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Forest Resources, Environment and Socio-Economic Development of Siberia

A Research Proposal

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June, 1992

VERSION II

1. BACKGROUND

The economic and ecological stability of the forest resources is declining in many regions of the world. A number of problems have appeared which call for greater vigilance in the years to come:

- The pressure on forest resources due to the demand for industrial roundwood and fuelwood will become increasingly stronger.
- Environmental pollution is an increasing threat to the forest resources.
- Growing demands for environmental, recreational, and other non-wood forest products require new forest management practices.
- The forest resources of the globe have been identified to be a crucial stabilizing factor in the world's ongoing global change process.
- National development policies with a view to sustaining yield are only implemented in few regions of the world.

The actual development of the global forest resources has been brought up on key political agendas. The Group of Seven initiated this process in the Houston Economic Declaration (1990), stating that they were "ready to begin negotiations in the appropriate form, as expeditiously as possible on a global convention or agreement, which is needed to curb deforestation, protect biodiversity, stimulate positive forestry actions and address threats to the world's forests." This statement has resulted in strong international efforts to formulate and implement such a global forest convention. One example is a proposal for an International Commission on the Conservation and Utilization of the World Forests (The Woods Hole Research Center, 1991).

Siberia (including the Far East) is one of the globe's largest wood baskets. The region comprises 497 million hectares of forested area (about 19 percent of the world's forested area), with a total stocking of 55.4 billion m^3 (about 17 percent of the world's growing stock), of which 48 billion m^3 are constituted by coniferous species (about 38 percent of the growing stock of the world's coniferous forests).

Rosencranz and Scott (1992) underline that the Siberian forests help mitigate global warming, stabilize large-scale biospheric processes, constitute a natural heritage of international importance and drive local and national socio-economic development in Russia.

The ecosystems in Siberia are extremely sensitive to disturbances due to the harsh conditions. A strong degeneration of the forest resources is taking place in the region. It has been declared that the forest resources in Siberia with built-up infrastructure may be mined in 40 to 50 years (Nilsson et al., 1992). The degeneration of the forests and other natural resources, and the environment is conceptualized as stemming from man's industrialization and exploitation of the natural resources. Stanglin (1992) argues that the deforestation rate of the Siberian forests is about 2 million ha per year.

Mismanagement of the forest resources is widely recognized and appears to arise from poor organization and management of the harvests, inadequate silviculture, and conflicting objectives and jurisdiction among various organizations responsible for the forests. Based on existing knowledge, it can be concluded that large areas of the Siberian forests are not managed on a sustainable basis (Nilsson et al., 1992). Knight (1992) indicates that after three decades of relentless and uncontrolled exploitation of the natural resources, the bills are now due in one of the world's last great natural frontiers. Some authors argue that with the easing of Moscow's political control, Siberia has become something like the Wild West, meaning that local authorities are expanding the exploitation of natural resources without any type of restriction (See for example Stanglin, 1992).

Environmentalists (see for example Rosencranz and Scott, 1992) fear that the ongoing economic transition will result in an increased harvest, which will stimulate the sagging Russian economy, but further degenerate the environment and break down indigenous cultures. Barr (1989) indicates that an increased harvest will increase the erosion and the losses of top soil level in the Siberian forests.

Trexler (1991) points out that the Siberian forested land may sequester 40 000 million tons carbon, which is nearly half of the amount in the Amazon basin. From a global change point of view, it is important that this sequestering capacity be sustained. Isaev (1991) and Nilsson et al. (1992) indicate that the sequestering capacity may be increased by 20 percent by the restoration of Siberian forests.

Feshbach and Friendly (1992) point out that no other industrial civilization, as the USSR, has so systematically or for so long poisoned its air, land, water and people. This is also true for the conditions in Siberia. Stanglin (1992) indicates that Russia and Siberia are too poor to rebuild the economy and repair the ecological damage at the same time. There are too few resources available to address either problem, let alone both at once.

A specific problem connected to the Siberian forest resources is biodiversity. Biodiversity is not only a question of the number of species, but biotic communities and their life forms as well. From a purely ecological viewpoint, life forms are more essential than species; they are the building blocks of the ecosystem structures. In Siberia, each individual species is a massive block in the ecological pyramid, and none can be removed without threatening the entire ecological pyramid. For the moment, there is limited information available on how the exploitation of the Siberian forest resources has affected the biodiversity.

Another specific condition which must be considered is that permafrost covers large areas of Siberia. Harvesting in these permafrosted areas may result in permafrost destabilization and wetland formation. Wetlands normally cause emissions of CH_4, which would contribute greatly to climate change. Some scientists argue that largescale harvesting of forests in the permafrost zone might be more harmful from a regional and global point of view, than the famous plans to reverse the flow of rivers in order to irrigate parts of Central Asia.

The political, social and economic changes taking place in Russia are creating unprecedented opportunities and risks for the development of the environment, forest resources and the forest industry, although the outcome from these changes is far from clear (Backman and Waggener, 1990). One way to help generate a sustainable development of the environment and the forest resources is to maintain a stable and sound development of the forest industry. Historically, traditions for Siberia's industrial development can be characterized by the establishment of extremely large-scale projects which have had a tendency to exhaust the natural resources, causing ecological degeneration. The existing forest industry faces big problems in adapting to the market economy. The industry is bulk oriented in both production and export. Much of the technology is obsolete, the productivity too low, product qualities unsatisfactory, and most of the industry too remotely located from markets to be competitive on both the international and national markets in a pure market economy. World prices of forest products are too low to justify the massive new investments needed to modernize the industry (Knight, 1992). Therefore, the overall question facing the industry is what to produce and for which markets? To achieve sustainable development of the industry it is obvious that, at least in the near term, the restoration process is heavily dependent on foreign investment, and with huge investments in infrastructure (Backman and Waggener, 1991). The dominating difficulty in generating foreign capital for investments is that doing business in Russia will remain complicated, costly and time consuming, with high risks (as measured by Western standards) and with an infrastructure which is limited.

Although it should also be emphasized that the forest industry, if current structural problems can be solved, may play a major role in generating hard currency, necessary for both socioeconomic and environmentally positive developments in Siberia.

Siberia, in spite of its richness in natural resources, suffers from a rather weak economic development in comparison with other regions of Russia. This has led to an unsatisfactory social development in most of the Siberian sub-regions followed by increased social problems.

Siberia, as the rest of Russia, is in a turbulent stage of transition. If the appropriate development and management strategies are not implemented during this transition, there exists a high risk for increased economic, ecological and social strains. These strains include the depletion of man-made and natural capital, degeneration of the environment and increased social problems. Under these conditions, the overall problem is to find suitable criteria for sustainable environmental and socio-economic development. The Russian government has chosen to implement a full-market economy with minimal preparations within a very short time-frame. It means an implementation of traditional economic efficiency criteria as a measure of sustainability. This development is supported strongly by some Western economic experts and institutes, such as the World Bank, IMF, etc. Other experts, and some economists, regard this development as a large experiment with Russian society, involving extreme risks for social destitution and social time bombs. These latter experts indicate that Russian traditions require lengthy preparation and transition to a market economy and criteria, other than traditional economic efficiency, must be employed to secure a sustainable environmental and socio-economic development.

The Siberian forests are not only important from a national point of view, but also of international concerns. As pointed out earlier, Rosencranz and Scott (1992) have stressed "the international community needs to recognize Siberia's forests as an economic, climatic and wilderness resource of global significance". They are surprised by today's low international interest for the Siberian forests, in comparison with the high interest for tropical forests. However, recently, there have been some international initiatives taken illustrating the fact that Russian forests constitute a major part of the world's boreal forests. Last year, the International Boreal Forest Research Association was established and the German Bundestag has proposed an intensified forest management of the Russian forests. The latter proposal includes a forest plantation of 100 million ha of Russian territory for increased carbon sequestering.

2. OVERALL TASKS OF THE STUDY

The International Institute for Applied Systems Analysis and the Russian Academy of Sciences supported by the Ministry of Ecology and Natural Resources of the Russian Federation, among others, have agreed to cooperate in carrying out a study on, *Forest Resources, Environment and Socio-Economic Development of Siberia.* The overall tasks of the study are:

- to analyze the present state and resource-ecological role of Siberian forests on the basis of specifically generated data bases for ecological-economic regions of Siberia;

- to assess the biospheric role of Siberian forests, their influence on Global Change, the gas composition of the atmosphere and carbon circulation;

- to develop a dynamic tool to perform analyses of the Siberian forests and to produce scenarios of their future development and multi-purpose functions;

- to identify the suitable strategies for sustainable development of the forest resources, and for the required development of the industry, the infrastructure and the society;

- to carry out a detailed study on forest utilization and socio-economic development of a specific industrial region (Ust-Ilimsk region).

The study will be implemented by the International Institute for Applied Systems Analysis and the Russian Academy of Sciences supported by the Russian Ministry of Ecology and Natural Resources of the Russian Federation. Other institutions worldwide will be invited to participate in the study as collaborators and correspondents. Linked to this study are other study agreements, such as the agreement between Royal Swedish Academy, the Royal Swedish Academy of Agriculture and Forestry, and the Russian Academy of Sciences to cooperate on forest research, and also studies conducted and coordinated by the International Institute for Forests, Moscow, and the activities of the International Boreal Forest Research Association.

The full agreement is attached in Appendix 1.

3. SPATIAL COVER BY THE STUDY

The study will be comprised by one macro-component and one micro-component. The macro-component will cover all of Siberia (from the Urals to the Pacific). For the macro-component, the analysis will be carried out for a number of subregions in Siberia. The division into subregions is the following:

SIBERIA

West Siberia	East Siberia	Far East
Tyumen Region	Krasnoyarsk Territory	Yakutsk ASSR
Omsk Region	Irkutsk Region	Magadan Region
Novosibirsk Region	Chita Region	Amur Region
Kemerovo Region	Buryat ASSR	Khabarovsk Territory
Tomsk Region	Tuva ASSR	Primorski Territory
Altai Territory		Sakhalin Region
		Kamchatka Region

The micro-component will be a case-study of the Ust-Ilimsk region (north-west of Lake Baikal). One of the biggest industrial forestry combines in Russia is located in the Ust-Ilimsk region. This combine was established about 20 years ago, with the capacity for about 4 million m^3 of mechanical wood processing per year and about 500,000 tons of bleached chemical pulp processing per year. The wood catchment area is about the size of 36,000 km^2. In connection to the industrial combine, one of the largest hydroelectric power stations in Russia has been built. The power station has a capacity of 4 million kilowatts and a reservoir area of 2000 km^2. A new town has been established on the shores of the Angara River (650 km north-west of Irkutsk), with a railway connected to the Baikal-Amur Railroad and an airport of II ICAO category. A number of different investigations have already been carried out in the region by different research groups and consultant companies. Therefore, there is a stock of relatively available data for the region and also identifiable existing and possible future problems.

4. MAJOR COMPONENTS OF THE STUDY

Based on the description of the study's major tasks, the major components of the problem area have been structured in Figure 1.

As seen in this figure, in addition to forestry (the major component of the study), the study must analyze markets, the industry and infrastructure to assess the ecological and global change aspects, and socio-economics. It can also be seen that these major components are inter-linked in a network and influence each other. Some comments can be made with regard to these major components and their interrelationships. This structure is relevant for both the micro- and macro-components of the study discussed earlier.

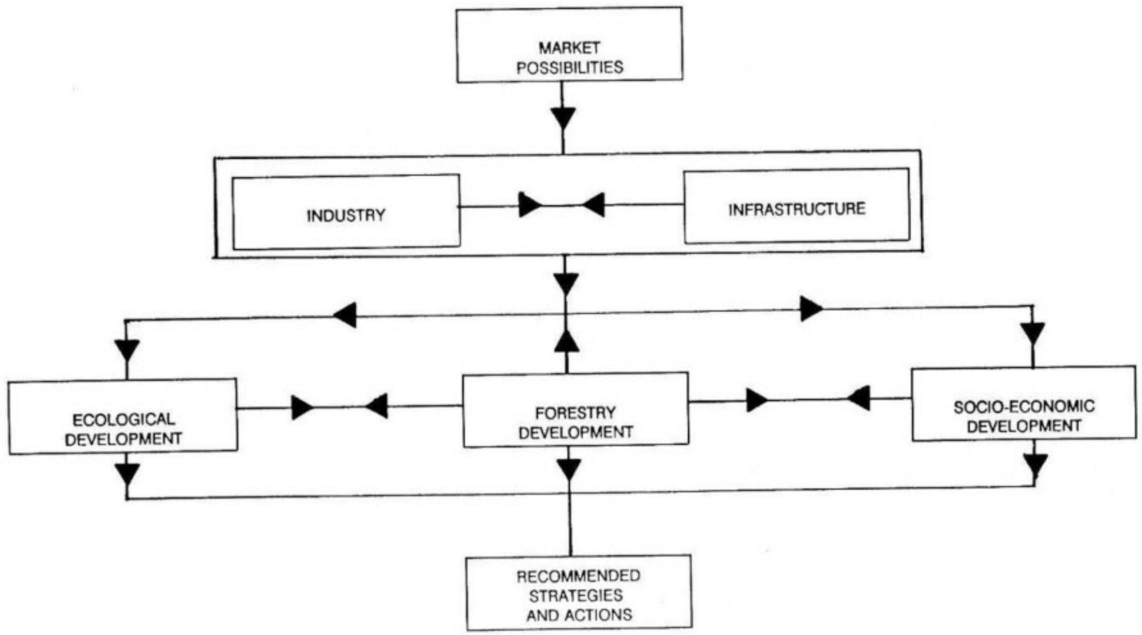
Market Possibilities

It is important to obtain a reliable picture of future forest product markets, the information of which are:

- volume
- products
- quality
- possible prices

This information should be broken down into individual international and domestic market areas. The future market possibilities influence the industrial structure and required organization of the infrastructure.

Figure 1. Major components of the Siberian Study.



Industry

The future development of the industrial structure is heavily dependent on future market development but it is also dependent on the existing industrial structure and therefore, the following information is required:

- capacities for different products
- productivity
- technological status
- efficiency of wood utilization

The future industrial structure is also influenced by the infrastructure and the industrial structure will, in turn, influence the required development of the infrastructure.

Infrastructure

The future infrastructure is dependent on future investments, future market and industrial structure as well as the existing structure. The important information on the existing structure is the accessibility information in which the following parameters are included:

- energy production and consumption
- density of railways and roads of different standards
- vehicle density
- intensity of infrastructure usage
- intensity of goods transport
- time span for transportation of different products (from production to consumption)
- flow of information, goods
- immigration, out-migration (travel in and out of the region)
- spatial interaction with other regions.

Forestry and Ecology

The future development of forest resources depends on the realization of economic transition, the future industrial production and infrastructure, demand on non-wood benefits, ecological concerns and global change aspects as well as on the existing structure of the forest resources and on socio-economic requirements. The type of information required on the existing forest structure is the following:

- species distribution
- site class distribution
- age class distribution
- growing stock
- growth information
- management/silvicultural programs (forestry standards according to Russian nomenclature)
- regeneration
- fire and disease information
- harvesting equipment.

Ecology and Global Change

Analyses of the ecological sustainability and impacts on Global Change have to start from the existing ecological status. For the existing status, the following basic information is required:

- status from global change aspects
- the biospheric role of the forests
- deposition patterns
- stability of the ecosystems
- sensitive areas with regard to:
  - o recreation
  - o protection
  - o other non-wood benefits.

The ecological development will also be influenced by the forest management strategy selected. Therefore, it is necessary to estimate the ecological consequences of the different forestry strategies analyzed in the study.

Socio-Economics

The socio-economic development is dependent on the future structure of industrial production and connected infrastructure. The chosen strategies for the future management of the forest resources based on ecological and global change concerns will also influence the socio-economic development, but it is also directed by the existing structure of the socio-economic conditions. Therefore, there is a need to collect data on the types of parameters presented in Appendix 2.

5. ANALYTICAL STRUCTURE AND ANALYTICAL TOOLS

The proposed study is planned to be carried out with mutual efforts by project teams at IIASA and the Center for Ecological and Forest Productivity Problems of the Russian Academy of Sciences. Other Russian research institutes will also participate in the study as collaborators and correspondents.

The analytical structure of the proposed study can be illustrated in the form of a matrix. The matrix contains research areas respectively, research activities and is presented in Figure 2. The research activities are organized into blocks. The five blocks identified are:

- pre-feasibility analysis of existing data and set-up of the study
- data collection, analyses of existing data, and generation of data bases
- assessment studies
- integrated analyses
- policy implications.

The content of the matrix in Figure 2 also illustrates the output or products of the study at an aggregated level.

Figure 2. Analytical Structure of the Study

Components Activities	Forestry	Markets	Industry and Infrastructure	Ecology and Global Change	Socio-economics
Block 0 PRE-FEASIBILITY OF EXISTING DATA + SET-UP OF STUDY	Integrated pre-feasibility study of existing data on all components and set up of the study				
Block I COLLECTION, ANALYSES OF EXISTING DATA, AND GENERATION OF DATABASES	•Forest Resources •Forest Management •Management Technology •Economic conditions	•Description of international markets •Description of domestic markets	•Description of existing industrial structure (capacities and technological status) •Description of existing infrastructure	•Description of ecological status •Global Change status	•Description of socio-economic conditions •Description of socio-economic indicators
Block II ASSESSMENT STUDIES	<u>Forest Resources Assessment</u> •Allowable cut •Sustainable forest structure •Multiple-use •Protection •Forest management	<u>Market Assessment</u> •Identification of market possibilities •Possible market strategies	<u>Assessment of Industry and Infrastructure</u> •Technological development options •Industrial development options •Infrastructural options	<u>Ecological Assessment</u> •Sustainable ecological development options •Global Change effects	<u>Socio-economic Assessment</u> •Socio-economic development options
Block III INTEGRATED ANALYSES	Integrated analyses of all components based on results from Block II				
Block IV POLICY IMPLICATIONS	•Allowable cut •Forest management	•Market strategies •Marketing activities	•Industrial strategies •Infrastructural strategies	•Strategies for regional and global sustainable development	•Socio-economic development strategies

The core-team will work with a set of analytical tools to achieve the overall tasks of the study, although the major tools will deal with Forest Resources, Global Change, Resource Allocation and Industrial Structure, and Markets. From the analytical structure of the study (Figure 2) it can be identified that the study will deal with two interrelated major streams namely resource-ecology and global change, and economic development.

Within the first stream three major subactivities can be identified.

5.1 Development of Databases and Assessment of the Resource-Ecological Role of the Siberian Forests.

To analyze the status of the forest resources and the ecological roles of the forests, a specific databases of the resources must be generated. The databases should be based on existing ecological and economic regions of Siberia. The developed databases will contain a combination of existing scientific data and data from the State Forest Account (SFA). The data are compiled by ecologically homogenous sub-regions within administrative formations of Russia and Siberia (districts, territories, autonomous formations, etc.). The level of detail in the databases will be determined by the availability of SFA-data. The division into ecological regions will correspond to the division made by Kurnaev (1973). The general structure of the databases covering the ecological regions will be the following:

- characteristics of the forest fund according to SFA data
  (land categories, areas and growing stocks)
- climate data
  (temperatures, precipitation, etc.)
- soil characteristics
- status of the environment and anthropogenic impacts
- general data for the region
  (orography, relief, etc.).

Specific working tasks for generation of the required databases are:

- supplementing missing data in the State Forest Account for the ecological regions
- estimation of the current increment of the forest
- estimation of the biomass of the forest vegetation

The developed databases should meet the requirements on the possibilities to map the data, and to link the data to international databases.

Analyses of the resource-ecological role of the Siberian forests will include assessments of the status of the existing forests with respect to the degree of utilization, and productivity of different forestry functions.

5.2 Assessment of the biospheric role of Siberian forests and their impact on global change

By using the database described above (6.1) as a platform, a systemization of the quantitative characteristics of the ecological functions of the forests (oxygen-formation, CO_2-circulation, water-preservation, etc.) will be carried out. Special concern will be taken in these analyses to the transfer of matter and energy, and the impact to the atmospheric gas balance. Models for the carbon circulation will be employed and will take into account the carbon fixation above ground and in the soils. These models will also describe the flows of carbon as a result of anthropogenic impacts, forest management and forest fires. Special effort has to be made in these analyses concerning carbon fixation, permafrost and forest utilization. A permafrost destabilization as a result of forest utilization will probably increase the emissions of CH_4. The quantitative characterization of the forest ecosystems must also deal with the question of biodiversity. This is of special importance in connection with different forest management practices.

This activity will also include development of specific new databases and maps of forest soils, biomass production, forest mortality and ecological zonation of the Siberian forests.

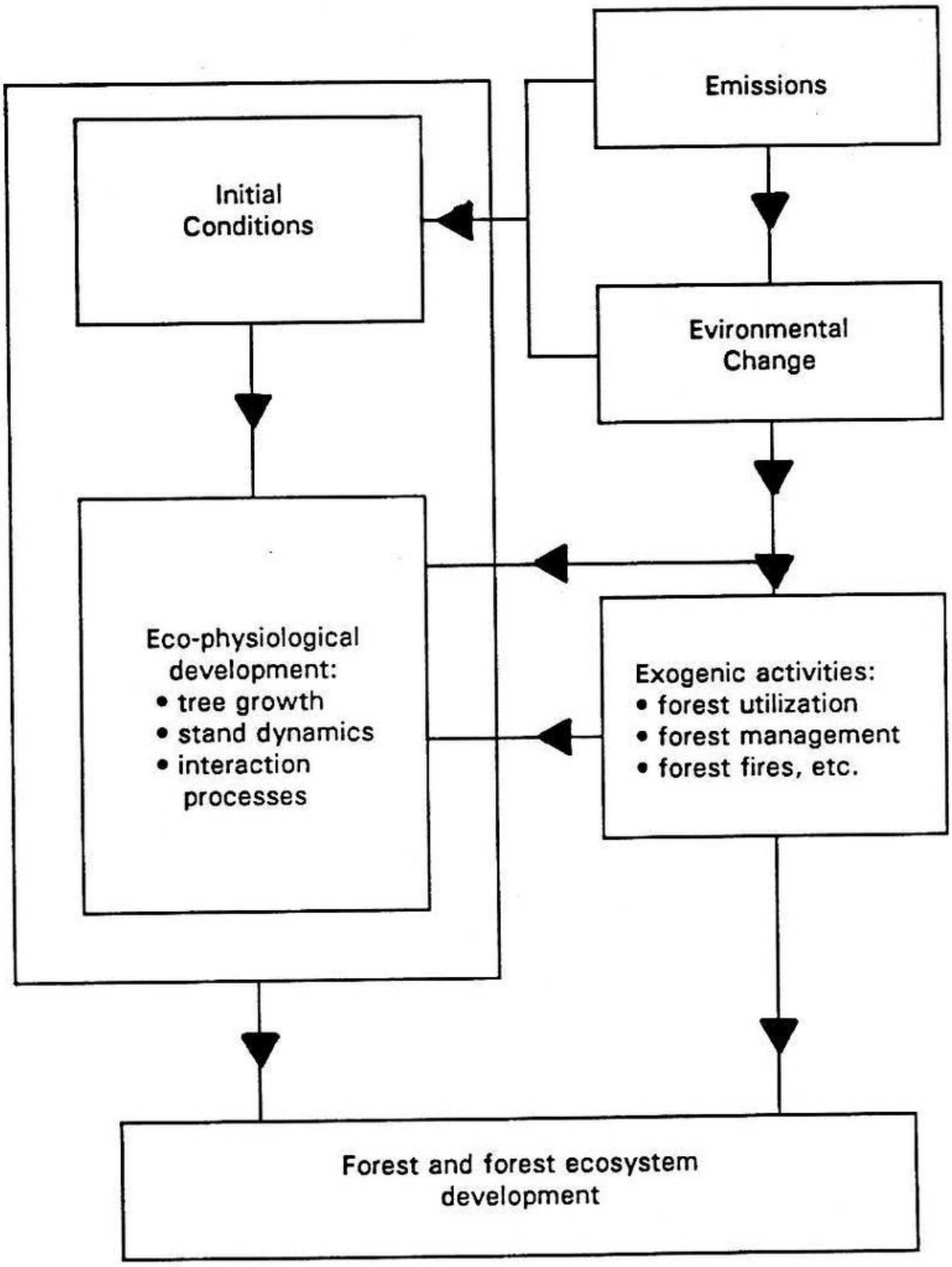


Figure 3. Factors to consider in quantitative assessments of the forest resources in Siberia.

5.3 Development of dynamic forest models

Employment of dynamic forest models are necessary for generation of long-term scenarios on sustainable utilization and ecological functions of the forest ecosystems. The employed dynamic models should be able to:

- estimate the effects on the forest ecosystems of increased anthropogenic stress and global climate change
- illustrate the dynamics of ecotones (changes boundaries of the forest vegetation, changed productivity, and changed biodiversity) under different conditions
- generate consistent scenarios with a time horizon of 100 years on productivity and rational utilization under different climate change assumptions and management strategies.

The general model framework is presented in Figure 3.

An important component of this activity is also to identify operational criteria for sustainable development of the forest resources.

Within the framework of the second major stream (economic development) of the study two dominating activities can be identified.

5.4 Development of a database on socio-economics, infrastructure and industry and analyses of current conditions

The basic collection of data on infrastructure, industry, domestic markets and socio-economics will be carried out by the Institute of Economics and Industrial Engineering, Novosibirsk. The generation of the database will take place stepwise. Some data are easily obtained, while others require special methods for collection and estimation.

The base year for the database will be 1989, although some of the data will be collected as time series. The data to be collected are listed in Appendix 3 and a time schedule for the collection is presented in Appendix 4. The analysis in this activity include assessments of the current social, infrastructural and industrial conditions and their interactions.

5.5 Analyses of resource allocation and industrial structure

For this component, the plan is to adopt a simulative tool developed by Dr. C. Backman, CINTRAFOR, University of Washington, for analysis of the Russian forest sector. The overall questions to be analyzed by this tool are:

- sound allocation of the wood resources to the industry
- sound industrial structure under given conditions
- possible transfer of capital back to the forest
- possible transfer of capital to society (taxes)
- effects on efficiency of improved infrastructure and transportation
- adjustment of production at different market conditions.

For the market analyses we plan to use existing tools to analyze international market opportunities, such as the Global Trade Model (originally developed at IIASA, see Kallio et al., 1987 and further developed by CINTRAFOR, University of Washington, see Cardellichio et al., 1988) and other tools that were implemented by consultant companies and international organizations.

5.6 Strategies for sustainable forest resource management and socio-economic development

The analyses of suitable strategies for sustainable development and sustainable forest management has to take into account the future demand on forest products, the requirements on the different ecological functions of the forests and required socio-economic living standards.

The overall objective is to identify a number of suitable strategies with descriptions of the impacts on the sustainability in the form of consistent scenarios.

5.7 Detailed study of the Ust-Ilimsk region

Parallel to the overall study of all of Siberia a more detailed study will be carried out for the Ust-Ilimsk region concerning utilization and regeneration of forest resources and socio-economic development.

This study will be entirely carried out by the Russian collaborators with the IIASA team acting as advisers.

The components of this micro study of Siberian conditions are:

- to analyze forest utilization and development under market economy conditions
- to develop sustainable strategies for forest resource utilization
- to develop computer aided planning systems for forest management
- to improve the socio-economic conditions in the region.

6. IDENTIFIED STEPS OF THE WORKING PLAN

At this stage, it is difficult to identify all the necessary steps for the entire study period of the study. The steps presented below should be regarded as a first attempt and be revised, updated and improved on an on-going basis. The study's duration is expected to be four years (1992-1996). A critical path over the major steps of the study is presented in Figure 4.

Step 1. Preparatory step

The preparatory step includes the establishment of Russian scientific collaborating teams, an efficient organization of the study, steering groups and advisory committee of the study.

Step 2. Generation of the databases with respect to resource-ecological data

This step encompasses the data collection from different institutes and organizations concerning resource-ecological aspects. In parallel the computer design of the database will be developed.

Step 3. Generation of the databases with respect to socio-economic, infrastructural, and industrial data

This step is similar to Step 2 but deals with the socio-economic, infrastructural, and industrial data instead of the resource-ecological data.

Step 4. Auxiliary satellite studies

As further discussed in section 8, a number of preliminary, vital auxiliary studies to the core study have been identified. These auxiliary studies should be carried out by Russian collaborators. The need for further studies will evolve during the entire study period. However, some of these studies can start immediately, while others at a later time. Output from these studies used as input to the core study will emerge during the entire study period.

Step 5. Identification of market possibilities (Market Assessment)

Analyses of the future market possibilities could start at an early state and deliver at least intermediate results at an early stage. These analyses have two major components: domestic markets and international markets. The domestic markets should be analyzed by collaborating Russian teams. The international markets should be carried out by the IIASA core-team.

Step 6. Forest Resources, Industry and Infrastructure Assessments

These assessments can be carried out in parallel. This step also includes the development and adjustment of necessary analytical tools.

Step 7. Ecological and Global Change Assessments

This activity has to be carried out in two steps. An assessment of the current status of ecological conditions and global change impacts can start immediately, but the interaction between the development of the forest resources, infrastructure and industry can start only after Step 8 is finalized.

Step 8. Socio-Economic Assessment

The same procedure as in Step 7 must be followed.

Step 9. Integrated analyses and policy implications

The integrated analyses and studies on policy implications can start after the assessments of the individual components (steps 6-8) are finalized.

In the integrated analyses, the selection of suitable strategies for the management of the Siberian forest resources will be based on;

- the fulfillment of the sustainable ecological functions of the forests
- the fulfillment of the sustainable supply of forest products
- the sustainable socio-economic development of the Siberian region.

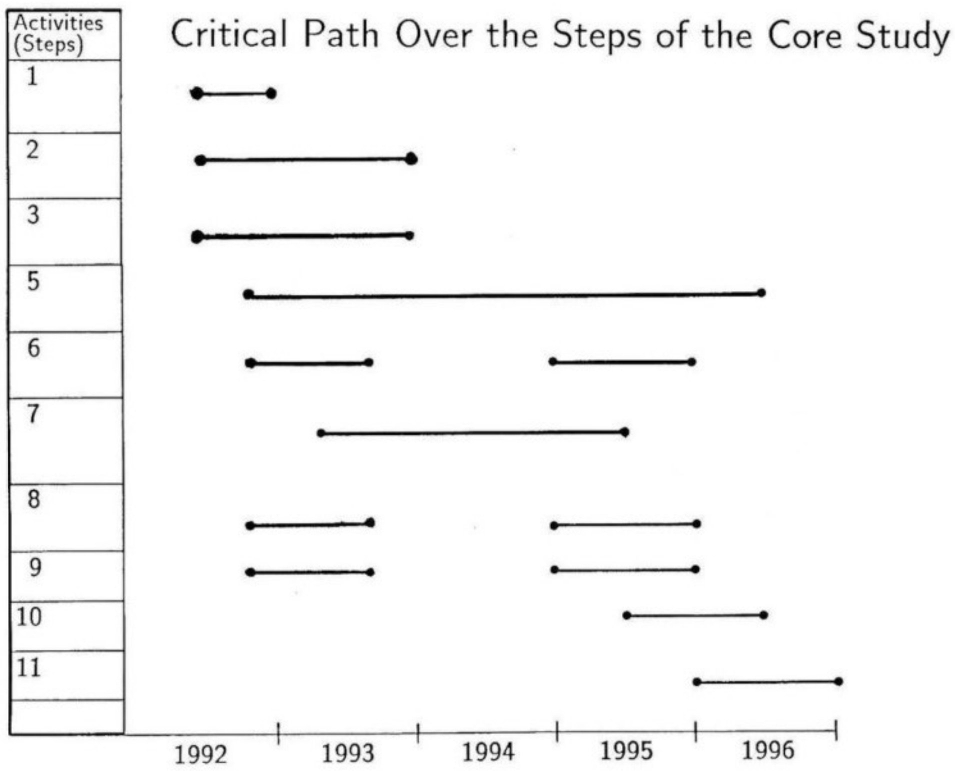
An important task in the integrated analyses is to identify sustainable criteria for development, criteria which should guide the integrated analyses and the policy implications. Due to the occurrence of extreme inflation in the Russian economy, it seems to be more realistic to work with physical criteria for sustainability than traditional economic measures.

Step 10. Dissemination of results

The study is assumed to deliver a steady flow of research reports during its lifetime. Although, the final products will be a number of books which will be finalized at the end of the study.

The final dissemination will also take place in different journals and in television programs.

Figure 5.


Activities (Steps)
1
2
3
5
6
7
8
9
10
11
Critical Path Over the Steps of the Core Study
1992
1993
1994
1995
1996

8. AUXILIARY SATELLITE STUDIES

At this stage - and as earlier discussed - we have identified a number of vital auxiliary studies which should be carried out by Russian experts. The list is tentative and will be further developed during the progress of the study. Thus, the following is a preliminary list of Russian auxiliary studies to the core study:

Socio-economic studies

- State of the art of social strains in Siberia
- Multiple-use/social utilization of Siberian forests
- Cultural aspects on forest utilization in Siberia
- Trade-off aspects between better welfare and improved environment

Trade studies

- Description of existing domestic trade and how it may develop in the future in Russia
- Market possibilities in China and South East Asia
- Market possibilities with Asian republics in the former USSR
- Market possibilities in the former European USSR
- Description of the existing barter trade and possible future development
- Organization of current forest products trade (including the wholesale market)
- Comparison between Russian and Western standards for forest products (grading system)

Infrastructural studies

- Degree of utilization of existing infrastructure
- How is access to the infrastructure paid
- What is the capacity of the infrastructure
- What competition does the forest sector face in accessing the infrastructure
- Costs for expanding the infrastructure in true costs
- Multi-sectorial influences on the development of the infrastructure

Industrial studies

- Possibilities for Russian machinery industry to supply the Russian forestry industry with required equipment.

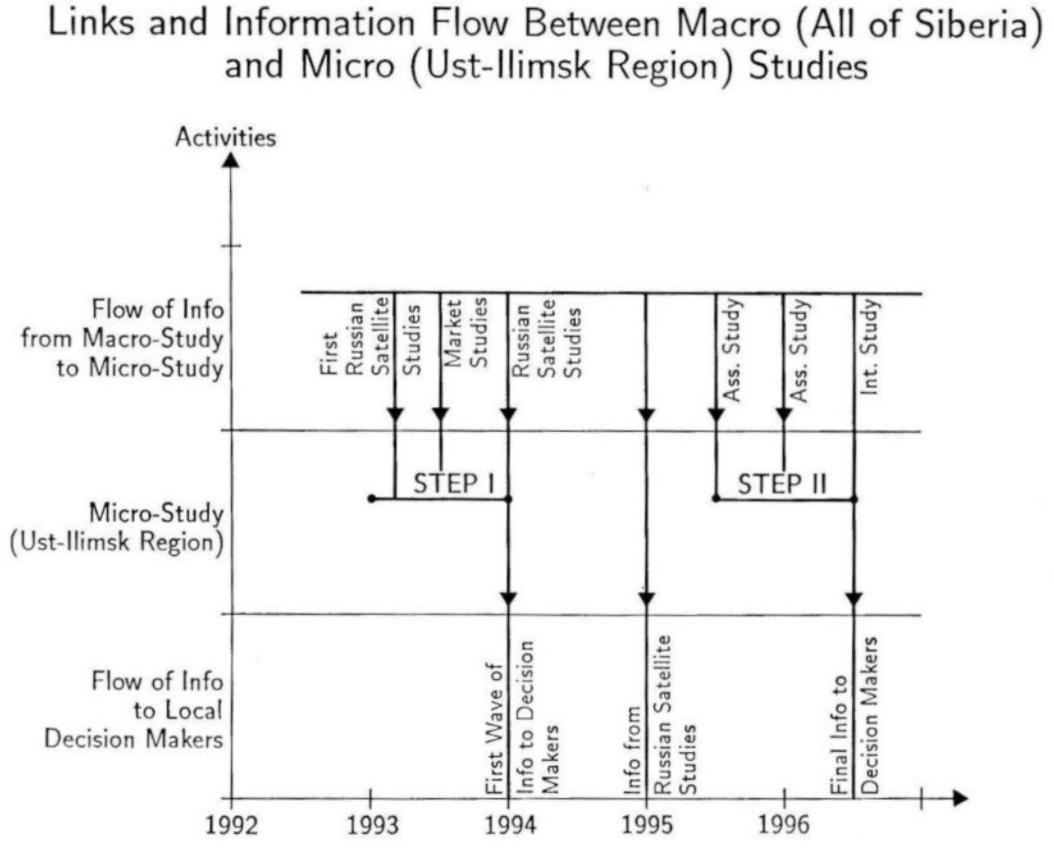
9. LINKAGE BETWEEN THE MACRO- AND MICRO-STUDIES

As presented earlier (section 3), parallel with the macro-study for all of Siberia, a micro-study should be carried out for the Ust-Ilimsk region. The developmental possibilities of the Ust-Ilimsk region is strongly influenced by the future macro development of all Siberia. The study of the Ust-Ilimsk region aims to illustrate the effects of a sustainable and rational utilization of the forest resources in the region, of special importance are;

- implementation of analytical tools, which will help to ensure the sustainable development of the forest resources in the region.
- illustration of the market effects on the forest utilization, industrial production and socio-economic development.

The links and information flow between the macro- and the micro-study are presented in Figure 5.

Figure 5. Links and information between Macro- (all of Siberia) and Micro- (Ust-Ilimsk region) studies.



10. ORGANIZATION OF THE STUDY

The study's overall organization is presented in the study agreement (Appendix 1) between IIASA and the Russian Academy of Sciences. The fundamental idea in the agreement is to link the strengths of the Russian collaborators with the strengths of the IIASA core-team, which is illustrated in the following;

Strengths of Russian Collaborators

- access to data
- familiarity with data
- contacts within administrative channels
- knowledge of the specific problem areas
  - forest resources
  - forest management
  - ecology
  - global change
  - trade
  - culture and socio-economics
- skills to subject-wise studies

Strengths of IIASA

- access to suitable tools for quantitative analysis
- skills in integrative analysis
- knowledge about the concept of prices and market economy
- knowledge of social indicators in a market economy

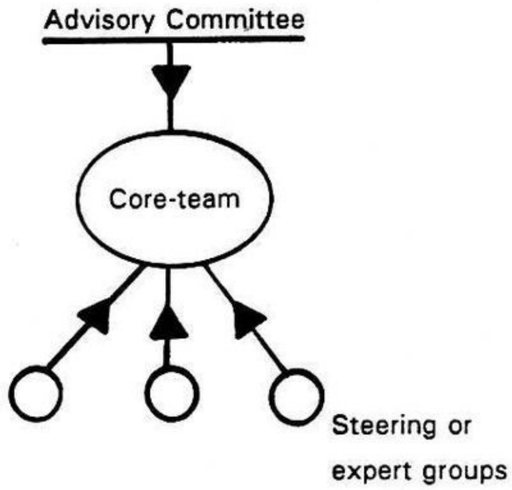
Thus, the study will be carried out by a joint core team constituted by IIASA and the Center for Ecology and Forest Productivity, Russian Academy of Sciences. The latter organization will administrate the soft currency and the former organization the hard currency involved in the study.

In addition to input from the specific IIASA core-team to the study, contributions are also expected from the following groups at IIASA:

- Diffusion of technology and infrastructure
- Economic Transitional Theme
- Socio-economic group within Population.

The study will be guided by an advisory committee and a number of steering or expert groups. The advisory committee should constitute high profile policy people and external funders. The steering groups should be composed of experts in specific fields. The advisory structure is illustrated in Figure 6.

Figure 6. Advisory Structure of the study



11. BUDGET FOR THE CORE-TEAM

Presented in the following is a budget - based on functions - for the study-team of IIASA.

Project Leader
Expert: Forest Resources and Forest Management
Expert: Ecology and Global Change
Expert: Forest Industrial Production and Infrastructure
Expert: Socio-economics
Expert: Markets
Expert: Forest Modeling
Expert: Sustainable Development
Programmer: 1.0
Secretary: 1.5

Consulting
Support for basic data collection
Support to Auxiliary Satellite Studies
Meetings
Advisory Committee
Travel
Documentation
Computer

The total budget for the above functions is calculated to be 2 million US$/year for the lifetime of the study. The expenditures covered by Russian funds for the Russian part of the study are estimated to be 5 to 7 million rubles per year (expressed in the price level of the first half of 1992).

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Appendix 1

Scientific Cooperation Agreement

between

The International Institute for
Applied Systems Analysis (IIASA)
A-2361 Laxenburg, Austria

and

The Russian Academy of Sciences
117901, Moscow, Russian Federation

on the study entitled
Forest Resources, Environment and Socio-Economic
Development of Siberia

Laxenburg and Moscow, April 1992

1. GENERAL

The International Institute for Applied Systems Analysis and the Russian Academy of Sciences supported by the Ministry of Ecology and Natural Resources of the Russian Federation, hereafter referred to as the "Parties", have agreed to cooperate in carrying out a study on, *Forest Resources, Environment and Socio-Economic Development of Siberia*. The overall tasks of the study are:

- to analyze the present state and resource-ecological role of Siberian forests on the basis of specifically generated data bases for ecological-economic regions of Siberia;
- to assess the biospheric role of Siberian forests, their influence on Global Change, the gas composition of the atmosphere and carbon circulation;
- to develop a dynamic tool to perform analyses of the Siberian forests and to produce scenarios of their future development and multi-purpose functions;
- to identify the suitable strategies for sustainable development of the forest resources, and for the required development of the industry, the infrastructure and the society;
- to carry out a detailed study on forest utilization and socio-economic development of a specific industrial region (Ust-Ilimsk region).

The project will be implemented by the International Institute for Applied Systems Analysis and the Russian Academy of Sciences supported by the Russian Ministry of Ecology and Natural Resources of the Russian Federation. Other institutions worldwide will be invited to participate in the study as collaborators and correspondents. Linked to this study are other study agreements, such as the agreement between the Royal Swedish Academy, the Royal Swedish Academy of Agriculture and Forestry, and the Russian Academy of Sciences to cooperate on forest research, and with institutions like the International Boreal Forest Association.

The success of the project is crucially dependent on obtaining adequate financial resources from funding organizations. Neither the Russian Academy of Sciences nor IIASA have at present the necessary financial means to carry out the ambitious plans described in the agreement. The signing parties will approach funding organizations to secure adequate financial support.

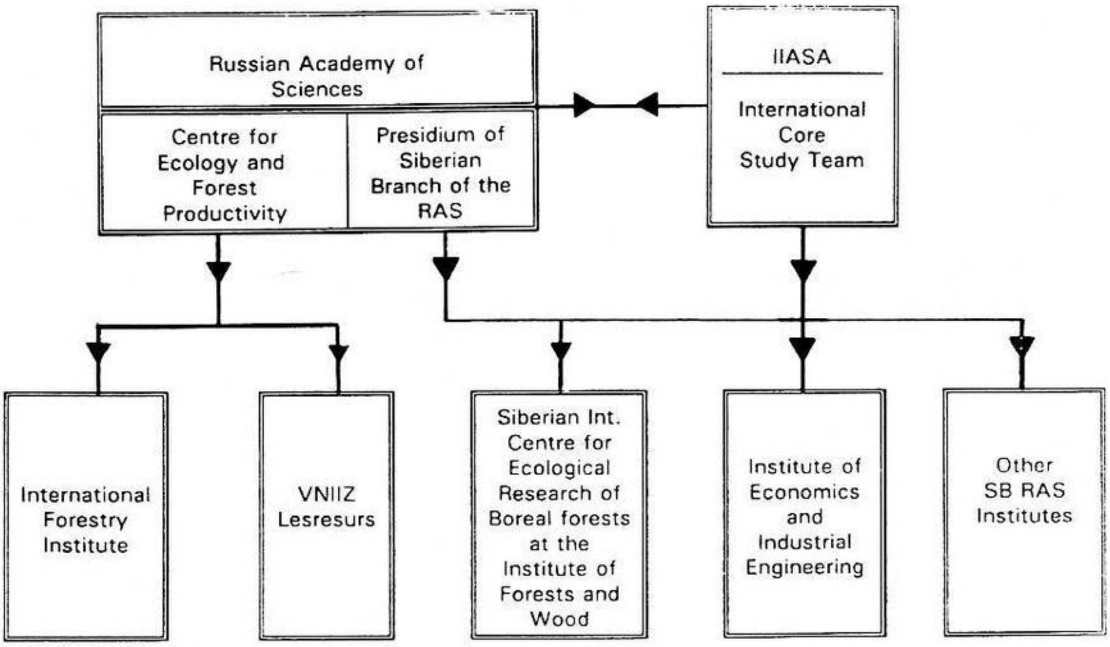
The duration of the project is estimated to be five years: 1992-1996.

2. ORGANIZATION AND RESPONSIBILITIES

For implementation and realization of the study the parties have agreed that two research centers will be organized:

- the Forest Resources Project at IIASA will organize an international core team at the Institute in Laxenburg, Austria. The size of the core team will depend on external financing. The Forest Resources Project will also organize a network of international correspondents for the study.

- the Russian Academy of Sciences will organize a research project center in Moscow, Russian Federation. This center and the Presidium of Siberian Branch of RAS will coordinate the activities of the collaborating institutes as illustrated in the chart below.



An international advisory committee will be established by the signing parties for guidance and overall coordination of the study. The parties have agreed to nominate two coordinators of the study: From IIASA - Academician S. Nilsson and from the Russian Academy of Sciences - Academician A. Isaev (in contact with Academician V. Koptyug).

3. FUNDING

IIASA will fund, mainly through special grants raised from funding agencies, the core-team at the Institute in Laxenburg, Austria and will also cover the expenses (trips and accommodation) of Russian experts invited by the Forest Resources Project to IIASA. The Forest Resources Project at IIASA will also try to raise additional funds for travel and participation of the Russian collaborators at meetings abroad and for the equipment necessary for the fulfillment of the study.

The Russian parties will secure the funds for participation of the Russian experts in the study in Russia.

4. TIME-SCHEDULE FOR ESTABLISHMENT OF THE STUDY

The parties will prepare a detailed work plan for the study within one month after signature of this Agreement.

The study should be fully organized and established by July 1, 1992.

The Agreement has been drawn up in English and in Russian and both copies are equally valid.

For the International
Institute for Applied
Systems Analysis:

P. de Jánosi
Director

S. Nilsson
Leader
Forest Resources Project

Date: March 9, 1992

For the Russian
Academy of Sciences:

Academician V. Koptyug
Vice-President

Academician A. Isaev
Director
Center for Ecology and
Forest Productivity

Agreed with:
the Ministry of Ecology and
Natural Resources of Russian
Federation

V. Danilov - Danilyan
Minister

Date: March 9, 1992

Examples of socio-economic indicators

Socio-economic Indicators		
Indicators related to sectors	Indicators related to individuals	Indicators related to infrastructure
Health	• Average lifetime • Remaining lifetime for 5-years individuals	Number of medical doctors per 1000 inhabitants
Education	• Percentage inhabitants with 12, 15 respectively 18 years' education	Percentage school seats for 18 respectively 21 year old individuals
Money	• Average income	
Housing		Average housing floor (m^2) per capita
Food	Availability of staple food (in kg/capita and month)	
Crimes		Number of crimes per capita and year
Per Capita Consumption Inventory of selected durables Taxes		

Appendix 3

Information Support to the Siberian Study

by the

Institute of Economics and Industrial Engineering,
Siberian Branch of the Russian Academy of Sciences,
Novosibirsk

1. AGGREGATES

The available information can be aggregated for the following regions.

SIBERIA

West Siberia	East Siberia	Far East
Tyumen Region	Krasnoyarsk Territory	Yakutsk ASSR
Omsk Region	Irkutsk Region	Magadan Region
Novosibirsk Region	Chita Region	Amur Region
Kemerovo Region	Buryat ASSR	Khabarovsk Territory
Tomsk Region	Tuva ASSR	Primorski Territory
Altai Territory		Sakhalin Region
		Kamchatka Region

2. BASIC GENERALIZED ECONOMIC-TECHNICAL INDICATORS — REGIONS

- Production of major forest products — in physical terms
- Production value of major forest products
- Production costs of major forest products
- Number of employees
  - distribution of employees over branches and categories of the labor force (total, production, labor)
  - employees as manual labor
  - employees in hard physical labor
- Fixed capital stock (FCS) mln rbls
  - average annual costs of getting FCS into operation, thous of rbls
  - average annual depreciation
  - depreciation as percentage of initial FCS value
- Labor productivity rbl/person
- Return per unit of FCS
- Labor-intensity of one unit of FCS, thous rbl
- Input per 1-rbl of output
- Volume of capital investment in production; mln rbls:
  - sites - infrastructure for the mill
  - buildings, machinery
  - environmental protection
  - prevention of effects of log rafting
- Investments made in relation to budgeted investments

- Required time for construction in relation to budgeted time
- Balance between production (cut wood) and consumption of roundwood and wastes in the industry
- Volume of transportation of final forest products (distributed over means of transport) mln ton
- Characteristics of the automobile and railroad networks and river transportation (type of roads quality/length and maximum flow tons/year)
- Average distance of transportation for final products (industry-market)
- Productivity tons/km
- Allowable cut mln m^3 (coniferous and deciduous)
- Actual cut mln m^3 (coniferous and deciduous)

3. BASIC ECONOMIC-TECHNICAL INDICATORS — INDIVIDUAL ENTERPRISE

- Geographic location
- Starting-up year
- Theoretical capacity of major final products
- Actual production capacity of major final products
- Practical capacity — (close to production) of major final products
- Basic indicators for production of major final products (see section 2)
- Production respectively sales of final products in rbls
- Capacity utilization (production/theoretical capacity)
- Input/output tables in rbls (wages, raw material, etc.)
- Production costs per rbl of output
- Sales price of final products
- Profit
- Number of employees
  - total
  - production personnel
  - labor

- Total budgeted wages distributed over different labor groups
- Average wages per year distributed over different labor groups
- Personnel turnover indicators (remaining persons)
- Labor productivity:
  - output per person in rbls
  - integrated output in m^3

- Labor intensity for major products and operations in man-days
- Composition of capital stock (FCS) (see section 2)
- Coefficients for utilization of basic machinery and equipment (see section 4)
- Planned and actual use of raw materials (by types) and final product
- Production of raw material for pulp- and similar production from harvest residues and wood processing in m^3
- Mechanized level of operations according to specific formula
- Electricity consumption per worker and per unit of equipment

4. HARVESTING ENTERPRISES

- Maximal allowable cut in m^3
- Actual cut in m^3
- Species composition of the harvest (expressed in tenths)
- Average growing stock per hectare m^3
- Average log volume m^3
- Average transportation distance (stump to mill), in km
- Transportation of timber m^3;
  - total from stump to industry
  - transportation distributed over different networks (Franco?) (to railways, points for rafting, points for consumption on etc.).
- Roundwood consumed for production of final products
- Availability and utilization of harvesting machines (different types)
  - number of machines
  - volume produced by machines
  - utilization coefficients
    - technological accessibility
    - utilization of machine parts
    - number of shifts the machinery has been utilized
  - productivity per machine & per shift and machine in m^3
  - costs for machine unit per shift
  - fuel consumption per produced m^3 of wood Hcal
  - electric power consumption per m^3 wood kWt/hour

5. SOCIAL INFRASTRUCTURE

The following information is expressed per 1000 inhabitants (working)

- housing, m^3
- nursery schools (places available)
- schools (places available)
- hospitals (number of beds)
- cultural institutions (number of seats)

- Average monthly salary for different groups of employee
- Turnover rate of personnel
- Social infrastructure (see factors above) required and supplied by the industry
- Telephone density
- Average expenditure costs per family member (rbls/year)
- Energy demand at the enterprises:
  - electric power kWt/hour per year
  - thermal power Hcal/year

6. ENVIRONMENT PROTECTION

- water consumption, mln m^3/year
- specific consumption of water, m^3/1,000 rbl of output
- specific water consumption at the timber industry enterprises, m^3/year
- throws of sewage into water basins, mln m^3/year
- throws of pollutants into the surface water reservoirs by the timber industry enterprises, thous tons/year
- used of recycled water, %
- total amount of pollutants thrown into atmosphere tons

Appendix 4

Generation of Database on Socio-economics, Infrastructure, Industry and Domestic Markets (section 5.4)

The start and extent of the data collection to be carried out by the Institute of Economics and Industrial Engineering, Novosibirsk, depends on the availability of external funding support.

The steps of the data collection identified and connected possible analyses of the data by the institute is presented in the enclosed figure with brief explanations. The data of first order represents data which are rather easily accessible. Data of the second order represent data which require specific methods for collection and estimation.

Short explanation to different steps identified in the figure.

Step 1. Collection of data of first order on socio-economics and infrastructure

Step 2. Collection of data of first order on forest industry and domestic markets

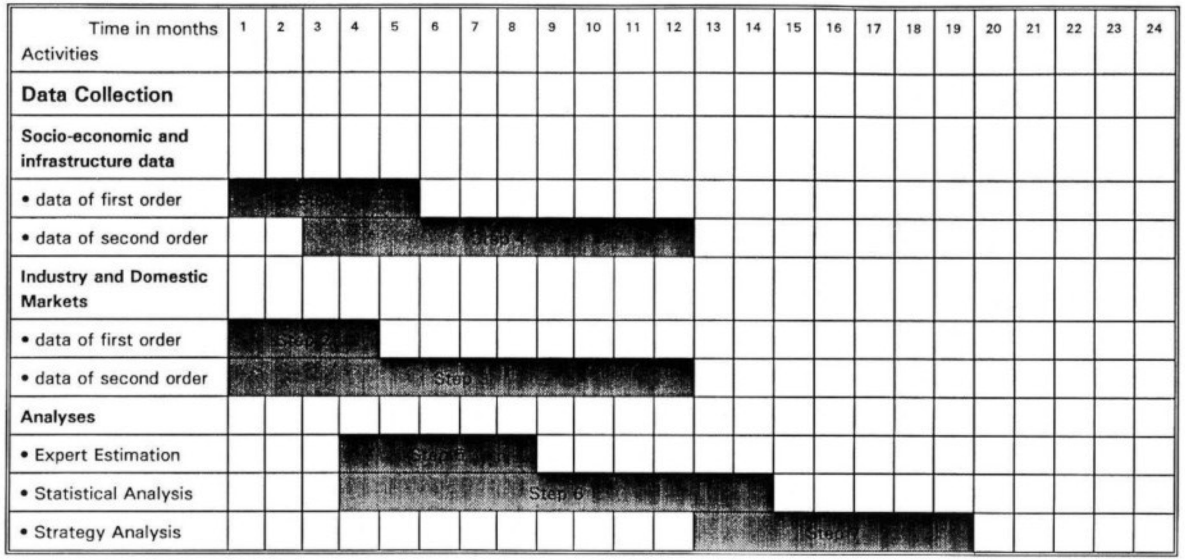
Step 3. Generation of data of second order on forest industry and domestic markets

Step 4. Generation of data of second order on socio-economics and infrastructure

Step 5. Evaluation of the quality of the collected data

Step 6. Statistical analyses of collected data

Step 7. Identification of developmental strategies for the Siberian forest sector based on the collected database.


Time in months
Activities
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Data Collection
Socio-economic and infrastructure data
• data of first order
• data of second order
Industry and Domestic Markets
• data of first order
Step 2
• data of second order
Analyses
• Expert Estimation
• Statistical Analysis
Step 6
• Strategy Analysis