IIASA

options

International Institute for Applied Systems Analysis

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Special Issue

Includes:

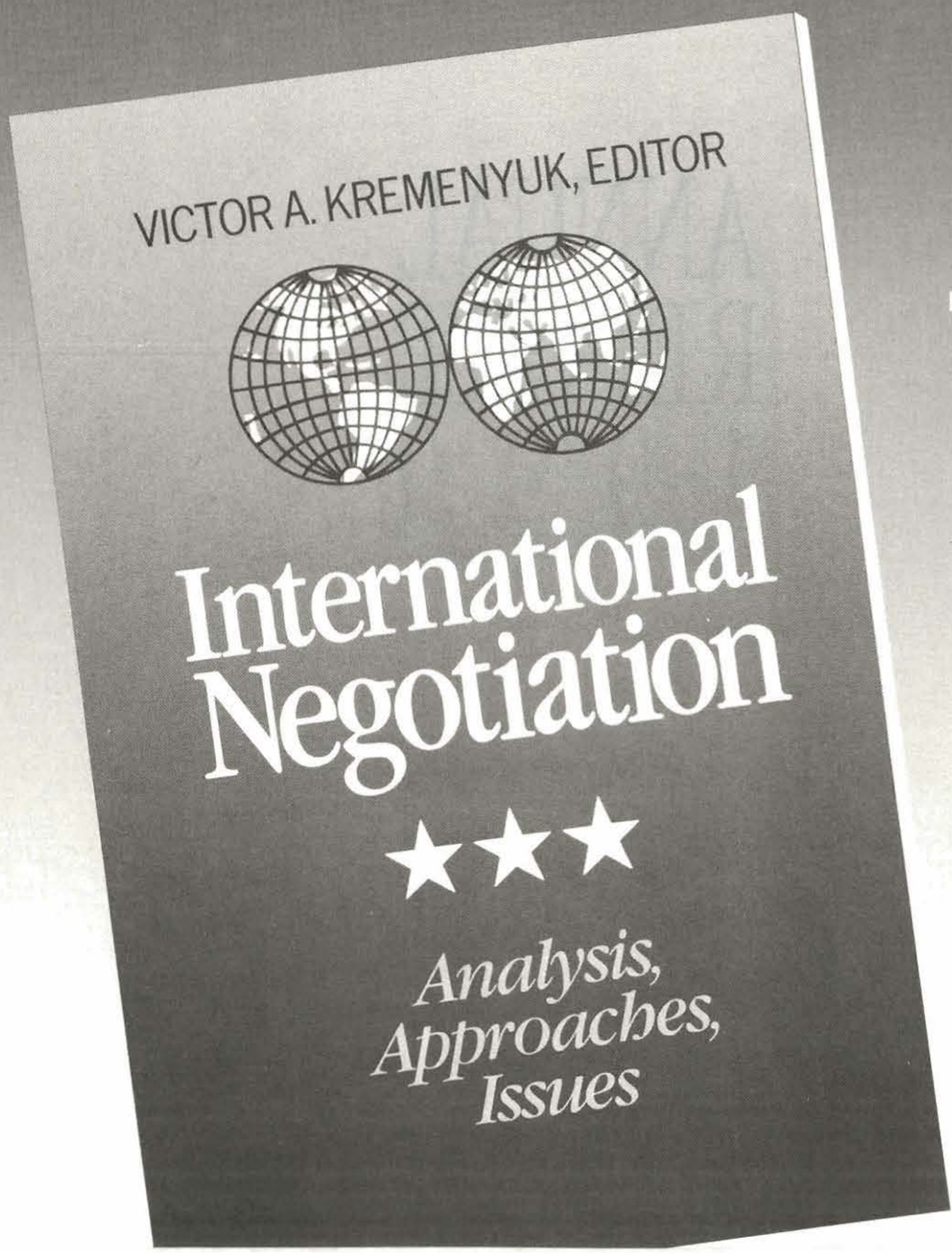
ANNUAL REPORT 1990

IIASA BOOKS

This monograph, the result of a collaboration of negotiation experts and practitioners from 10 countries, offers a comprehensive overview and comparison of the latest conceptual frameworks, analytical approaches, and applications in the field of international negotiation.

International Negotiation
Analysis, Approaches, Issues

Victor A. Kremenyuk, editor
Jossey-Bass Publishers



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options

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IIASA is an international research institution which draws on the scientific and financial resources of member organizations to address problems of global significance.

Used worldwide, IIASA's results and products have established IIASA as a frontrunner in applying systems analysis to the examination of international issues.

National Member Organizations

Austria – The Austrian Academy of Sciences; *Bulgaria* – The National Committee for Applied Systems Analysis and Management; *Canada* – The Canadian Committee for IIASA; *Czech and Slovak Federal Republic* – The Committee for IIASA of the Czech and Slovak Federal Republic; *Finland* – The Finnish Committee for IIASA; *France* – The French Association for the Development of Systems Analysis; *Germany* – The Association for the Advancement of IIASA; *Hungary* – The Hungarian Committee for Applied Systems Analysis; *Italy* – The National Research Council and the National Commission for Nuclear and Alternative Energy Sources; *Japan* – The Japan Committee for IIASA; *Netherlands* – Netherlands Organization for Scientific Research (NWO); *Poland* – The Polish Academy of Sciences; *Sweden* – The Swedish Council for Planning and Coordination of Research (FRN); *Union of Soviet Socialist Republics* – The Academy of Sciences of the Union of Soviet Socialist Republics; *The United States of America* – The American Academy of Arts and Sciences.

EDITORIAL

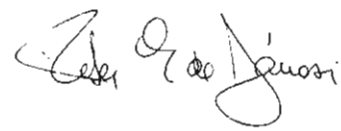
Readers of this issue of *Options* will find within it a copy of IIASA's 1990 Annual Report. We hope that the report gives a broad overview of our activities in the past year and some insight into where we will be going in the future.

The shortened issue of *Options* that surrounds the annual report gives news of upcoming meetings and recent conferences, plus somewhat longer reports on two IIASA-sponsored conferences on divergent topics.

In February, 45 scholars from 14 countries came to IIASA to discuss the concept of eco-restructuring. The meeting stemmed from a proposal by IIASA alumnus Robert U. Ayres for a wide-ranging study that would identify obstacles to sustainable development and point to policies that would reduce threats to the environment. Participants ended the conference by adopting a declaration, reprinted on the following page, which highlights some of the questions that should be addressed by such a study.

A follow-up meeting will be held at IIASA in June.

The second report summarizes a 1990 conference on the safety and reliability of energy systems. The author of the report, Soviet Academician Yuri Rudenko, points out that modern distribution networks for electricity, oil products, and natural gas function as single technical units of immense size and complexity. The failure of any component, even a single pump or transformer, can upset an entire system, disrupting the lives of millions of people living far from the site of the breakdown. The conference provided an opportunity to discuss issues related to the interconnection of large energy systems and to explore ways to minimize the risks of system failures.



Peter E. de Jánosi
Director

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Laxenburg Declaration on Eco-Restructuring

In February, 45 experts from 14 countries gathered at IIASA's offices in Laxenburg, Austria, to discuss ways of assessing the challenges associated with threats to the environmental and resource base caused by current, unsustainable paths of development. The meeting ended with this declaration:

According to the Brundtland report sustainable development strategies should seek paths of economic, social, and political change that meet the needs of the present without compromising the opportunities for future generations to meet their own needs. Present trends of technological, industrial, and agricultural change are far from automatically assuring sustainable development. For much of the human population, indeed, there is hardly any development at all. And yet global economic expansion is increasingly threatening local, regional, and global environment. Environmental degradation is reducing the potential for future economic development.

Eco-restructuring is an emerging concept focussing on the long-term transformation of the technological base of the world economy, with a view towards reducing the pressures exerted by human society on its environmental and resource base. It must be part of the principal answer to the challenge of sustainability. Some of the questions that need an international coordinated research effort are the following:

1. What can we say scientifically about the carrying capacity of the earth and about trends in this capacity over time? What can we say about the resilience of the biosphere on various time and space scales?

2. What technologies are available or potentially feasible as ingredients of eco-restructuring and what are the barriers to their introduction?

3. If markets and free trade by themselves will not lead to sustainable development and regulations may be too cumbersome, what institutional changes and instruments are needed to bring about a sustainable development path?

4. To what extent can "corrected" markets lead to sustainability?

5. What may be a reasonable time scale for changes?

6. How can the scientific community work most productively with policy makers and the public in designing and implementing the eco-restructuring process?

7. Studies of eco-restructuring need to be regionally specific. Also, for many countries, especially in the South, eco-restructuring is impeded by debt, lack of access to the world's technology pool, and deteriorating, unstable terms of trade.

Concerning the goals and instruments of environmental policy, changing scientific knowledge and public values and expectations make any "safe level" of pollution a receding target. Accumulation of toxic metals and greenhouse gases cannot be tolerated indefinitely. Hence eco-restructuring should constitute a dynamic process of continuing reduction of environmental pollution and pressures.

Dynamic processes of eco-restructuring should ideally work on each of the factors of the environmental burden caused by man: population, income per capita, resource use per unit of income, environmental damage per unit of resource use. The almost exclusive reliance of the industrialized countries on emissions reduction is a particularly expensive solution; research is needed on whether resource efficiency is likely to be less expensive and equally effective.

F E A T U R E

Safety and Reliability of Energy Systems

The energy industry has one feature which distinguishes it from all other branches of the economy, namely that individual enterprises (power plants, enterprises that extract, process, and store natural gas and oil, etc.) are connected to each other not only economically, but also physically. Modern electric power systems and oil and gas power networks function as single technical units of immense proportions.

Increasingly these networks cross national borders, sometimes spanning entire continents. Examples include the integrated electric power systems of the USA and Canada, Eastern Europe, Western Europe (UCPTE), and the North European countries (NORDEL), and the integrated gas supply system of the USSR and Eastern and Western Europe.

As systems grow larger and more efficient, so do critical pieces of equipment within them. The higher nominal power of equipment means that a single breakdown or accident can cause enormous problems. Interconnection of regional and national systems increases the probability of such accidents causing a snowball effect. It is the possibility and the actual occurrence of large accidents of this kind, including systemic ones, that has led to increased study of the reliability of energy systems.

The International Meeting on The Safety and Reliability of Energy Systems held in Sopron, Hungary, in 1990, gave experts in the field a chance to discuss better ways of ensuring the safety and reliability of these extraordinarily complex structures.

The conference, jointly organized with IIASA, comprised four sessions on methodological issues, electrical power systems, power generation and distribution equipment, and pipeline systems.

In discussing methodological issues, participants concluded that no single model could be applied to energy systems. They also agreed on the need for coordination of methods of data collection and data analysis, and for an exchange of reliability data. The importance of training and education was emphasized, including international exchanges of students and curricula.

The second session, on the safety and reliability of electric power systems, resulted in a call for international standardization of terminology and indices. Participants noted the need for better methods to evaluate the advantages and disadvantages of interconnecting energy systems and the need for exchanges of data on controllability, survivability and safety. And they called for further research on the question of how best to allocate financial resources to achieve greater reliability.

A third session at the conference underscored the deficits in knowledge of safety and reliability of power generating and distribution equipment. Mechanical stress, aging, corrosion and the evaluation of the residual life of equipment were singled out for investigation. Participants also concluded that more attention should be paid to maintenance, inspection and testing, especially the establishing of optimal test intervals. Other areas not adequately covered are the quality control of equipment and rating of components by comparing load and respective reliability.

The following topics for short-term research (1-3 years) were identified: preliminary risk analysis of new nuclear plant designs;

Academician Yuri N. Rudenko

measures of reliability, availability and safety; computer design and analysis programs; and quality control of equipment.

The fourth section focussed on the safety and reliability of pipeline systems. Several products of research on reliability of pipeline systems were presented, including:

- SOSNA, a software package for the design of heating networks (Siberian Energy Institute, Irkutsk)
- An analysis of the safety and reliability of district heating systems (Heizbetriebe Wien Ges.m.b.H.);
- A program for design and use of long-distance gas pipelines, including provision of backup reservoirs (Institute of Natural Gas, Moscow);
- SIMONE software for simulation of the dynamic behavior of pipeline systems (Institute of Information Theory and Automation, Prague);
- SANNTUS software for the analysis and synthesis of data on the reliability of pipeline systems (Institute of Energy Studies, Moscow).

Participants concluded that more research was needed on the impact on large pipeline systems of legal and economic measures now being introduced in Eastern Europe, including price management, taxes, bonuses, subsidies, and fines. Several participants expressed concern

FEATURE

that introduction of such measures could affect spending and investment on pipeline systems in undetermined ways, perhaps degrading the reliability of the entire USSR-Europe pipeline system.

They also noted that in the linking of national oil and gas distribution systems into continental supersystems—already a fact in Europe and North America—better coordination in the planning and design could save money and increase reliability. For instance, reservoirs could be installed near borders as has been done in the USSR, where there is a 24 billion m^3 reservoir near its western border.

The need for enhanced international cooperation, especially among Eastern and Western Europe and the USSR, was a theme that arose in many contexts. In discussing the reliability of pipeline systems, participants agreed on the need to develop guidelines for national and international safety inspection and for reliability control systems, and on the desirability of further research on the use of international communication and air- and space-borne remote sensing systems to monitor large pipeline systems. They also called for development of a common terminology; unification of research models and methods; and creation of shared data banks on the reliability and safety of equipment.

In discussing electric power systems participants noted the need for study of the potential implications for integrated power systems of the economic restructuring of Eastern and Central Europe.

Participants called for creation of an association of specialists on reliability within international professional organizations. The association would exchange publications, interact with the public, assess large projects and their potential, and organize international educational programs on reliability.

Contributed by
Academician Yuri N. Rudenko

RESEARCH

Technologies to Mitigate Global Warming

The Global Industrial and Social Progress Research Institute of Tokyo and IIASA's Environmentally Compatible Energy Strategies Project initiated a four-month study to evaluate innovative technologies that could mitigate global warming, including technologies for energy conservation, renewable energy, greenhouse-gas sinks, and technology transfer to developing countries. (Contact: *Nebojša Nakićenović*, IIASA)

Emission Reduction Strategies for Europe

With financial support from the Dutch Ministry of Housing, Physical Planning, and Environment (VROM), Leidschendam, IIASA's Regional Air Pollution Project will further extend the Regional Acidification INformation and Simulation (RAINS) model to enable more comprehensive analyses of emission reduction strategies. The time horizon of the energy-emission module will be extended to 2040, and the model will be adapted to allow simultaneous assessment of national CO_2 emissions. The incorporation of energy conservation and fuel substitution as options for emission reductions will be carried out in cooperation with the University of Karlsruhe, Germany, which will adapt the national EFOM-ENV energy models developed for the Commission of the European Communities as input to the RAINS model. This will allow simultaneous optimization of international emission reductions for SO_2 and NO_x. (Contact: *Markus Amann*, IIASA)

Comparison of Models

IIASA's Regional Air Pollution Project has been awarded a contract by the Directorate General for Environment, Nuclear Safety, and Civil Protection of the Commission of the European Communities in Brussels to compare various European acid-rain models. (Contact: *Markus Amann*, IIASA)

Environmental Impact Analysis

Sponsored by the *Jubiläumsfonds* of the Austrian National Bank, IIASA's Advanced Computer Applications Project has begun an 18-month project to integrate monetary assessment methods and elements of cost/benefit analysis into a rule-based expert system for environmental impact analysis. (Contact: *Kurt Fedra*, IIASA)

Trade and Environment

The Austrian Federal Ministry of Science and Research has invited IIASA and the Austrian Association for Agricultural Research to undertake a jointly funded five-month study of linkages between international trade and the environment. A report of the study, to be completed by July, will identify topics for further research and possible changes to GATT. (Contact: *Friedrich Schmidt-Bleek*, IIASA)

Participants in the February conference on eco-restructuring discussing the declaration reprinted on page four. A followup meeting will be held at IIASA, June 13-14.

CONFERENCES

Recent Conferences

Acid Rain Models Comparison, Laxenburg, Austria, 21-22 January.

IIASA's Regional Air Pollution Project hosted this meeting of experts associated with the leading integrated assessment models for acid rain in Europe. The objective was to identify and define common scenarios against which the models will be tested as part of a comparison exercise funded by the Commission of the European Communities. (Contact: *Markus Amann*, IIASA)

Ammonia Emissions in Europe: Emission Factors and Abatement Costs, Laxenburg, Austria, 4-6 February.

At this workshop, organized jointly by IIASA's Regional Air Pollution Project and the Dutch Ministry of Housing, Physical Planning, and Environment, 35 participants from 18 Eastern and Western countries reviewed the new ammonia module of IIASA's RAINS model, and discussed national experiences in estimating ammonia emissions. A special session was devoted to available emission control measures. (Contact: *Markus Amann*, IIASA)

Carbon Cycle and its Perturbation by Humans, Laxenburg, Austria, 7-8 February.

IIASA's Biosphere Dynamics Project organized this meeting to develop objectives and research strategies for the improvement of carbon cycle models. Discussions focused on model coupling strategies; model validation; stable isotopes; CO_2 fertilization; and the steps to be taken in the new EPOCH project. (Contact: *Gerd Esser*, IIASA)

Forthcoming Conferences

The following conferences will be sponsored or co-sponsored by IIASA:

May 2-3, 1991: Emission Inventory for the Pentagonale Countries, Laxenburg, Austria (Contact: *Markus Amann*, IIASA).

May 6-10, 1991: Optimization and Control Theory, Bronislawow, Poland (Contact: *Alexander Kurzhanski*, IIASA).

May 7-9, 1991: East German Economic Transition: Experiences and Outlook, Wolfsburg, Germany (Contact: *Petr Aven*, IIASA).

May 13-16, 1991: Global Environment-Development Policy: Pragmatism and Effective Policymaking, Abisko, Sweden (Contact: *Paul Weaver*, IIASA).

May 13-17, 1991: Electricity and the Environment, Helsinki, Finland (Contact: Joint Secretariat, c/o IAEA, P.O. Box 100, A-1400 Vienna, Austria).

June 18-20, 1991: International Energy Workshop, Laxenburg, Austria (Contact: *Leo Schrattenholzer*, IIASA)

June 24-28, 1991: Social Behavior, Lifestyles, and End-Use, Laxenburg, Austria (Contact: *Nebojša Nakićenović*, IIASA).

July 3, 1991: Processes of International Negotiations Scoping Meeting: Negotiation Training Working Group, Laxenburg, Austria (Contact: *Bertram Spector*, IIASA).

July 22-26, 1991: Geometric Methods in Nonlinear Optimal Control, Sopron, Hungary (Contact: *Alexander Kurzhanski*, IIASA).

August 5-23, 1991: Summer School in Applied General Equilibrium Modeling, Laxenburg, Austria (Contact: *Lars Bergman*, Stockholm School of Economics, P.O. Box 6501, S-113 83 Stockholm, Sweden).

August 27-29, 1991: Applied General Equilibrium Modeling, Laxenburg, Austria (Contact: *Lars Bergman*, Stockholm School of Economics, P.O. Box 6501, S-113 83 Stockholm, Sweden).

September 9-13, 1991: User-Oriented Methodology and Techniques of Decision Analysis and Support, Warsaw, Poland (Contact: *Marek Makowski*, IIASA).

NEWS

Awards

The trustees of the Bank of Delaware have announced that the winner of the 1991 Common Wealth Award in Sociology is Professor Nathan Keyfitz, Leader of IIASA's Population Program.

PUBLICATIONS

IIASA Books

The following books are now available from your regular book supplier or direct from the publisher.

International Negotiation: Analysis, Approaches, Issues. V. Kremenyuk, editor. Jossey-Bass: San Francisco, Oxford. ISBN 1-55542-297-7.

Climate Change and World Agriculture. M.L. Parry. Earthscan Publications Ltd.: London. ISBN 1-85383-065-8.

Future Demographic Trends in Europe and North America: What Can We Assume Today? W. Lutz, editor. Academic Press: London, New York, San Diego, Boston, Sydney, Tokyo. ISBN 0-12460-445-5.

IIASA Reports

The following IIASA reports are available at the prices indicated:

Morphological Analysis, Diffusion and Lock-out of Technologies: Ferrous Casting in France and the FRG. D. Foray and A. Grübler. February 1991. Reprinted from *Research Policy*, Vol. 19, No. 6, December 1990. RR-91-1. US $10.

The Uncertainty of Atmospheric Source-Receptor Relationships in Europe. J. Alcamo and J. Bartnicki. February 1991. Reprinted from *Atmospheric Environment* Vol. 24A, No. 8, pp. 2169-2189, 1990. RR-91-2. US $10.

For further information contact Robert McInnes, IIASA Publications Department.

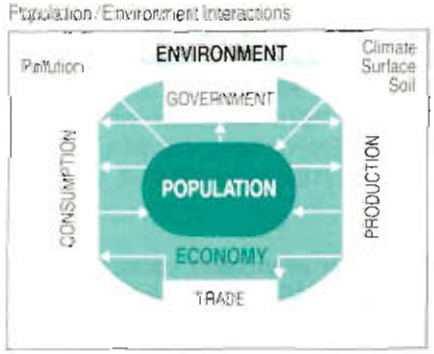
IIASA

International Institute
for Applied Systems Analysis

IIASA's ROLE

The International Institute for Applied Systems Analysis is an international, nongovernmental research institution sponsored by scientific organizations from 15 countries. IIASA's objective is to bring together scientists from various countries and disciplines to conduct research in a setting that is non-political and scientifically rigorous. It aims to provide policy-oriented research results that deal with issues transcending national boundaries. Resident scientists at IIASA coordinate research projects, working in collaboration with worldwide networks of researchers, policymakers, and research organizations.

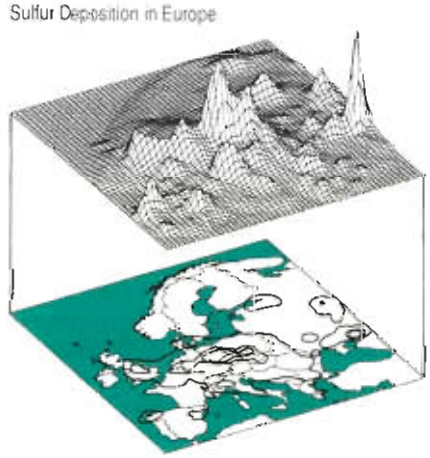
Population/Environment Interactions



RESEARCH

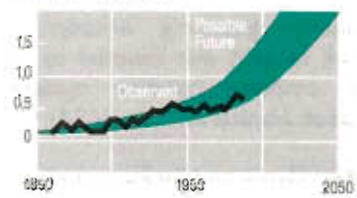
Recent projects include studies on global climate change, computer modelling of global vegetation, heavy metal pollution, acid rain, forest decline, economic transitions from central planning to open markets, the social and economic implications of population change,

Sulfur Deposition in Europe



processes of international negotiations, and the theory and methods of systems analysis. IIASA applies the tools and techniques of systems analysis to these and other issues of global importance.

Global Mean Temperature



MEMBERSHIP

IIASA was founded in 1972 on the initiative of the USA and the USSR, and now also includes eleven European countries, Canada, and Japan. IIASA has member organizations in the following countries: Austria, Bulgaria, Canada, the Czech and Slovak Federal Republic, Finland, France, Germany, Hungary, Italy, Japan, the Netherlands, Poland, Sweden, the Union of Soviet Socialists Republics and the United States of America.

FURTHER INFORMATION

Further information about IIASA and its work is available from: The Office of Communications, International Institute for Applied Systems Analysis, A-2361 Laxenburg, Austria, Telephone (0 22 36) 715 21-0.