RAMP 1992-1999

RUSSIA AIR MANAGEMENT PROGRAM

Final Report

Mother Russia

ACKNOWLEDGMENTS

Many people and organizations shared responsibility for the success of the Russia Air Management Program (RAMP). Thanks should first go to the visionaries from Russia and the United States who originated the idea of testing American air quality management techniques in Russia. Their farsightedness has been validated by the success of the project and the enthusiasm of its participants. This vision was shared by the organizations who funded and supported parts of the project: US AID, US EPA and the World Bank.

We are grateful to all of the participants in the project, both Russian and American. Our Russian colleagues have been dedicated to working for a cleaner environment for years. People like Dr. Mark Berlyand, who has had a long pioneering career at the Main Geophysical Observatory in St. Petersburg since 1942, is representative of many who have worked for many years for the environment. The project participants from both Russia and the United States willingly shared their knowledge and experience with each other and found that they gained much in the process.

Our colleagues at Science Applications International Corporation (SAIC), Eastern Research Group (ERG) and the Institute for Sustainable Communities (ISC) brought their technical abilities and experience to the project but they also added an incredible level of personal commitment to help make RAMP a successful project.

After reading the report that follows, it will be clear that it took a huge team to do this successfully. The administrative support in the United States was highly professional and capable for the routine tasks, such as travel arrangements and visas, and tremendously responsive in the exceptional cases, such as serious illnesses halfway around the world. The translators, drivers, and logistical support people in Russia were absolutely essential to the ability of the American personnel to be effective there.

The US EPA managers deserve everyone's gratitude for their enthusiastic tolerance of the "other project" which often made it necessary to adjust schedules. Fortunately, they shared the vision of the need for this kind of effort and led the way for everyone.

In the end, the most important accomplishments went beyond the sharing of technical knowledge. It was the development of respect and longlasting relationships between Russian and American colleagues. We found that we have many more things in common than differences and ultimately we all share the goal of a better environment.

COLLABORATION

COMMUNICATION

CHANGE

The Russia Air Management Program (RAMP) began in 1992 following preliminary investigations into the air management system in the former Soviet Union by US project initiators. The effort was conceived as a four-year cooperative program among the Russian Ministry of Environmental Protection and Natural Resources (MEPNR) and the US Environmental Protection Agency (US EPA) to improve national institutions, policies, and practices for air quality management in Russia. The program was part of the Environmental Policy and Technology project conducted by the US Agency for International Development (US AID).

In 1992, the World Bank had contacted the US EPA to discuss collaboration on an air pollution management project in the former Soviet Union (FSU). US EPA personnel subsequently held meetings with Byelorussian and Russian colleagues to review the air management system in the FSU and to identify areas of potential collaboration. Following further discussions with local political and environmental authorities throughout western Russia, the city of Volgograd was chosen as the site for the RAMP pilot project.

The Volgograd pilot project featured the development, practical demonstration and evaluation of alternative approaches for improving air quality management policies and practices in Russia. Volgograd has a progressive and environmentally enlightened local government, and a diverse industrial base. It is located south of Moscow on the Volga River and was proposed by the MEPNR. It was selected after a site visit and a series of discussions with the Ministry, Volgograd officials, the World Bank, and the US EPA. Following the pilot, RAMP's intention was to facilitate implementation of selected parts of the pilot in other areas of Russia using training, technology transfer, and public awareness.

The project was divided into components conforming to the fundamental structure of mature air quality management programs, with leadership roles assigned to US EPA personnel with expertise in specific aspects of air quality management. Additional technical and administrative support was provided by two US contractors, Eastern Research Group (ERG) and Scientific Applications International Corporation (SAIC), one US non-profit organization, the Institute for Sustainable Communities (ISC), as well as three main Russian subcontractors, Scientific Research Institute — Atmospheric Air Protection (SRI AAP) and Main Geophysical Observatory (MGO) in St. Petersburg, and Institute Agroproject (IA) in Volgograd.

Air Quality Management in Russia

The initial step for RAMP was to make a quasi-comparison of Russian and American air quality management systems. Although the break-up of the Soviet Union exposed a country that had experienced years of environmental neglect, it was also quite clear that a very sophisticated system of environmental measurement and control was in place, managed by highly qualified technical experts. American and Russian experts needed to begin by understanding each other's work. That became the first priority for RAMP.

As might be expected, there are significant differences in the Russian and American systems of air quality management. Air quality management in the Russian Federation has been oriented towards the control of stationary sources with a rather modest emphasis devoted to area or mobile sources.

The main elements of the Russian system include:

- ambient air quality norms or standards for more than 1,000 pollutants
- ambient air quality monitoring
- emission inventories
- establishing maximum permissible rates for the enterprises (industries)
- establishing sanitary protection zones around the enterprises where the ambient concentrations can be higher than the maximum permissible concentrations
- permits and ecological passports for enterprises.

Russia, as part of the former Soviet Union, established air quality norms, or standards, for over 1,000 pollutants. Maximum Permissible Concentrations (MPC's) were established for over half of these, for a range of measurement periods. The other norms are considered to be guidelines only and may be used to establish temporary MPC's where none have been established. The Ministry of Public Health (MPH) establishes MPC's and typically establishes 5-10 new ones per year. They do not routinely review an MPC once it has been set. The MPH has determined that some pollutants are more harmful when present with other pollutants than when found alone in the atmosphere.

The MPC is used in combination with the prescribed air quality model to determine the Maximum Permissible Emission Rate (MPER) and to establish the level of control equipment needed on the pollutant source(s) in the enterprise. Once the enterprise begins operation there is no legal requirement for the enterprise to give routine feedback on the effectiveness of the control measures by monitoring and comparing the measured pollutant concentrations with the MPC's.

Ambient monitoring is done by the State Committee on Hydrometeorology (Hydromet), the Sanitary Epidemiological Service and enterprises, using approximately 1900 stations. These monitoring stations typically monitor for some or all of the following: dust, sulfur dioxide, oxides of nitrogen, carbon monoxide, ammonia, hydrogen sulfide, phenol, hydrogen fluoride, formaldehyde, and benzo(a)pyrene, as well as metals and other pollutants, as necessary.

Hydromet operates stations on a regular basis in 402 cities. The Main Geophysical Observatory (MGO) in St. Petersburg is the repository of this air quality information, regularly publishing Federation-wide trends and analyses reports.

Emission measurements, on the other hand, are usually conducted by the enterprises themselves. Enterprises have to put together a Technical and Economic Assessment (TEA) in order to obtain approval to build a new facility or modify an existing one. The air quality analysis for the TEA consists of a screening level modeling analysis and includes identification of pollutants and emissions, determination of background concentrations, and modeled maximum estimated concentrations.

Each enterprise has a sanitary protection zone (SPZ) surrounding it. This is analogous to the fence line of the property surrounding a stationary source in the United States and is an area where the maximum permissible concentrations may be exceeded. Russian law forbids people from living in these areas. However, this law is often violated so that workers may live close to their work. In Volgograd, for instance, apartments and schools have been built adjacent to the Red October Steel Mill, well within Red October's SPZ.

Maximum permissible emission rates are set for each pollutant at each emission point in an enterprise. Many enterprises are constructed with relatively little emission control, however, based on the premise that the SPZ can simply be extended from the facility to include all areas where ambient impacts exceed MPC's.

Environmental passports (permits) are negotiated each year by the enterprises and the pollution control agency. Enterprises are assessed fees based on exceedances of the maximum permissible emission rates. These fees recently have had little meaning because the fee levels were set prior to inflationary times and are now token amounts. In some rare cases enterprises have been closed for violations. Inspectors and enterprise officials often have friendly relationships, much more so than in the United States. Inspections are routinely scheduled ahead of time and the emission testing is usually done by the enterprises themselves. Inspectors can levy fines but, as mentioned above, they are often of token amounts.

Prior to the break-up of the Soviet Union, one ministry directed all environmental programs. That ministry was split up so that RosHydroment is now responsible for monitoring, modeling and air quality data, while the State Committee for Environmental Protection (SCEP), formerly the Ministry, is responsible for emissions controls. There is usually very little communication between the two. In addition, technical institutes in St. Petersburg (similar to US EPA's Office of Research and Development) serve both of these agencies but have very little real interaction with each other.

THE RUSSIA AIR MANAGEMENT PROJECT (RAMP)

The Russia Air Management Project (RAMP) was designed to reflect the American air quality management process by applying each component of that process to Volgograd. Senior US EPA specialists in each technical area were chosen to work with their counterparts in Russia to test the application of American techniques to the Russian situation. The Russians could then evaluate the success of these and choose which might possibly be adapted and applied Russia-wide.

US EPA and the Ministry developed the strategy for the project together and selected Volgograd as the pilot city. Volgograd is an important industrial city with a strong local environmental program, a diverse industrial and economic base, and experienced citizen environmental groups. The industrial mix in Volgograd offered the opportunity to try a variety of control strategies.

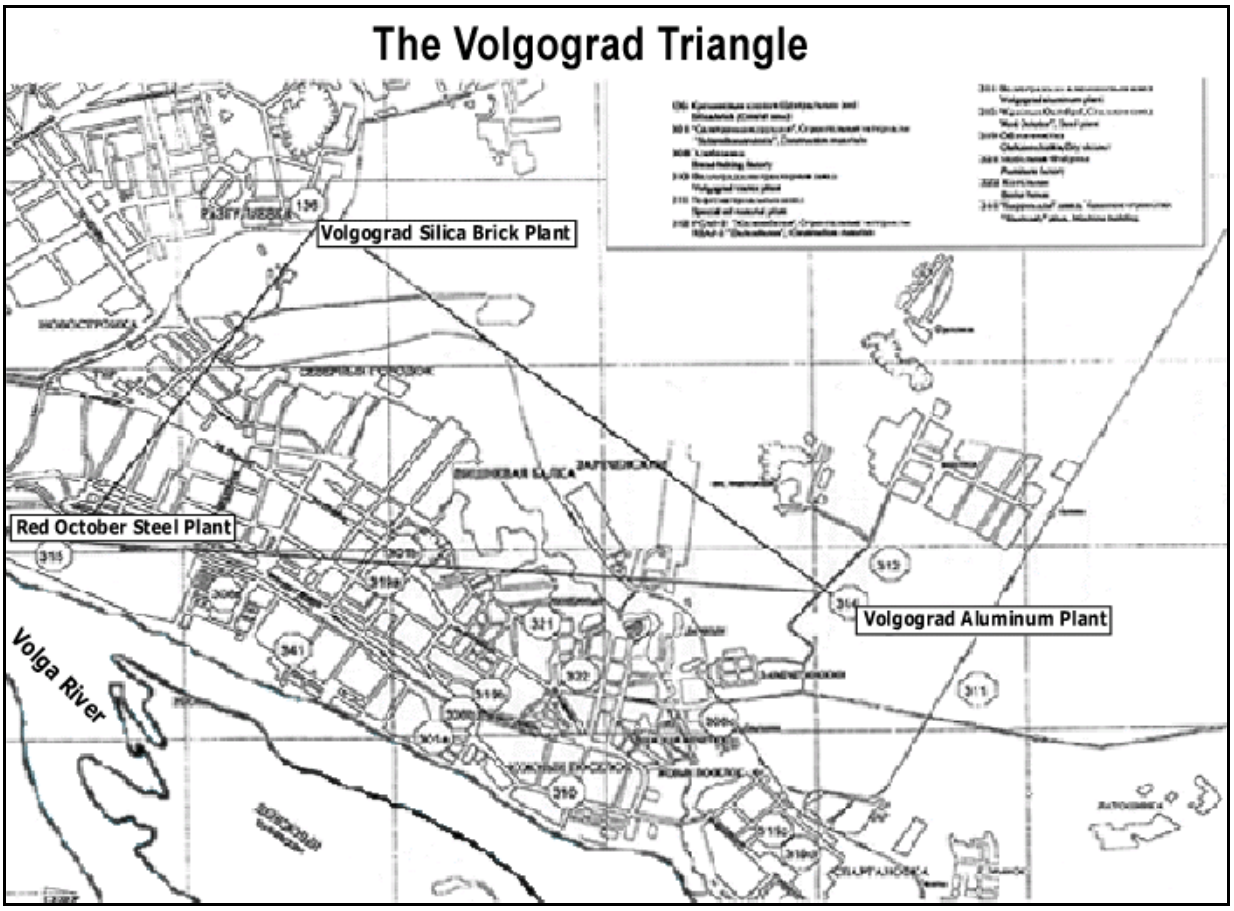
The Ministry and US EPA settled on three elements as the basic strategy for RAMP. First, the US air quality management components would be applied to situations in Volgograd. This would culminate in the development of control strategy alternatives for Volgograd. Second, successful components would be considered for incorporation into national policies and legislation. Third, project results would be disseminated throughout Russia through training and public outreach.

The entire gamut of American air quality management techniques was translated into project components in Volgograd. Russian and American team leaders were selected for each component and together planned their work, which often included assistance by American technical contractors.

AIR QUALITY MONITORING

Ambient air quality monitoring is a substantial portion of the foundation for the entire air quality management process in the United States for it is often how problems are first detected. Monitoring results are reconciled with the modeling analysis to determine where emission reductions must be made and used to assess and manage the efficiency of implemented measures. The amount of time available and budget made it impossible to do the kind of full-scale monitoring analysis that would have been preferred. In its place, RAMP component leaders suggested performing a series of saturation studies, i.e., intensive short-term studies of portions of

The Volgograd Triangle



the city of Volgograd, including the area defined by the location of three important enterprises — Red October Steel Mill, the Aluminum Reduction Plant and the Silica Brick Plant - The Volgograd Triangle. This surrogate for a long-term monitoring study gave the Volgograd specialists the opportunity to apply the American study techniques with the monitoring and analysis equipment and to understand how the monitoring step fits into the overall air quality management process.

Source Assessments & Low Cost Measures

Volgograd is a large industrial city—too large for RAMP to examine each of its major enterprises. The northern part of Volgograd became the focus of the project and nine important enterprises there were targeted for source assessments. Teams made up of Volgograd Committee staff, US EPA component leaders and American contractors conducted source assessments to identify potential low cost/no cost pollution prevention measures.

Detailed plans for low cost measures were developed and implemented for three major sources in Volgograd—the Aluminum Reduction Plant, the Silica Brick Plant and the Red October Steel Plant. Generic low cost measures and plans for these source categories were developed and published for Russia-wide use.

Emission Inventories & Emissions Factors

Most Russian inventories are cumbersome, noncomputerized documents. The cumbersome format makes them relatively inaccessible and difficult to use. RAMP's goal was to help computerize inventories, standardize the data, and streamline the format to make them more useful and compatible with standard international practice. In Volgograd, the objective was to prepare a new point and area source inventory for the northern part of the city.

Emission factors are the basis for estimating emissions that are not actually measured. They complement source testing as the means by which emissions data are compiled into emission inventories. The current Russian system is different from that of the United States and western European countries. By sharing American techniques with their Russian counterparts, RAMP hoped to suggest improvements in the Russian methodologies that would bring more comprehensive and accurate coverage for current emissions processes.

Emission Testing

Source testing is vital to the air quality management process because reliable emissions data are the starting point for virtually all of the analytical procedures and management practices involved in air quality management. RAMP carried out source testing at key enterprises to support the development of a control strategy, to support enforcement, and to develop and refine emission factors.

Risk and Health

Russia has set health-based standards, called Maximum Permissible Concentrations (MPC's), for over 1,000 air pollutants. Most other countries focus on a very small number of priority pollutants. The burden for trying to manage for this number of pollutants is challenging.

One of the goals of RAMP was to begin to prioritize pollutants to be regulated based on their toxicity and potential for human exposure. By looking at specific enterprises and the priority pollutants emitted by them, a cost-effective control strategy could be developed for Volgograd.

Strategy Development

After taking into account all of the joint work described above, the RAMP team in Volgograd developed control strategy options for the "Triangle" area—the area delineated by the locations of the aluminum reduction plant, the silica brick plant and the Red October steel plant. The source assessments at the nine major plants were analyzed and these three plants were selected as the most important from a health risk standpoint and where promising results were possible. Several scenarios were developed for different levels and combinations of control strategies which would improve air quality and reduce health risk in Volgograd. The first phase looked at near-term, no-cost and low cost measures—essentially pollution prevention measures. The second phase identified longer-term, more costly measures. The objective of the exercise was to integrate all elements of the American air quality management process in Volgograd.

Compliance and Inspection

The Russian compliance and enforcement system appears on the surface to be very similar to many other countries. Permits are issued to factories (enterprises) and emissions limits are set. Inspectors periodically check the enterprise's compliance with the emission limits and permit conditions. Lack of compliance results in penalties, which include fines, administrative sanctions, and even possible closure and imprisonment of enterprise officials.

In reality, however, enterprises often ignore permit conditions and rarely attempt to come into full or rapid compliance. The recent inflation has made fines set previously to be almost trivial amounts of money, easily ignored by the industry. Besides that, local government officials do not want to interfere with the operating enterprises since so many are not operating or face economic difficulty.

US EPA's approach to compliance and enforcement in Volgograd was to work with Volgograd counterparts to strengthen the basic system with particular emphasis on activities and measures that will be of immediate and practical benefit, such as visible emissions evaluation. In the United States, visible emissions evaluation is an effective, inexpensive technique to strengthen enforceability since it requires neither access to the enterprise nor costly instrumentation. It relies on the trained eye of the observer to evaluate the opacity of the smoke emerging from a stack.

Public Participation

Another goal of RAMP was to spread knowledge and expertise on RAMP successes and air quality issues in general beyond the relatively small circle of technical experts in government and industry. The sustainability of RAMP would be greatly improved with the growth of public support for environmental goals and improved public participation in environmental issues.

Legal Task Force

The Legal Task Force consisted of Russian and American attorneys who investigated Russian environmental legal issues and made recommendations to RAMP component leaders. The Russian legal structure is very complex and much different than the American system.

The Legal Task Force had a unique position in the RAMP project. In one sense, the task force acted as a RAMP component but it was funded separately for the most part, generally through the Harvard Institute for International Development grant on a related US AID/EPA project. It also did a great deal of work independently of the RAMP project.

Training

One of the major goals of RAMP was to disseminate project results and possible applications throughout the Russian Federation. The most important way of doing this was through the Center for Environmental Training (CET) established in Volgograd. The center was intended to be the main vehicle for spreading the lessons learned in RAMP in Volgograd.

SUMMARY OF IMPORTANT ACTIVITIES

ENGINEERING

- Conduct an emissions inventory for selected key point and area sources in Volgograd.
- Review technology-based emission standards in other countries and the applicability of such an approach in Russia.
- Provide technical guidance on low cost measures.
- Advise Russian planners on strategic options for improving public health-related air pollution problems in Volgograd.
- Conduct source evaluations on nine significant stationary sources.

LEGAL

- Identify legal and regulatory changes needed to implement specific RAMP projects.
- Establish a certification program for inspectors of visible emissions.
- Support implementation of an approved public participation program for regulatory decision-making.
- Develop a plan to legally enable the implementation of the successful elements of the Volgograd pilot to Russia-wide application.

MONITORING

- Install and operate new air monitoring and laboratory equipment provided by the Commodities Import Program (CIP).
- Conduct and report on a summer air quality characterization study.
- Initiate the development of a Pollutant Standards Index (PSI).
- Setup and operate new source emissions testing and associated laboratory CIP equipment.

TECHNICAL INFORMATION

- Initiate an air quality management system based on health standards
- Formalize non-health standards with the formal use of a visible emissions program.
- Adopt standardized emission factors for inventory maintenance.
- Move toward use of non-wet chemistry methods for pollutant identification.
- Accept the concept of non-traditional sources (i.e. fugitive dust) as a significant air pollution problem.