



IIASA

options

International Institute for Applied Systems Analysis

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Inside:

Siberian Forests

ECONOMY & ENVIRONMENT

Economic Instruments
for Air Pollution Control

Edited by Ger Klaassen and Finn R. Førsund



International Institute for
Applied Systems Analysis
Kluwer Academic Publishers

IIASA
BOOKS

**Economic Instruments
for Air Pollution Control**

Edited by Ger Klaassen and Finn R. Førsund

In this volume a team of international experts provides the first comprehensive review of economic theory, simulation models, and practical experience in using economic instruments, focusing on air pollution control.

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

National Member Organizations

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BULGARIA

The National Committee for Applied Systems
Analysis and Management

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The Canadian Committee for IIASA
CZECH REPUBLIC

The Czech Committee for IIASA
FINLAND

The Finnish Committee for IIASA
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EDITORIAL



IIASA was conceived and created by representatives of government, so it is somewhat surprising that for the next 22 years these same governments made no effort to sit together and discuss the progress of their creation. In November the Austrian government held such a meeting at IIASA, bringing together high-level representatives of supporting governments to review the state of the institute. The summary statement by Austrian Vice-Chancellor Erhard Busek, chairman of the meeting, is reprinted on the following pages.

We at IIASA were much encouraged by the enthusiastic interest of the governmental representatives. The endorsement of the directions on which the institute embarked some years ago — global change and its human dimensions, sustainable growth, and integrated assessment — will enable us to reinforce our efforts and further develop and improve our work. The overall commitment by government representatives to the institute eliminates uncertainties and instabilities which might have harmed our work.

The meeting also revealed challenges unmet. IIASA must do even better in finding appropriate niches within the international scientific scene. We must redouble our efforts to ensure that world-renowned experts contribute to our programs, and that the work meets the highest scientific standards.

Most importantly, IIASA must further develop its communication network. The meeting clearly revealed an uneven knowledge and understanding of IIASA, its activities, and its potential.

The meeting will spur us on to further strengthen contacts in supporting countries. The members of the IIASA Council and the National Member Organizations they represent can play an exceptionally important role in ensuring that the institute is responsive to the scientific and policy communities in their respective countries. In many countries this is already happening, but more must be done to ensure IIASA's success in *all* member countries.

In addition to the heads and members of the governmental delegations, we were fortunate to have with us selected members of the IIASA Council, including J. Ahearne, G. Golitsyn, K. Komarek, D. Kosáry, and H.-J. Schellhuber, as well as Y. Osipov, President of the Russian Academy of Sciences. Their presence will help us to follow up on the conclusions of this important meeting.

Peter E. de János
Director

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The Future of IIASA

In November representatives of governments supporting IIASA met to discuss the future of the institute. Below is an edited summary of their discussions prepared by the chairman of the meeting, Austrian Vice-Chancellor Erhard Busek.

At the invitation of the Austrian Government, the competent government authorities of all countries that participate in and support IIASA activities met in Vienna and Laxenburg, Austria, on November 17, 1994. The aim of this governmental conference was to discuss securing IIASA's future development.

The representatives of the 17 member countries:

- reaffirmed and promised support for the reorientation of IIASA's work which will concentrate on global change and its human dimensions, on sustainable growth, particularly in a period of economic and political transformation and of transition from centrally-planned to market-oriented economies, and on integrated modeling of Earth system;
 - formulated recommendations and guidelines for IIASA's future development, addressed to the National Member Organizations and to the IIASA Council, the responsible body to translate them into reality.
- In principle, there is also consensus on the following points:

a) IIASA should continue with East–West concerns, yet over time add emphasis to North–South issues, based on a long-term concept of development;

b) The institute is expected to involve scientists of all countries in its work in order to achieve highest scientific quality and creativity, in particular broaden the involvement in IIASA's program for young scholars and enlarge the support of the Young Scientists Summer Program;

c) France and the United Kingdom should be urged to renew their commitments to IIASA; the membership in Europe should be enlarged (e.g. Norway, Switzerland, possibly Slovenia), if such additions can be linked to IIASA's core activities; cooperation with the European Union is considered vital; and, for the purposes of addition of North–South issues, researchers and member organizations from appropriate countries of Asia, Africa, and South America could be invited to join IIASA;

d) IIASA is to remain a nongovernmental scientific institution that can serve, as a European-based center of excellence, for creation of and collaboration in international scientific networks and for advising governments on regional, national, and international levels, preparing a scientific basis for political decisions and for regulatory measures;

e) There is common understanding that regular high-level governmental meetings would not be appropriate

but useful at critical moments of IIASA's future development; the governments will be advised on that question, for instance, a meeting on the progress of IIASA's reorientation should be considered in the near future;

f) There seems no need any longer to continue with the many and multi-purpose reviews of IIASA's work. IIASA's new review procedures will be considered sufficient, with the council providing scientific advice. The IIASA Council is urged to secure mechanisms by which the regular assessments and evaluations are independent of the council and of the management of IIASA.

g) IIASA's Council is asked to examine within the next year:

- revisions of the Charter when advisable for more efficient structures in implementing the reorientation process;
- selection procedures by which the best qualified researchers will direct IIASA and guide the council;
- contribution schemes that take into account the size

and situation of a member country; adequate core support must continue, but special support schemes or additional funding from private sources as well as from governments for research of special interest to specific member countries should be secured.

The representatives, endorsing the reorientation of IIASA, committed their financial support.

Their exchange of opinions was timely and valuable in several ways:

- for discussing the new program directions;
- for a systematic information flow from and to the member governments and the council at this moment of reorientation; and
- for a recognition of the need that National Member Organizations, government authorities, and council members must cooperate effectively and continuously.

The representatives congratulated the council and the director of IIASA as well as the scientists for their work.

Heads of National Delegations

Austria

Dr. Erhard Busek
*Vice-Chancellor
Minister of Science
and Research*

Bulgaria

Dr. Valentin Bossevski
Minister of Environment

Canada

DDr. Jon Gerrard
*Secretary of State for
Science, Research, and
Development*

Czech Republic

Ing. Ivan Pilip
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Ministry of Education
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Slovak Republic

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Sweden

Mr. Carl Tham
Minister of Education and Science

Ukraine

Mr. Vladimir E. Storyzhko
*Chairman
Supreme Council Committee of
Science and Education*

USA

Dr. Robert T. Watson
*Associate Director
White House Office of Science
and Technology Policy*

Siberia's Forest Wealth

Siberia's vast forests are a natural resource of global importance, both economically and ecologically. Properly developed, they could serve as a cornerstone of the Russian economy. They already serve Russia and the world as a source of wood, a symbol of wilderness, and a critical stabilizer of the global climate.

IIASA's Siberian Forest Study is the most extensive international study ever undertaken of this vital resource. Articles on the following pages are intended to give an overview of some aspects of the study, beginning with the project's unique database. Since the study began the focus has been on policy options that would encourage sustainable development. The goals are to assess Siberia's forest resources, forest industries, and infrastructure; to examine the forests' economic, social, and biospheric functions; with these functions in mind, to identify possible pathways for their sustainable development; and to translate these pathways into policy options for Russian and international agencies.

Sprawling over eight time zones, from the Ural Mountains to the Pacific, Siberia is home to one-fifth of the world's forested area and half of all coniferous trees. In those forests are some 40,000 million tons of carbon, about half the amount stored in the Amazon Basin.

Everyone has a stake in the intelligent, sustainable development of this resource. Change in Russia brings unprecedented opportunities and risks. In spite of Siberia's timber and mineral wealth, it suffers from a weak economy and severe social problems. Careless exploitation of Siberian forests could hold back Russia's economic renewal, permanently scar the local environment, and destabilize the global climate. On the other hand, healthy forests and forest industries could help revitalize Russia's economy and society, open a new source of timber for global markets, and improve the ecological well-being of the entire world.

Restructuring Siberia's forest industry will be difficult and costly. The historical legacy is massive industrial developments, obsolete technology, low productivity, and poor quality products. Most of the wood is far from the main world markets. It will take concerted effort to overcome these difficulties. The world has seen too many forests used as a short-term cash crop, without regard for the long-term economic, environmental, and social consequences. The challenge is to avoid the same in Siberia.

FEATURE

The Database

The database of IIASA's Siberian Forest Study is the most comprehensive ever assembled, inside or outside Russia, on Siberia's environment, forest resources, and related factors. Rich data sets have long been held at separate institutions in Russia: this project is the first attempt to bring them together and link them in a modern geographic information system. The result is a unique and highly flexible information source for Russian policy makers, officials of international agencies, industrial analysts, and natural and social scientists.

There is no limit to the scientific questions that could be asked about Siberia's forests. But there are very real limits to data.

When this study began it was difficult to know what information would be available, and hence, what questions might be usefully addressed. The first task, then, was to assemble the best possible data on the widest possible front.

This would have been impossible in the days before *glasnost* and without IIASA's excellent relations with the Russian scientific community. Even so, it took nearly four years to identify institutions and individuals in Russia with sound data, to formalize the collaboration, and to assemble the data. In 1992 and 1993 the first of some 20 contracts for delivery of data and scientific collaboration were signed directly with institutions across Russia. The resulting network is one of the project's greatest strengths (see page 13).

In 1992 members of the core team prepared the first version of a 100-page manual, in Russian and English, to guide data assembly. Some of the data, especially forest inventory and socio-economic data, were already available. But most of the desired ecological and industrial data had never been collected in a useable form. In these areas especially, a detailed manual was essential.

The first data set was delivered to IIASA in November 1993. By

October 1994 more than 900,000 lines of data and some 23 million separate numbers had been delivered. Considerable effort was put into cross-checking and validation. About a third of all data were returned for revision.

This vast amount of data is divided into five themes. The themes are listed below with some, but not all, of their contents.

Forests

Currently based on the forest inventory of 1988; some 200 types of traditional forestry data in 14 areas (land category and functional use, forest

class, species and age distribution, growing stock and annual increment, reforestation and silviculture, fires, drainage, transportation systems, allowable cuts, etc.) for all forests under state management; digital maps of the boundaries of all forest enterprises.

Forest Industries and Infrastructure

Industrial wood data for 2500 forest enterprises (involved in harvesting, silviculture, and some milling); a database on 850 forest industry enterprises (larger mills, pulp and paper plants, etc.), with 36 parameters on each enterprise; for 130 of these enterprises, detailed data in an additional 24 categories, including costs and productivity.

Ecology and Global Change

An environmental overview of Siberia with 382 data parameters grouped under five headings (atmospheric, soils, hydrological, biospheric, and human factors) for 65 digitally mapped ecoregions; designed principally by Russian members of the network, it is one of the first large information bases of its kind.

Socio-Economics

By late 1994 included data in some 750 parameters (to be expanded to 1500) for 86 administrative regions; categories include demography, labor and wages, industry and agriculture,

Some Technical Notes

CASE technology and entity-relationship modeling was used to create a central data dictionary. The geographic information system, a key element of the database, will be based on Arc/Info. Another industry standard software, Oracle, is used for relational database management.

At present the database is accessible from PC or UNIX platforms using different analysis and browsing software packages. The main tool for accessing the Siberia GIS-database will be Arc/View 2.0.

transport and communication, finances, supply of materials and spare parts, and environmental protection.

Markets

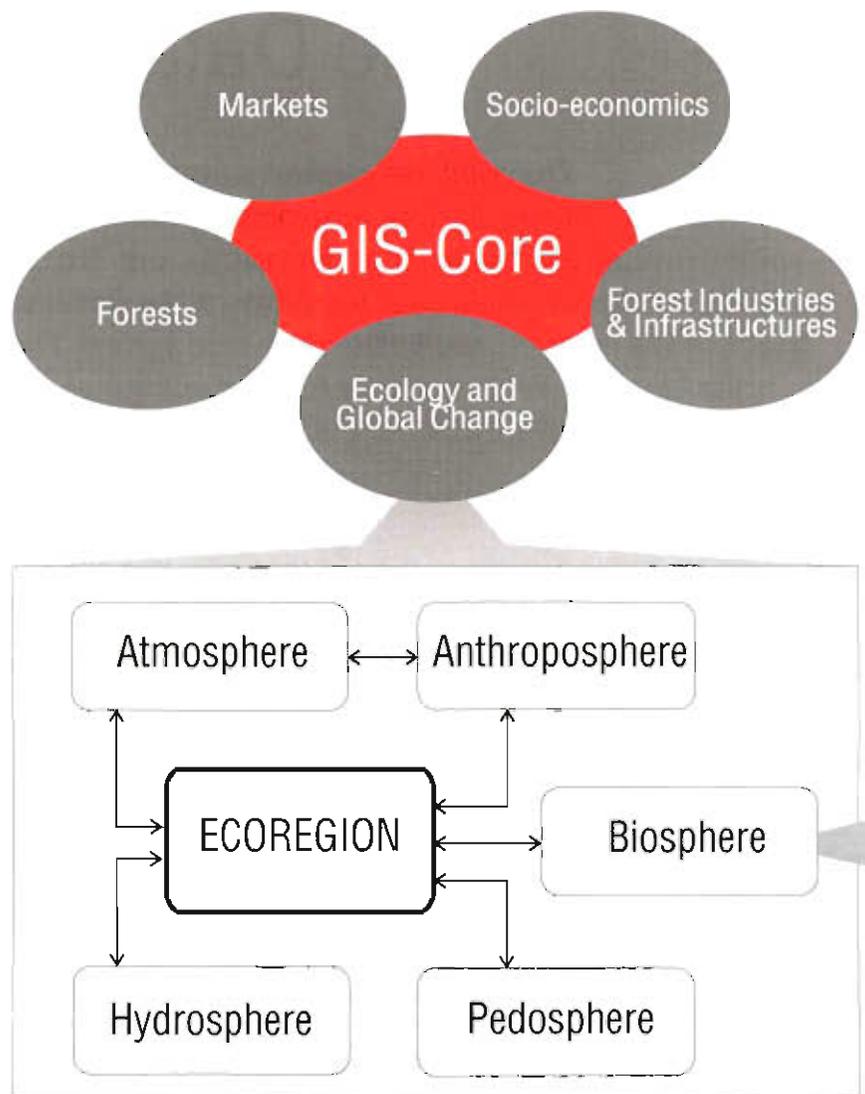
Not so much a traditional database as a bank of information on market potentials in and outside Russia; detailed information on market potential in regions and countries bordering Russia, including Europe, China, new republics in Central Asia, and Japan and the eastern Pacific Rim.

By late 1994 work was completed on the data structure regarding forestry, industry and infrastructure, and ecology and global change. Structuring of socio-economic and market data will finish in 1995.

Data sets will be updated as necessary. More sets may be added, further extending the usefulness of the database. At present it is useful for the study of many ecological, biophysical, and other scientific topics, as well for the study of policies regarding forest management, development of industry and infrastructure, and other topics. It is comprehensive enough for analysis of national policies, yet detailed enough for analysis of local projects: for example, development of infrastructure in a medium-sized watershed, or the siting of a new mill or factory.

First-order analyses of the data began late in 1994 and will continue to mid-1996 (see page 14). Researchers and institutes worldwide will be involved, but the bulk of the work will be done either at IIASA or in Russia. IIASA will coordinate all core studies.

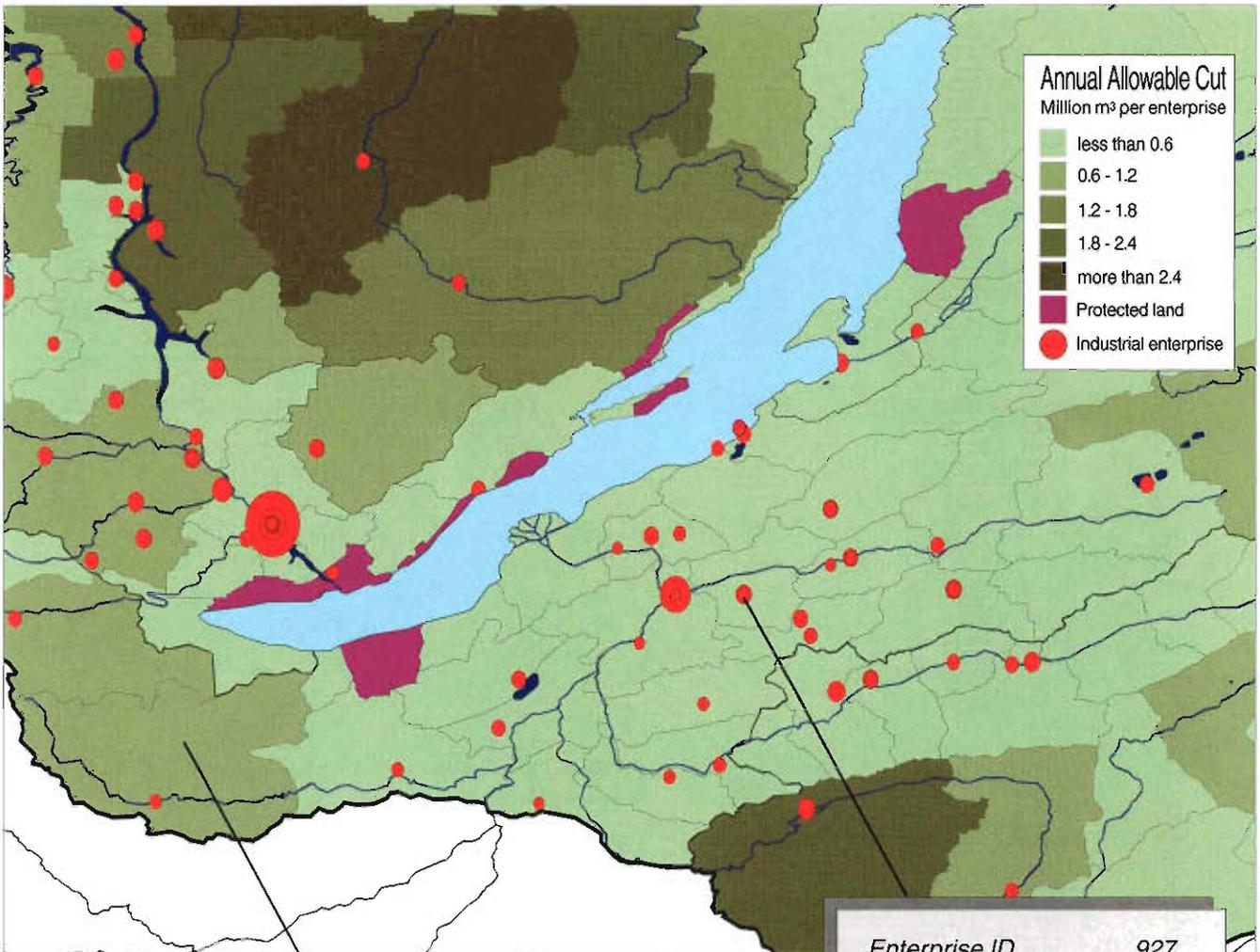
In 1996 work will begin on the second level of analysis, namely the integration of studies. Particular efforts will be made to identify policy options that are complementary or contradictory. This is in keeping with the overall goal of the study: to identify policies that will encourage the sustainable development of Siberia's forests. ■



Structuring the Data The Biological Component

A schematic depiction of one part of the database. On the page opposite is the schema of biological information. The database also has data on atmospheric conditions, hydrology, and soils (pedosphere), as well as human impact factors (anthroposphere) for each of 65 digitally mapped ecoregions. The figure at the top of this page shows the overall organization of information in five themes.

Complex ecoregional databases of this type are not common, but are likely to become more so in studies of sustainable development. This element of the database was designed by the IIASA core team in cooperation with the Russian network. The data were collected by the network.



Forest Enterprise		Commercial Wood			
ID number	Name	Total	Conifers total	Pine	Spruce
11810225	Tunkinsky	627	522	56	115
11810210	Zakamensky	893	799	11	81
11252229	Slyudyansky	48	41	15	13
11810238	Babushkinsky	107	66	8	56

Enterprise ID	927
Harvest cap.	330
Harvest prod.	273
Industrial wood prod.	197
Lumber cap.	62
Lumber prod.	61
Veneer cap.	0
Veneer prod.	0
Partial board cap.	0
Partial board prod.	0
Fiberboard cap.	0
Fiberboard prod.	0
Paper cap.	0
Paper prod.	0
Board cap.	0
Board prod.	0
Pulp cap.	0
Furniture cap.	0
Furniture prod.	0

(Figures in both boxes in 1000 cubic meters)

Geographic Information Forests and Industries near Lake Baikal

A sample application of the study's geographic information system. The green shading indicates annual allowable cut of timber in each forest enterprise. Purple areas are protected land and parks. The box above shows part of the annual allowable cut data for one enterprise. Circles mark the sites of mills and other forest industry enterprises; size indicates production capacity. The box at right shows data on one mill. The GIS can display all information in the database, including data on 2500 forest enterprises and 850 forest industry enterprises.

FEATURE

From Log Exports to Carbon Sinks

A sample of the early output of the Siberian Forest Study

Before completing the Siberia database, researchers at the institute carried out a number of preliminary studies using other data sources.

Below are brief summaries of four of those studies.

Current Status of the Siberian Forests

Official data from the Russian forest inventory of 1988 indicate the following.

The total area of Siberia (West and East Siberia and the Far East) is 1277 million hectares (by comparison the continental United States is 877 million hectares). Russia officially classifies almost three-fifths of Siberia, 710 million hectares, as Forest Land. The actual forested area is closer to 605 million hectares, almost all of which is under state management. Nearly 85 percent of this area is allocated for industrial exploitation. About 87 percent of the growing stock is coniferous species.

The following trends and characteristics can be identified.

General dynamics. The resource is deteriorating. Despite additions to the officially designated forested area between 1966 and 1988, the growing stock declined by at least 6 billion m³, or 10 percent, during that period.

Forest health. Large areas are damaged by insects and diseases, anthropogenic pollution, and unsustainable harvest practices.

Fire losses. From 1.5 to 2.0 million hectares are lost each year due to poor fire control.

Species changes. Commercially desirable coniferous species make

up nearly 90 percent of forests. Following harvesting and fires, the species distribution typically changes to 50–50 coniferous–deciduous.

Utilization. “High-grading” or “creaming” of stands – harvesting only the best timber – is widespread.

Silviculture. Silvicultural measures are inadequate, resulting in degenerating forests and slow renewal.

Forest Policies. Agencies responsible for management of forests have little control, resulting in local over-exploitation of forests.

Forest Research. There is little or no application of research findings in operational forestry.

For further information:

Nilsson S., Shvidenko A., Bondarev A., and Danilin I. **Siberian Forestry.** IIASA Working Paper 94-08.

Shvidenko A. and Nilsson S. **What Do We Know About the Siberian Forests?** *Ambio*, Volume 23, Number 7, November 1994.

Siberian Forests and the Carbon Balance

Preliminary estimates are that the forests of the former Soviet Union constitute a net sink of some 450 million

tons of atmospheric carbon annually. About 85 percent of that sink is in Siberia. The possibilities for improving carbon sequestration were analyzed in a scenario which assumed:

- improved protection of forests from fire, insects, and disease;
- large-scale reforestation of clear cuts and burned areas;
- replacement of low productivity and overmature stands;
- improved intermediate treatment of forest stands;
- introduction of agroforestry.

The results suggest that implementation of these measures could, in the long term (100 years), double net carbon sequestration to some 900 million tons annually. But there are many uncertainties about implementation under current conditions in Russia.

For further information:

Shvidenko A., Nilsson S., and Roshkov V. **Possibilities for Increasing Carbon Sequestration by Implementation of Rational Forest Management in Russia.** Forthcoming in *Water, Air and Soil Pollution*.

Shvidenko A., Nilsson S., and Roshkov V. **Status and Possibilities for Increased Influences of the Terrestrial Biota on the Carbon Budget in the Territories of the Former USSR.** Forthcoming chapter in a book to be published by the Air & Waste Management Association.

Russian Logs and the East Pacific Market

Much has been written recently in the popular press about a surge in logging in the far east of Siberia and exports of logs to East Asia, especially Japan and South Korea. In fact, net exports have declined.

Exports of Russian logs to South Korea have indeed gone from nearly nothing in 1990 to 0.8 million m³ in 1994. But exports to Japan began decreasing steadily in the early 1970s, from 7–8 million m³ per year to 4.4 million m³ in 1992, before recovering partially to 5 million m³ in 1993.

Detailed analyses show that the market potential in the Eastern Pacific is substantial. Annual export potential in the year 2000 is estimated to be 4–7 million m³ for Japan and 1–4 million m³ for South Korea. But to achieve the higher volumes the following measures must be taken in Russia:

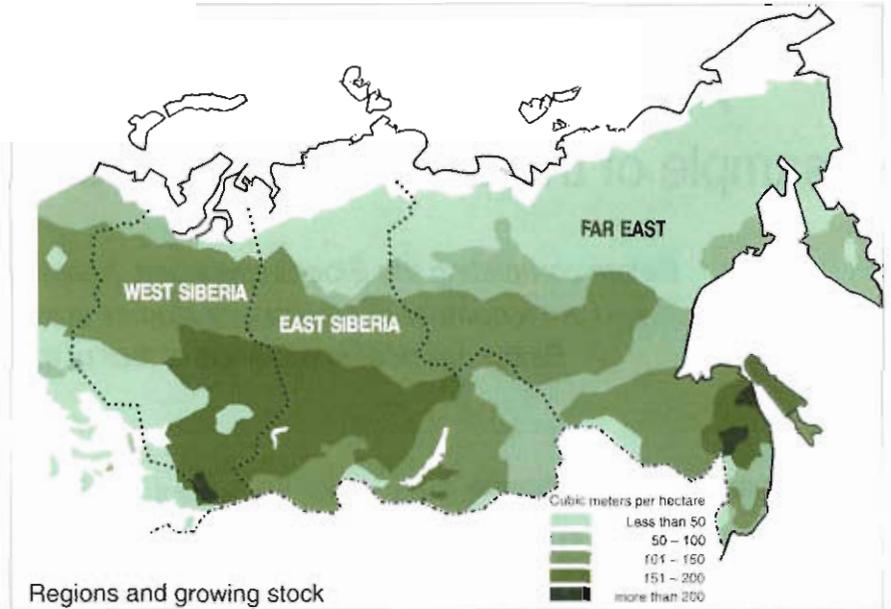
- improved grading and sorting by grades and species;
- stabilization of supply by improved transportation and communication;
- stabilization of export prices;
- improved market service (cooperation with traders and establishment of a marketing office in the Pacific Rim).

For further information:

Zausaev V. **Analysis of International Links and the Main Factors Affecting its Growth in the Forest Industry of the Far East.** Contract report to IIASA (in Russian), 1994.

Tak K-I. **South Korea: Potential Market for Russian Wood.** IIASA Working Paper 94-93.

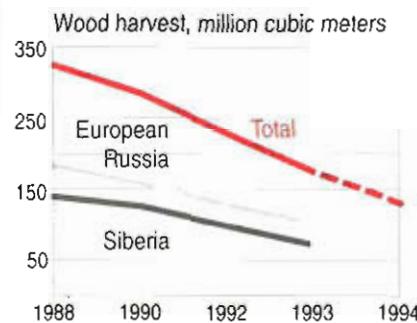
Kakizawa H. **Japan: Potential Market for Russian Wood.** IIASA Working Paper 94-94.



Accessibility of Russian Forest Resources

Using official 1988 data, total supply was divided into two components, based on accessibility. Short-term supply was defined as the potential annual harvest if all existing infrastructure were effectively exploited. Medium-term supply would require investment in new infrastructure.

The figures in the table are theoretical maximums: they do not take into account the economic realities. Nevertheless, they indicate the great



Maximum possible allowable cut, million cubic meters

	European Russia		Siberia		Total
	Coniferous	Deciduous	Coniferous	Deciduous	
Short-term	92	89	104	55	340
Medium-term	11	10	119	60	200
Total supply	103	99	223	115	540

For further information:

Backman C.A. **The Russian Forest Resource: Physical Accessibility by Economic Regions.** Ministry of Industry, Ottawa, Canada, 1994.

Sheingauz A.S. **Forest and Forestry Legislation in Russia, Its Implications for the Far East, and the Organization of Forest Utilization Regulation.** Contract report to IIASA, 1994.

potential for increased harvests in Siberia, especially of coniferous species.

The figures in the table can be compared with the graph showing actual harvests since 1988.

The dramatic decline in output is due less to a fall in demand than to the breakdown of the Russian economy. Wood harvesters and processors have problems getting fuel and spare parts, shipping their products within Russia, and getting paid for them.

The Network

The core team at IIASA relies heavily on researchers and officials in some 50 governmental and scientific institutions in 10 countries. Most of the network is in Russia. About 100 Russian scientists, including biologists, ecologists, foresters, soils scientists, computer scientists, and economists are actively involved. In 1993 and early 1994 they made more than 50 trips to IIASA, while members of the IIASA core team, including project leader Sten Nilsson, made as many trips to Russia. Below are some of the key institutions in the network.

Russian Network

Alexander Isaev (scientific co-leader)

Federal Forest Service, Moscow
 Ministry of Environment and Natural Resources, Moscow
 Ministry of Science and Technical Policy, Moscow
 Center for Ecology and Forest Productivity, Moscow
 Archangelsk Institute for Forestry and Forest Chemistry, Archangelsk
 Far East Forestry Research Institute, Khabarovsk
 Economic Research Institute, Khabarovsk
 Kamchatka Institute for Ecology, Petropavlovsk-Kamtchatsky
 Center of Forest Cover Dynamics, Novosibirsk
 Dokuchajev Soil Institute, Moscow
 V.N. Sukachev Institute of Forestry, Krasnoyarsk
 All Russian Information Research Center for Forest Resources, Moscow
 International Forestry Institute, Moscow
 Institute of Economics and Industrial Engineering, Novosibirsk

Non-Russian Network

Some of the 40 Western institutions in the network.

US State Department, Washington
 USDA Forest Service, Washington
 Canadian Forestry Service, Ottawa
 Canadian Ministry of Industry, Ottawa
 Commission of the European Communities, Brussels
 The World Bank, Washington
 Intergovernmental Panel on Climate Change, Geneva
 NATO Scientific Division, Brussels
 European Forest Institute, Joensuu, Finland
 Institute for Remote Sensing Applications, Ispra, Italy
 Swedish University of Agricultural Sciences, Uppsala
 Institute for Advanced Studies, Vienna
 CINTRAFOR, University of Washington, Seattle, USA
 Lakehead University, Thunder Bay, Canada
 Hokkaido University, Japan
 Korea University, Seoul

Siberian Study Landmarks

1989

First exploratory studies by Sten Nilsson, leader of IIASA's Forest Resources Project, following completion of a four-year study of forest resources and industries in Europe, including European parts of the Soviet Union (as far east as the Ural Mountains).

March 1992

The formal launch of the study: IIASA, the Russian Academy of Sciences, and the Russian Ministry of Environment and Natural Resources sign an agreement for a study of *Forest Resources, Environment, and Socio-Economic Development of Siberia*.

November 1992

Anatoli Shvidenko becomes the first Russian to join the core team at IIASA.

November 1992

A collaborative agreement is signed with the Institute of Economics and Industrial Engineering, Novosibirsk. During the next year similar agreements for delivery of data are signed with 20 institutions across Russia.

November 1993

The first large data set, regarding forest industries, is delivered to IIASA. Work begins on verification and appraisal of data and on a linking framework based on a core geographic information system.

December 1993

First meeting of the international advisory committee. The 12 members include senior officials in the Russian and US governments and the World Bank, eminent scientists, and a representative of industry.

June 1994

IIASA, the Russian Academy of Sciences, and the Russian Federal Forest Service, in agreement with the Russian Ministry of the Environment and Natural Resources, sign a supplement to the 1992 agreement clarifying goals and responsibilities for further work.

August 1994

Second meeting of the international study advisory committee, formulating priorities for analysis in 1995–96.

October 1994

Basic data assembly is completed. Some 23 million numbers are organized in more than 2000 categories covering general ecology and environment, forest resources, forest industry and infrastructure, and socio-economics. Work begins on analysis.

Late 1996

Begin integrating separate analyses and refining policy alternatives for sustainable development.

FEATURE

Nine Topics for Further Research

IIASA's unique database on Siberian forests gives manifold possibilities for analysis. The following nine topics have been selected as potential research topics in 1995–1996 because of their relevance to environmental, economic, and industrial policies in Russia and abroad. Further analyses will be carried out as financial resources become available.

Siberian Study Databases

Development of the database will continue throughout the lifetime of the study. The database is essentially a passive source of information, not a tool for active analysis. Various analytical models and tools must be linked to it, which may require some adjustments of the database. In addition, updated data sets and new information will be implemented in the geographic information system over time.

TASK

- *Maintain and update the database and GIS so that they continue to provide the best possible support for scientific study and analysis of policy regarding Siberian forests.*

Greenhouse Gas Balances

Forests play many important roles in stabilizing climate, in the short term and the long term, locally and globally. Forest biomass is a critical part of the global carbon cycle. Worldwide it contains about two-thirds of the amount of carbon currently contained in the atmosphere. Without more knowledge of the greenhouse gas balance of Siberian forests, there is no way to assess their influence on

global climate. There is also limited knowledge on the interaction between boreal forest ecosystems and other greenhouse gases, such as NH_4 and N_2O .

TASK

- *Estimate the current and possible future fixation of greenhouse gases (carbon and methane) in Siberian and other Russian forest ecosystems, taking into account existing and possible future land use and management programs.*

Forest Resources and Forest Utilization

The forest resources of Siberia are huge and tremendously varied. Infrastructure is limited: for practical purposes, many forests are inaccessible. Any assessment of the utilization of forest resources involves much more than a study of harvesting wood. Other factors include patterns of land use, greenhouse gas balances, biodiversity, forest protection, the dynamics of forest growth, and infrastructure.

TASKS

- *Determine the real increment of Siberian forests.*
- *Estimate the sustainable supply of industrial wood from Siberian forests.*

Biodiversity, Landscapes, and Bioproductivity

Part of the uncertainty in forest policy development relates to our limited understanding of how forest ecosystems function and how people and forests relate to each. Important components of this uncertainty are bioproductivity, biodiversity, and the function of landscapes. Each is an important element of sustainable development. In the case of biodiversity, the overall objective should be to ensure that the natural biological diversity of forest ecosystems is not significantly changed and, where necessary and practical, is restored. There are good possibilities in Siberia for studying the whole complex of boreal forest biodiversity.

TASKS

- *Analyze the current biodiversity of Siberian forest ecosystems.*
- *Identify management regimes for Siberian ecosystems and landscapes that will promote sustainable bioproductivity and biodiversity.*

Non-Wood Products and Functions

Forests produce more than wood. Non-wood products and functions, both intangible (water and soil protection, cultural identity) and tangible (berries and mushrooms, furs, and wild

game), are essential parts of Siberian society. We have only limited knowledge on the non-wood benefits that are produced and could be produced by Siberian forest ecosystems.

TASKS

- Estimate the real production of non-wood benefits and identify which functions influence their production.
- Determine which regimes for management of Siberian ecosystems would increase production of non-wood products and by how much.

Environmental Status

An extensive literature confirms that environmental problems are severe in Siberia and in Russia generally. It is also clear that the environmental problems are not evenly distributed. We have limited knowledge about their distribution. An overview of the location, nature, and intensity of environmental problems is essential to sound policy analysis.

TASKS

- Analyze the current regional environmental status of Siberia.
- Determine how the current environment influences forest ecosystems in various regions of Siberia and how negative impacts can be avoided in the future.

Forest Industry and Markets

The transition from a centrally planned economy to a market economy has been very painful for the forest sector in Russia. As illustrated earlier, the industrial harvest of wood (excluding wood from forest thinning, dam- and road-building, etc.) has

decreased from 324 million m³ in 1988 to 174 million m³ in 1993.

TASKS

- Assess the international competitive position of the Siberian forest sector and identify international market prospects.
- Estimate future domestic consumption in Russia.
- Clarify the current structure of the forest industry and possible future development paths.

Transportation Infrastructure

Weak infrastructure is a bottleneck for further development of Siberia. A major concern for the forest sector is a poor transportation system.

TASK

- Analyze the current infrastructure from the forest sector point of view and determine how it can be improved.

Socio-Economics

Without a knowledge of regional socio-economic problems it is not possible to develop policies for the forest sector that will support truly sustainable development. An understanding of regional characteristics is doubly important in the current period of transition and uncertainty, now that central planning and federal concepts of integrated development have been swept away.

TASKS

- Assess the current regional socio-economic structure in Siberia.
- Identify the most important socio-economic problems with respect to the forest sector.
- Identify possible paths to sustainable socio-economic development in Siberia.

The Siberian Study International Advisory Committee

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FEATURE

Economic Transition and Integration

In the spring of 1992 IIASA and the Russian government signed an agreement to hold a series of seminars on Russia's transition to a market economy. Project leader Merton J. Peck reports on the outcome.

The 1992 agreement called for a series of eight seminars to address specifically Russian issues, but it was clear that the issues of transition from central planning to a market economy are general. This wider scope was recognized in two ways. First, the project joined in organizing additional seminars focused on comparisons among economies in transition (see list opposite). Second, each of the Russian-oriented seminars included a session on the experiences of other formerly centrally planned economies with comparable issues. Russian officials found such sessions particularly valuable.

Organization

All seminars followed certain principles which on reflection served us well. Some of these precepts were:

- *Limit the participants to professional economists.* Economists share a common vocabulary and methods of discourse, regardless of nationality and politics. They are also policy-makers: participants included Russian deputy prime ministers and ministers, division chiefs of international organizations, and former senior officials from G-7 countries.
- *Aim for quality rather than quantity in invitations.* Seminars were usually limited to 30 participants. In each case some of the participants had been at previous seminars, thus ensuring continuity and recognizing that economic problems are linked. Each seminar included Russian officials and ex-

perts, economists from other formerly centrally planned economies and from market economies, and representatives from international organizations.

- *Have papers that focus the discussion.* For each seminar papers were written by participants and distributed in advance. Other participants were assigned to comment on the papers and initiate discussion. IIASA staff later summarized the seminars in working papers. In two instances the papers were published in edited books.

The Substance: Transformation

The seminars addressed two aspects of the transformation: employment and privatization. The pattern of employment was the most striking, distinctive, and unexpected aspect of the Russian transition. From 1991 to

1993 industrial production fell by 30 percent, but industrial employment in official statistics fell by only 3 to 5 percent.

The last two seminars focused on this apparent anomaly. The explanations were several: shortened working time, unpaid leaves of absence, wage reductions rather than layoffs, and state subsidies to allow enterprises to keep workers. The Russian approach to employment has in it both good and bad: good in that it avoids mass layoffs and reduces social tensions, already high from the uncertainties of transition; bad in that it means low productivity, a delay in the restructuring to make output match demand, and problems in holding down inflation because of the payment of subsidies and easy credit.

Privatization, the subject of three seminars, is the most dramatic of the Russian institutional changes.

The seminars focused less on particular changes in ownership and more on how privatization, especially of large firms, could create enterprises that would be effective

The Next Step

In 1995–1996 the project on Economic Transition and Integration will concentrate on the following activities.

Impediments to Growth in Smaller Transition Economies: The International Dimension

Empirical research is being carried out by a small group at IIASA and by a network of collaborators in eight countries in Central Europe (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Romania, Slovakia, and Slovenia) using a common framework developed at IIASA. Work will focus on five areas: impediments to exports; impediments to foreign direct investment; impediments to access to international capital; import competition; and the possible role of regional trading or financial arrangements.

Restructuring Russian Applied R&D

Russia's immense pool of scientific and engineering talent is potentially its greatest economic asset. In 1990 IIASA began a series of seminars and publications, first on Soviet, then Russian policies for basic research (Options June '93). This work will shift in 1995–1996 to a review of the current state of Russia's applied R&D sector and analysis of the possible restructuring of policies, institutions, and the sector as a whole. Plans are to hold two conferences and to prepare one book.

For further information contact János Gács at IIASA.

market participants. Such a focus raised issues of how the newly privatized enterprises will relate to the changing financial system and how corporate governance will evolve in Russia.

In both these issues the lack of macroeconomic stability was clearly critical. Monthly inflation rates of 10 to 30 percent reflect large government deficits and easy credit conditions. Economists have always made a sharp distinction between macro- and microeconomic issues. This is convenient for research and teaching, but the seminars demonstrated that for transition economies the division is even more arbitrary than for established market economies. No such division between macro and micro was imposed in the seminars.

The Substance: Integration

The Soviet Union was not integrated into the world economy. Russia intends to be, but that objective has created problems. These problems are compounded by the division of the integrated economy of the USSR into independent republics. Economic relations between the republics are now international ones, creating issues of exchange rates, payment systems, and trade barriers.

Two seminars, one on trade within the former USSR and one on trade with the rest of the world, grappled with this problem. One general proposition emerged. Participation in an international economy has a major impact on domestic institutions and policies. Belonging to the international economy restricts the freedom of domestic economic policy perhaps a disappointment to the newly independent governments.

Evaluation

The IIASA seminars did not provide a set of prescriptions, and thus did not compete with the many international organizations and private groups that recommended



Anatoly Chubais, Deputy Premier of the Russian Federation, discussing privatization at a seminar at IIASA in July, 1993.

specific policies during the last two years. Rather, the seminars were intended to make participants aware of a diversity of views and to make them better informed. Any contribution by the seminars to future Russian policy must come from their alumni.

I do think the seminars were valuable to the participants. The seminars achieved a reputation for quality. Requests to attend were numerous. Participants almost universally praised them more than politeness requires. Publications have been widely circulated among Russian officials and among scholars concerned with the economics of transition.

Our major asset was IIASA's reputation for quality, for concern with East–West relations, for sympathetic understanding of the history of both market and centrally planned economies. These seminars could only have been organized at IIASA.

IIASA Seminars on the Transition to the Market System

Meetings marked * were sponsored by the Ford Foundation and The Pew Charitable Trusts

Comparative Transition

Small-scale Privatization: Experiences from Eastern Europe 26–28 June 1992

International Trade and Restructuring in Eastern Europe 19–21 November 1992

Cosponsored by the Austrian National Bank

Macroeconomic Stabilization of Economies in Transition 22–24 April 1993, in Prague

* **Western Assistance to Central and East European Economies in Transition to Market Systems** 4–5 November 1993

Output Decline in Eastern Europe: Prospects for Recovery 18–20 November 1993

Cosponsored by the European Commission, Ludwig Boltzmann Institute of the University of Vienna, and Austrian Chamber of Commerce

Economic Transformation in Russia

Economic Policy: Key Issues 13–15 July 1992, in Moscow

* **Enterprise Behavior under Conditions of Economic Reform** 6–8 July 1993

* **Privatization of Large State Enterprises** 9–10 July 1993

* **Restructuring and Recovery of Output** 9–11 June 1994

* **Employment and Unemployment from a Microeconomic Perspective** 23–25 June 1994

Integration of Russia in the Global Economy

* **Economic Relations Among the Successor Republics of the USSR** 11–13 March 1993

* **International Trade Issues** 5–7 May 1994

INSIDE IIASA

RESEARCH GRANTS

Radioactive Contamination Study

The US Department of Energy, through the Lawrence Berkeley Laboratories in Berkeley, California, has awarded funds to support a two-year interdisciplinary case study of radioactive contamination of the Mayak nuclear complex in the southern Ural Mountains of Russia. Contact: *Boris Segerstahl*

Environmental Information System

On behalf of the Netherlands National Institute for Public Health and Environmental Protection (RIVM), IIASA will upgrade the XENVIS environmental information system by introducing an interface to work with any of several dynamic atmospheric transport and dispersion models, and by reprogramming XENVIS, which currently focuses on chemical process plants, to allow it to handle generic sources of risk. Contact: *Kurt Fedra*

Transportation Systems

Two grants have been awarded for the study of transport systems. On behalf of the Commission of the European Communities and the Institute for Prospective Technological Studies in Ispra, Italy, IIASA will review literature to identify, classify, and compare approaches to modeling feedback between human settlements and transportation systems. And as part of an effort by The Rockefeller University, New York, to explore the evolution of patterns of travel in the USA and its implications for the environment, IIASA will assess likely changes in modes of travel and penetration of new technologies. Contact: *Cesare Marchetti*

Presentations and discussions centered on three themes: methodologies to handle the many high uncertainties associated with water resource management, including global climate change; the range of computer tools that can be used to help, from interactive negotiation systems to tools for data management and water quality prediction; and methodology to reconcile multiple objectives. A further workshop on these themes will be held in September 1996. Contact: *Marek Makowski* or *László Somlyódy*

Energy Modeling Forum, 12 December, Laxenburg, Austria.

This meeting brought together 80 leading energy modelers, economists, and officials of various national and international organizations, especially working groups II and III of the IPCC, with an interest in the integrated assessment of climate change. It was the first full EMF meeting to take place at IIASA and the second full session in an international effort to compare approaches and tools used in the modeling and integrated assessment of global climate change. Representatives of major modeling groups gave brief overviews of their efforts and presented results from the first round of model comparisons. There was considerable discussion of, and agreement on, standardization of input and policy assumptions for the next round of comparisons. Areas of discussion included problems of uncertainty and discounting as well as an examination of submodels and other key components of integrated climate assessment models. The next full EMF meeting will be in May

at Stanford University, in California, where the EMF is based. Contact: *Nebojša Nakićenović*

Forthcoming Meetings

Sponsored or cosponsored by IIASA

February 25: Panel Discussion on International Environmental Regimes Database. Chicago. Contact: *H. Breitmeier*

March 25–27: Economic Growth. Ottawa. Contact: *Y. Kaniowski, G. Dosi*

May 6–8: Restructuring of Applied R&D in Russia. IIASA. Contact: *J. Peck*

May 11–16: Ecology and Evolution of Mutualism. IIASA. Contact: *K. Sigmund*

June 12–17: Nonsmooth and Discontinuous Optimization and Applications. IIASA. Contact: *A. Ruszczyński*

June 20–22: International Energy Workshop. IIASA. Contact: *L. Schrattenholzer*

July 23–25: Risk and Reflexivity. IIASA. Contact: *J. Linnerooth-Bayer*

September 4–8: Advances in Methodology and Software in Decision Support Systems. IIASA. Contact: *M. Makowski*

In Memoriam

Professor Norbert Weyss

Researcher in IIASA's Energy Project,
1974-1975 and 1976-1977.



CONFERENCES

Decision Analysis for Water Resource Management, 25–26 August, Laxenburg, Austria.

This workshop was sponsored jointly by IIASA projects on Water Resources and Methodology of Decision Analysis to consider trends in the modeling, analysis, and management of water resources.

Each year IIASA awards Peccei Scholarships for outstanding participation in the institute's annual Young Scientists Summer Program. Scholarships for 1994 have been awarded to (left to right): **Mari Pöyhönen**, from the Helsinki University of Technology, Finland, for her work in the methodology of decision analysis, **Kal Raustiala**, now at the Brookings Institution, Washington, D.C., USA, for his work on international environmental commitments, and **Alexander M. Tarasyev**, of the Institute of Mathematics and Mechanics, Ekaterinburg, Russia, for his work on dynamic systems. Peccei Scholarships entitle the recipients to return to IIASA for three months of research.



Claude Lemaréchal and Roger J.-B. Wets receiving the **George B. Dantzig Prize** for excellence in the field of mathematical programming (optimization) at the 15th International Symposium of Mathematical Programming, held in Ann Arbor, Michigan, USA, in August. Lemaréchal, Wets, and Dantzig are all alumni of IIASA.

Photo courtesy Optima, newsletter of The Mathematical Programming Society

APPOINTMENTS

Full- and part-time

Guiseppe Calori (Italy), from the Department of Electronics at the Milan Polytechnic and a participant in IIASA's 1994 Young Scientists Summer Program, has joined the Transboundary Air Pollution project.

Árpád Csurgay (Hungary), former IIASA Council Member of the Hungarian Committee for Applied Systems Analysis, has been appointed consultant to the Director.

Laurent Gilotte (France), from the International Center on Research in the Environment and Development, Paris, has joined the Environmentally Compatible Energy Strategies project.

Jill Jäger (UK), from the Wuppertal Institute for Climate, Environment and Energy in Wuppertal, Germany, has been appointed Deputy Director for Programs.

Ari Jolma (Finland), from the University of Technology, Espoo, and a participant in the 1994 Young Scientists Summer Program, has joined the Water Resources project.

Landis MacKellar (USA), from the International Labour Organization, Geneva, has joined the Population Project.

Sylvia Prieler (Austria), from the University of Agriculture, Vienna, and a participant in the 1994 Young Scientists



Jill Jäger has been named **IIASA Deputy Director for Programs**, responsible for implementation and coordination of research. A native of England, she was awarded a Ph.D. in geography by the University of Colorado in 1974. From 1976 to 1978 she was the leader of climate studies in IIASA's Energy Program. Subsequently she worked as a consultant on energy, environment, and climate. She is editor of the proceedings of the Second World Climate Conference.

Summer Program, has joined the Long-Term Environmental Policy Planning project.

Hans-Jürgen Sebastian (Germany), from the Aachen Institute of Technology, has joined the Methodology of Decision Analysis project.

NEW PUBLICATIONS

The following books are now available from booksellers or from the publishers.

The Future Population of the World: What Can We Assume Today? W. Lutz, editor. Earthscan Publications, London. ISBN 1-85383-239-1.

Negotiating International Regimes: Lessons Learned from UNCED. B.I. Spector, G. Sjöstedt, I.W. Zartman, editors. Graham & Trotman/Martinus Nijhoff, London/Dordrecht/Boston. ISBN 1-85966-077-0.

European Migration in the Late Twentieth Century. H. Fassmann, R. Münz, editors. Edward Elgar Publishing, Aldershot, UK. ISBN 1-85898-125-5.

Economic Instruments for Air Pollution Control. G. Klaassen, F.R. Førsund, editors. Kluwer Academic Publishers, the Netherlands. ISBN 0-7923-3151-6.

The following reports are now available from the IIASA Publications Department for the amounts indicated. For payment by Visa or Mastercard, please send the number of the card, the expiry date, and a copy of your signature.

Global Energy Strategies to Control Future Carbon Dioxide Emissions. Y. Sinyak, K. Nagano. Reprinted from *Energy* 19(2) 1994. RR-94-007. US \$10.

International Burden Sharing in Greenhouse Gas Reduction. A. Grüber, N. Nakićenović. RR-94-009. US \$12.

Generalized Urn Schemes and Technological Dynamics. G. Dosi, Y.M. Ermoliev, Y.M. Kaniovski. Reprinted from *Journal of Mathematical Economics* 23 (1994) 1-19. RR-94-011. US \$10.

Stabilization Policies at Crossroads? An Interim Report From Central and Eastern Europe. V. Barta, C.M. Schneider. CP-94-011. US \$20.

A complete list of publications is available from the Publications Department, or on the Internet at gopher.iiasa.ac.at and at <http://www.iiasa.ac.at>.



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FURTHER INFORMATION

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