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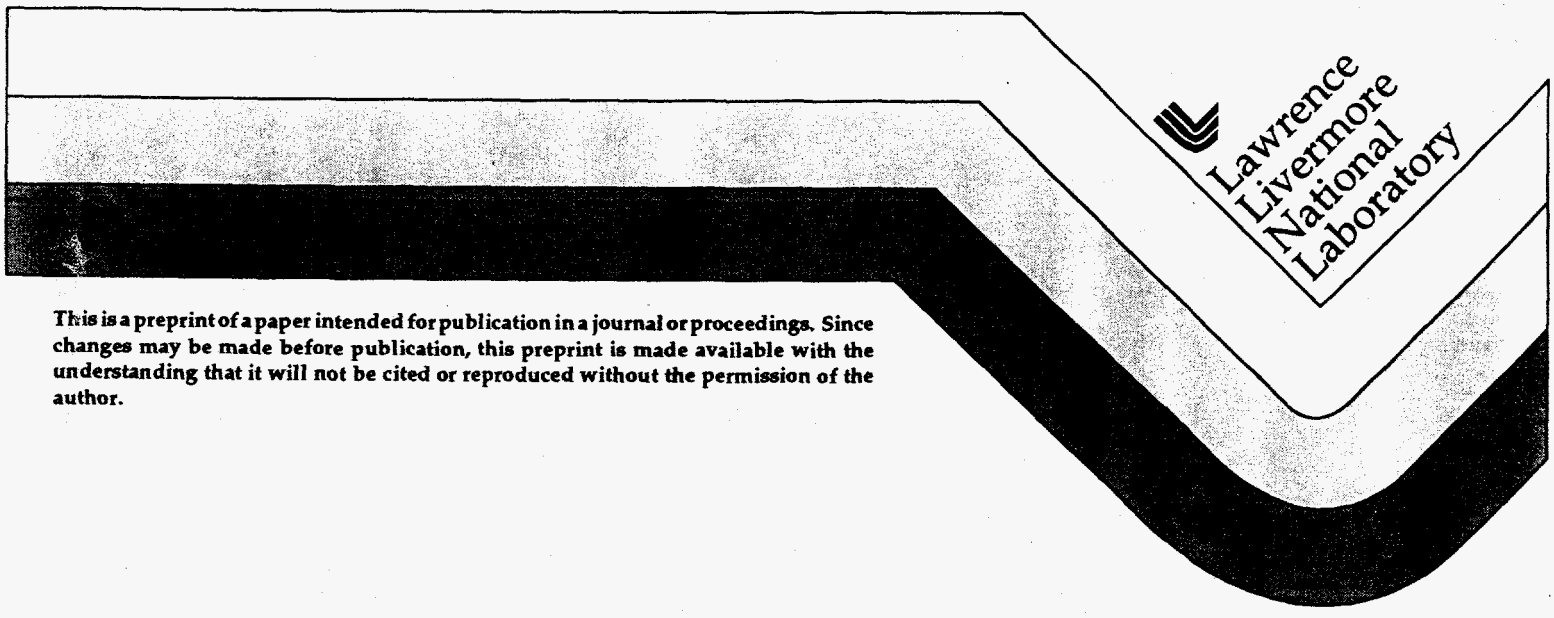

Middle Urals' Pollution Prevention Priorities Assessment Project*

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Abstract

The Middle Urals is an important Russian industrial region. The key industries are also the most environmentally damaging: mining, metallurgical and chemical industries. There are some 600 large-sized and medium-sized enterprises located within the Middle Urals' region. Their annual solid and gaseous chemical releases have led to exceeding some maximum permissible contaminant concentrations by factors of tens and hundreds. The environmental problems of the Middle Urals are of such magnitude, seriousness, and urgency that the limited available resources can be applied only to the problems of the highest priority in the most cost-effective way.

By the combined efforts of scientists from Lawrence Livermore National Laboratory (USA), Institute of Industrial Ecology (Ekaterinburg, Russia) and Russian Federal Nuclear Center (Snezhinsk, Russia) the project on Environmental Priorities Assessment was initiated in 1993. Because the project will cut across a spectrum of Russian environmental, social, and political issues, it has been established as a genuine Russian effort led by Russian principals. Russian participants are the prime movers and decision-makers, and LLNL participants are advisors.

A preliminary project has been completed to gather relevant environmental data and to develop a formal proposal for the full priorities assessment project for submittal to the International Science and Technology Center. The proposed priorities assessment methodology will be described in this paper.

The specific objectives of this project are to develop and to implement a methodology to establish Russian priorities for future pollution prevention efforts in a limited geographic region of the Middle Urals (a part of Chelyabinsk and Sverdlovsk Oblasts). This methodology will be developed on two geographic levels: local (town scale) and regional (region scale). Detailed environmental analysis will be performed on a local scale and extrapolated to the regional scale.

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This project will allow Russian federal, regional and local governments to more effectively focus efforts and direct capital investments to reduce the detrimental influence of current pollution sources on the environment and ultimately on human health, at both regional and local levels.

Results of the project and the experience accumulated during its performance will be useful thereafter to solve analogous problems in other regions of the Urals and, possibly, in other parts of Russia and other nations.

Introduction

The Middle Urals region of Russia, which includes the central and southern part of Sverdlovskaya oblast and the central and northern part of Chelyabinskaya oblast, is an important Russian industrial region. The key industries are also the most environmentally damaging: mining, metallurgical and chemical industries. There are some 600 large- and medium-sized enterprises located within this region.

According to the data presented in "The State Report on Environmental Conditions in Russia in 1992", the Ural region has the largest total atmospheric emissions of gaseous and aerosol wastes in Russia. The main contributors of these discharges are the industrial enterprises and transportation vehicles of Sverdlovskaya and Chelyabinskaya oblasts.

The Middle Urals' region is situated at the junction of three water basins, all of which are seriously contaminated with heavy metals, petroleum products, organic matter, nitrates and other pollutants. The levels and diversity of contaminants make it difficult to solve environmental problems, including those associated with regional food and water supplies.

The territory under discussion is also characterized by intensive agriculture and by intensive consumption of natural resources: mining, water use, State timber purchasing, recreation, wild berries and mushrooms.

The impact on the environment is redoubled by a high population density.

The environmental problems of the Middle Urals are of such magnitude, seriousness, and urgency that the limited available resources can be applied only to the problems of the highest priority in the most cost-effective way.

Project Objectives

By the combined efforts of scientists from Lawrence Livermore National Laboratory (USA), Institute of Industrial Ecology (Ekaterinburg, Russia) and Russian Federal

Nuclear Center (Snezhinsk, Russia) the Middle Urals' Pollution Prevention Priorities Assessment Project was initiated in 1993.

A preliminary project has been completed to gather relevant environmental data and to develop a formal proposal for the full priorities assessment project for submittal to the International Science and Technology Center.

The focus of the priorities assessment project is on immediate pollution problems from current industrial operations, the migration of legacy wastes, and potential accidental situations and their solutions, rather than long-term research related to fundamental environmental investigation. The specific objectives of this project are to develop and to implement a methodology to establish Russian priorities for future pollution prevention efforts in a limited geographic region of the Middle Urals (a part of Chelyabinsk and Sverdlovsk oblasts).

The project will be based on available environmental data obtained by Russian governmental organizations. Existing technical analyses for the assessment of environmental conditions and effects of pollution sources will be used and existing methods for modeling the transport of pollutants in the environment will be the basis for the methodology. The methodology will also include techniques developed at the Russian Federal Nuclear Center by nuclear weapons scientists which can be applied to environmental problems.

Methods for gathering, organizing, and systematically analyzing environmental information, and for formulating and testing priorities assessment models will be created for the proposed project. Diverse opinions, including those from governmental, nongovernmental, and scientific organizations are being integrated into the priority setting process.

This work is being performed in compliance with international standards in environmental protection; legislation and other regulations currently in force in Russia; and original techniques developed by the Russian participants.

The created pollution prevention methodology will be of practical importance at the local and regional levels. It will be useful for governmental planning and for future pollution prevention projects having the greatest impact on ecological improvement.

Middle Urals Pollution Prevention Project

The project has been divided into the following seven tasks:

1. The initial step will involve the collection of pertinent reference documents and other materials describing methods and approaches for the establishment of environmental priorities, including those adopted by Russian governmental and non-governmental organizations, and those used by environmental specialists in other countries. Based on the analysis of these reference materials, principles and criteria will be developed to define local and regional-level environmental priorities in the Middle Urals.

2. Regional environmental data presented in official reports about sources of direct and potential effects on the environment and the state of environmental objects will be collected, processed, systematically organized, and compiled into data bases. Models for the transport of pollutants in the environment will be reviewed.

3. A methodology (based on a variety of approaches, methods, and physical-mathematical models) for the establishment of pollution prevention priorities on a regional level will be developed. As part of this task, the regional environmental data gathered will be analyzed and summarized to develop a formal model of a regional level priorities assessment to prevent environmental pollution.

   After evaluation, methods will be selected for describing the condition of environmental objects and assessment criteria. Pollution migration models within different media (water, soil, air) will be considered and applied, with respect to the Middle Urals, based on their usefulness and scientific validity.

   Systematic analysis will be performed to relate the influence of a pollution source on the condition of environmental objects on a regional scale. The relevant parameters of this influence will be determined and the object's condition will be characterized.

   A priorities assessment model to prevent environmental pollution on a regional level will be formulated and studied.

4. A methodology (based on a variety of approaches, methods, and physical-mathematical models) for establishment of pollution prevention priorities on a local level will be developed.

   This task will allow closer examination of pollution sources and effects on a local scale. Two local model territories (one in Sverdlovsk region, another in Chelyabinsk region) typical of regional conditions will be chosen.

   Detailed data related to sources of direct and potential influence on the local-scale environment and the state of environmental objects will be gathered, analyzed, and summarized. Modeling of environmental effects of sources not fully described in official reports will be performed, and data obtained will be analyzed and summarized.

   After evaluation, methods will be selected for describing the condition of environmental objects and assessment criteria. Pollution migration models within different media (water, soil, air) will be considered and applied, with respect to the Middle Urals, based on their usefulness and scientific validity.

   Systematic analysis will be performed to relate the influence of a pollution source on the condition of environmental objects on a local scale. The

relevant parameters of this influence will be determined and the object's condition will be characterized.

A priorities assessment model to prevent environmental pollution on a local level will be formulated and examined. If needed, the local-scale model will be improved and then tested.

5. An environmental priorities assessment to prevent pollution in collaboration with local government bodies and non-governmental organizations will be conducted based on this model. Results of this work will be made public.

6. Based on results of the local-scale model, improvement will be made to the regional-scale model of environmental priorities assessment for prevention of pollution.

7. A priorities assessment for prevention of regional environmental pollution will be conducted in collaboration with regional governmental bodies and non-governmental organizations. Results of this work will be made public.

As a result of this project:

- Priorities for future pollution prevention efforts to reduce the negative effects of pollution sources on the environment and, consequently, on the health of people in the Middle Urals will be assessed;

- Local and regional-level methodologies will be created with practical uses which will allow local and oblast-level governing and administrative bodies to make better environmental decisions. This methodology will be developed on two geographic levels: local (town scale) and regional (region scale). Detailed environmental analysis will be performed on a local scale and extrapolated to the regional scale.

Results of the project and the experience accumulated during its performance will be useful thereafter to solve analogous problems in other regions of the Urals and, possibly, in other parts of Russia and other nations.

Current Status of the Project

A preliminary project to gather relevant environmental data and to develop a formal proposal for the full priorities assessment project for submittal to the International Science and Technology Center has been completed. Russian and LLNL collaborators have worked together to establish a project plan, share perspectives on approaches, and compile and publish regional environmental data.

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