution prevention and waste minimization specialist with more than 20 years of experience in environmental management and compliance, energy efficient audits and modeling, international business development/project financing, engineering, productivity improvements, product development, and project management in Korea, Venezuela, Ukraine, Russia, and the United States. He is currently helping the World Bank and the U.S. Export-Import Bank evaluate the environmental aspects of loans to the Ukraine and Uzbekistan. Recently, as the resident advisor for a USAID-funded project in Ukraine, he established the country's first ISO 14000 national environmental management system for the steel, chemical, and refinery industries with model programs at major industrial facilities. He implemented green technology pilot demonstrations aimed at waste minimization, productivity improvements, and energy savings in steel making and coke chemical plant operations. He guided the Ministry of Environmental Protection and Nuclear Safety in the development of national waste regulations. In Korea, he performed operations and energy audits and identified and recommended reactor and processing changes to a Korean synthetic rubber plant, which resulted in cost savings and the successful introduction of elastomer products into the Western European market. He is currently completing certifications as an ISO 14000 trainer and lead auditor. Dr. Cheremisinoff holds a Ph.D. in chemical engineering from Clarkson College of Technology in Potsdam, New York.

B. Russian Engineering Academy, Volga Department (VDREA)

Yuriy V. Mikheev, director and automotive specialist, VDREA. A scientific and engineering technical expert and project manager, Mr. Mikheev has more than 25 years of experience in automotive manufacturing, energy production, automated control systems, and integrated information systems for industrial enterprises. Mr. Mikheev directs the engineering and consulting activities of VDREA and oversees the company's development strategy. He is responsible for initiating a system of outsourcing that has helped make VDREA the leading company in the Samara region for implementation of large-scale engineering projects in various enterprises. He coordinates VDREA consulting activities with the automaker AvtoVAZ, including environment and energy savings, quality control and ISO 9000 standardization, development of environmentally clean cars, supplier assessment methods, and fuel supply injection system design. He has published more than 150 scientific works on automated control systems, power generation, economics, and auto manufacturing, and has participated in numerous international conferences and symposia. Mr. Mikheev holds an MSc. in industrial heat power from the Samara State Technical University in Samara, Russia, and has completed doctoral coursework there in thermal physics and molecular physics.

Alexander B. Remezentsev, financial specialist. A scientific and technical engineering expert and project manager, Mr. Remezentsev has extensive expertise in the field of automated control systems in manufacturing operations and heat power processes. As executive director of VDREA, he is the company's top financial manager and directs and manages various scientific and technical projects in the areas of energy production operations efficiency, fresh water treatment systems in industrial operations, and integrated information systems. Previously, as a senior scientific researcher and chair of automated systems and heat power process control at Samara State Technical University, Mr. Remezentsev directed the development of automated control systems for heat power processes for metal works and aviation manufacturing operations. He also taught courses in automatic control theory, heat measuring devices, and programming. Mr. Remezentsev has published more than 20 scientific articles on automated systems control, energy, and economics. He holds an MS with honors from the Samara State Technical University, specializing in automation of heat power processes, and has completed doctoral coursework there in thermal physics and molecular physics.

Maxim A. Epifantsev, project coordinator/EMS specialist. An expert in financial and environmental management, Mr. Epifantsev has experience in financial analysis, business plans, and financial management consulting in the public and private sectors in Russia. As project coordinator for EAPS activities in the Samara Oblast for VDREA under subcontract to Chemonics International, he is currently responsible for overall management, logistical coordination, and budget tracking for all EAPS activities. He coordinates all communications with Chemonics in Washington, D.C., partner enterprises, and the Samara State Ecological Committee; has participated in training seminars on environmental management systems (EMS) and the Internet; and works with the Department for Project Finance to help obtain financing for and to promote environmental initiatives. Mr. Epifantsev holds a Red Diploma (equivalent to MSc, with honors) in process engineering from the Bratsk Industrial Institute in Bratsk, Russia; holds a certificate from Buckinghamshire College in the United Kingdom for coursework in financial and environmental management, and marketing and economics; and has completed doctoral coursework in environmental management at Bratsk Industrial University in Russia.

Two additional individuals made significant contributions to the environmental component of the Samara Regional Investment Initiative: *Nikolay G. Gladyshev,Technical Expert* and *Elena Yu. Yakovenko, Leading Specialist*.

C. Ecoline

Sergei V. Makarov, industrial ecology and environmental management specialist. An associate professor at D. Mendeleev University of Chemical Technology in Moscow, Dr. Makarov specializes in industrial ecology, environmental education, and environmental management audit and has 25 years of professional experience in chemistry and chemical technology of inorganic substances, chemical engineering, and environmental engineering. Dr. Makarov provided expertise to the EAPS project for activities under the environmental component of the Samara Regional Investment Initiative. Dr. Makarov developed and helped implement environmental management and auditing in Russia, including pollution prevention planning and implementation. He played a key role in the development of federal environmental programs and federal environmental legislation, and sat on State Environmental Assessment commissions advising on projects, programs, environmental disaster zones, and regulatory documentation (12 assessments in total). Dr. Makarov has developed and taught courses in environmental management since 1987. He is the author of more than 100 scientific reports, articles, and books on chemical technology, environmental engineering, environmental audit, and management, including monographs. He is a member of the Supreme Environmental Council (SEC) of the Russian Federation, within the Environmental Committee of the State Duma. He holds an MS in chemical technology with honors, and a Ph.D. in technical sciences, from Mendeleev University. He has also completed doctoral coursework in environmental engineering at the East China University of Chemical Technology.

Marina V. Khotoulyova, environmentalist. An expert in water monitoring and environmental education and training, Dr. Khotoulyova has extensive scientific experience in catalytical chemistry and in the field of environmental research, with a focus on chemical and radioactive contamination, health effects. She is currently executive director of ECOLINE-Consulting, and for ECOLOGIA directs water monitoring programs in Russia and the NIS. Dr. Khotoulyova is also a consultant to UNICEF for program development and provides short courses in drinking water monitoring and environmental epidemiology in environmental disaster in the Aral Sea area. For USAID, she has provided expert services in equipment installation and program development, and has provided short courses on drinking water monitoring in Central Asia. She has been a lecturer and consultant in the development of environmental education programs for the Moscow Area Educational Center “Nakhabino,” and a teacher in pollution studies at the Moscow State University. She has developed course materials for professional higher education and retraining in environmental protection under the federal program, Environmental Safety of Russia, and consulted to the Russian Federation Committee for Ecology Research Institute (VNIIPriroda) in water quality monitoring, and equipment and methods certification. Dr. Khotoulyova holds a Ph.D. in chemistry and catalysis from the N.D. Zelinsky Institute of Organic Chemistry (Russian Academy of Science) in Moscow, and holds a certificate in environmental impact assessment for practitioners from the Central European University and a certificate in ISO 14000 from the Academy for Educational Development.